

**ASSAM UNIVERSITY**  
**SILCHAR**  
**PG/UG SYLLABUS**

<b>Sl. No.</b>	<b>Department</b>	<b>Page Nos.</b>
1	English	1
2	Philosophy	5
3	Political Science	13
4	Sociology	21
5	Social Work	35
6	Education	39
7	Library and Information Sciences	45
8	Sanskrit	53
9	Statistics	54
10	Physics	57
11	Assamese	85
12	Computer Science	86
13	Arabic	95
14	Economics	98
15	PG Diploma in Biodiversity Conservation	115
16	PG Diploma in Marketing Management	131
17	PG Diploma in Bioinformatics	143
18	PG Diploma in Information Technology	150
19	Certificate course, French	163
20	Diploma Course in French	164
21	Advanced diploma Course, French	168
22	Earth Science	172
23	Law	175
24	Computer Sc. And Engineering	187
25	Biotechnology	193
26	Chemistry	195
27	Agricultural Engineering	206
29	Mass Communication	393
31	Commerce	425
32	Urdu	443
33	Anthropology	450

**DEPARTMENT OF ENGLISH**  
**ASSAM UNIVERSITY**  
**SYLLABUS**

**E – 304 (C) Option C: TS: 6 credits**

**Translation Studies I**

OBJECTIVE: The course is designed to familiarize students with the theoretical concepts and practice of translation in the western and eastern traditions and to help them to get exposure to the dynamics of translation and enable them to understand the process of translation and appreciate linguistic, cultural and philosophical issues involved in this process through the study of some theoretical positions.

**Course Content:**

UNIT 1: TRANSLATION: CONCEPTS AND HISTORY

1. Development of the concept of translation and a brief history of translation theory
2. Concepts: Fidelity and Transparency; Relevance; Function and Reception; Formal Equivalence and Dynamic Equivalence; Types of Translation; Loss and Gain: Decoding and Recoding; Correspondence and Identity; Untranslatability; Translation Shifts; Metaphors and Idioms in Translation; Transcription; Transliteration; Transcreation; Translation and Ethics; Imitation, Adaptation and Parody, etc.

UNIT 2: THEORIES OF TRANSLATION II

1. Roman Jakobson (4.7)\*
2. Jiri Levy (4.8)\*
3. Eugene Nida (4.9)\*

UNIT 3:

1. Kalidasa: *Sakuntala* (Sanskrit) (Trans. Romila Thapar)
2. Shudrak: *Mricchakatika* (Sanskrit) (*The Little Clay Cart*. Trans. Arthur William Ryder)

UNIT 4:

1. Kabir's Dohas (Dialect in Hindi)\*
2. Mirza Ghalib: *Wine of Passion* :The Urdu Gajals of Ghalib\* (Urdu) (Trans. Sarfaraz K. Niazi)

UNIT 5:

1. Rabindranath Tagore's poems in translation from *Song Offerings*  
 (\*Poems to be selected by teacher)
2. Rabindranath Tagore: *Gora* (Bengali) (trans. Sujit Mukherjee)

**Texts Prescribed:**

1. Bassnett, Susan: *Translation Studies*.
2. Choudhury, Sukanta. *Translation and Understanding*. Oxford University Press, 1999.
3. Mukherjee, Sujit. *Translation as Discovery and Other Essays: On Indian Literature in English Translation*. Orient Longman, 1994.

4. Weissbort, Daniel & Astradur Eysteinnsson (ed.) *Translation – Theory and Practice: A Historical Reader*, OUP, 2006. (\* Unit 2, 3, 4 & 5 starred Chapters selected from this book)

**Scheme of Examination: 5 questions of 10 marks each: 10 x 5 = 50**

**5 questions of 04 marks each: 04 x 5 = 20**

### **Recommended reading:**

1. Baker, Mona. *Critical Readings in Translation Studies*. London. Routledge. 2010
2. Bassnett, Susan and Andre Lefevere (Ed) *Translation, History and Culture*. Continuum International Publishing Group. 1996
3. Bassnett, Susan and Harish Trivedi, eds. *Post-Colonial Translation: Theory and Practice* (London & New York: Routledge. 1999.
4. Catford J. C.: *A Linguistic Theory of Translation*, London OUP, 1965.
5. Hatim, Basil and Jeremy Munday: *Translation: An Advanced Resource Book*, Routledge, 2004.
6. Holmes, James (ed.): *The Nature of Translation: Essays on the Theory and Practice of Literary Translation*, The Hague Mouton, 1970.
7. Jakobson, Roman (ed.): 'On Linguistic Aspects of Translation', in R. Brower (ed.) *On Translation*, Cambridge Mass Harvard UP, 1959.
8. Kelly L. G. *True Interpreter: A History of Translation Theory and Practice in the West*, Oxford, Blackwell, 1979.
9. Levy Jiri: 'Translation as a Decision Process' in To Honour Roman Jacobson II, The Hague, Mouton, pp. 1111-1182.
10. Nida, Eugene Anwar Dil, (ed.), *Language Structure and Translation*, Stanford University Press, 1975.
11. Parks, Tim. *Translating Style: A Literary Approach to Translation—A Translation Approach to Literature*, Manchester, St. Jerome, 2007.
12. Schulter, Rainer and John Biguenet, eds., *Theories of Translation: An Anthology of Essays from Dryden to Derrida*. Chicago, 1992.
13. Steneir, George. *After Babel: Aspects of Language and Translation*, OUP, London, 1975.
14. Venuti, Lawrence (ed.) *The Translation Studies Reader*, 3<sup>rd</sup> Edn, Routledge, 2012

**E – 404 (C) Option A: IWET: 6 credits**

### **Translation Studies II**

OBJECTIVES: Emerging out of the context of a vast social, political, economic and cultural diversity, Indian literature is one of the richest literatures in the world. The course has been designed to introduce the students to the multicultural tradition of Indian literature down the ages through the study of some important texts from different Indian languages as available in English translation.

### **Course Content:**

#### **UNIT 1: THEORIES OF TRANSLATION III**

1. Walter Benjamin (4.4)\*
2. George Steiner (5.2)\*
3. Andre Lefevere (5.5)\*

#### **UNIT 2: THEORIES OF TRANSLATION: INDIAN PERSPECTIVE**

1. K. Ramanujan (5.10)\*
2. Sujit Mukherjee (*Translation as Discovery and Other Essays: On Indian Literature in English Translation*, Paperback, Orient Longman. 1994.) Chapters: 6 and 10
3. Sukanta Choudhury (Selections from *Translation and Understanding*, Oxford University Press, 1999) Chapters: 3 and 4

#### UNIT 3: DRAMA II

1. Badal Sarkar: *Evam Indrajit: Three Act Play*. (Bengali) (trans. Girish Karnad)
2. Vijay Tendulkar: *Kamala* (Marathi) (as in *Five Plays*, trans. Priya Adarkar)

#### UNIT 4: FICTION I

3. Bhisham Sahani: *Tamas* (Hindi) (trans. By self)
4. “Wake up Call”, “Ashraf Ali’s Homeland”, “Fire” from *Barbed Wire Fences*

#### UNIT 5: FICTION II

1. Mahasweta Devi: ‘The Breast Giver’ (Bengali) (trans. Gayatri Chakravorty Spivak)
2. Saurabh Kumar Chaliha: ‘The Jasmine Bower’ (Assamese)\*
3. S. K. Pottekkat: ‘On the River Bank’ (Malayalam)\*
4. Kishori Charan Das: ‘Death of an Indian’ (Oriya)\*

(\* as in *Contemporary Indian Short Stories*. Series III. Sahitya Akademi. 2009 reprint)

#### Texts Prescribed:

1. *Contemporary Indian Short Stories*. Series III. Sahitya Akademi. 2009 reprint.

**Scheme of examination: 5 questions of 10 marks each: 10 x 5 = 50**

**5 questions of 04 marks each: 04 x 5 = 20**

#### Recommended Reading:

1. Ahmed Aijaz. *Indian Literature –Notes Towards a Definition of Category*. London: Verso, 1992
2. Das, Sisir Kumar. *A History of Indian Literature: 1800 – 1910: Western Impact, Indian Response*. Sahitya Akademi, 2005
3. Dharwadker, Vinay and A. K. Ramanujan (eds.) ‘Modern Indian Poetry and Its Contexts’, *The Oxford Anthology of Modern Indian Poetry*
4. France, Peter ed. *The Oxford Guide to Literature in English Translation*. London, OUP, 2000
5. Mukherjee, Sujit. *Translation as Discovery*. Hyderabad, Orient Longman, 1994
6. Mukherjee, Sujit, *Translation as Recovery*, Pencraft International, 2004

#### **E – 404 Option B: ELT CP : 6 credits**

##### **English Language Teaching: Current Practices**

**OBJECTIVE:** The course intends to give students an insight into the current approaches, issues and practices in ELT within tertiary educational institutions where English is taught as a ‘second’ language or a ‘foreign’ language. This exposure is expected to enhance the students’ understanding of both the drawbacks of the traditional methods and approaches of ELT and the advantages of the ‘learner-centred’ methodological innovations like multiple intelligences, learner strategy training, and cooperative learning.

#### **Course Content:**

## UNIT 1: BACKGROUND AND ORIENTATION

1. ELT: A brief historical overview
2. The role of ELT in a changing Global Scenario: The emergence of new paradigms
3. ELT in the 'Post-Method' Era: Implications for the language teacher, the learner and the teaching-learning process.

## UNIT 2:

1. Introduction and historical background
2. Principles underlying the procedure in CLT
3. Classroom techniques and Materials: Use of Information gaps, role play, games, and authentic materials
4. Advantages and disadvantages

## UNIT 3:

1. The notion of Participatory Instruction: Introduction and history
2. Content-Based Instruction
3. Task-Based Instruction

## UNIT 4:

1. Cooperative Learning
2. Developing Learner Strategies
  - a. Listening Strategies through verbal reports
  - b. Tackling Reading Strategy related problems of weak learners
3. Multiple Intelligences

## UNIT 5:

1. Computer-Aided Language Learning
2. The Internet for English Language Teaching

**Scheme of examination: 5 (Five) essay type questions (one from each unit): 15 x 5 = 75**

### **Recommended reading:**

1. Brumfit, C. J., and K. Johnson. *The Communicative Approach to Language Teaching*. Oxford: Oxford U P, 1979.
2. Larsen-Freeman, D. *Techniques and Principles in Language Teaching*. Oxford: Oxford U P, 2004.
3. Richards, J. C., and T. S. Rodgers. *Approaches and Methods in Language Teaching*. Cambridge, Mass: Cambridge U P, 1986.
4. Richards, J. C., and Willy A. Renandya. *Methodology in Language Teaching: An Anthology of Current Practice*. Cambridge: Cambridge U P, 2002.

**DEPARTMENT OF PHILOSOPHY  
ASSAM UNIVERSITY  
SYLLABUS**

CBCS M. A. SYLLABUS IN PHILOSOPHY -- 2015

Total number of Courses in four semesters = 20 (5 in each Semester)

Number of Core Courses in four semesters = 17

Number of elective courses = 02

Number of open courses = 02

Term Paper = 01

Contact hours for each course = 50

Credit for each course = 06 ( Five (05) Lectures + One (01) Tutorial per week)

Marks for each course = 100

Duration of examination = 03 hours

Both the open courses are offered in the semester II: PHIO 203 & PHIO 204. Students are expected to have at least Six (06) and at the most twelve (12) credits as far as the opted courses are concerned from the courses offered by any of the disciplines of this University or any other University. Out of sets of electives (each comprising two papers), one is to be chosen in Semester III and the other in Semester IV.

Abbreviations:

PHIC – PHILOSOPHY CORE

PHIO- PHILOSOPHY OPEN

PHIE- PHILOSOPHY ELECTIVE

**Courses in Semester I**

PHIC 101- Metaphysics (Indian)

PHIC 102- Metaphysics (Western)

PHIC 103- Symbolic Logic

PHIC 104- Moral Philosophy

PHIC 105 – Philosophy of Religion

**Courses in Semester II**

PHIC 201 - Epistemology (Indian)

PHIC 202 - Epistemology (Western)

PHIO 203 – Philosophy and Literature

PHIO 204 – Philosophy of Human Rights

PHIC 205 - Contemporary Indian Philosophy

**Courses in Semester III**

PHIC 301 – Phenomenology and Existentialism

PHIC 302 – Contemporary Western Philosophy

PHIC 303 – (A) Applied Ethics

PHIE 304 – (SET 1) Philosophy of Swami Vivekananda

(SET 2) Gender Ethics

(SET 3) Vedānta I

(SET 4) Existentialism and the Concept of Dialogue

(SET 5) Philosophy of Mind and Consciousness

(SET 6) Contemporary Political Philosophy -I

(SET 7) Philosophy of Religion I  
PHIC 305 – Philosophy of M. K. Gandhi

#### **Courses in Semester IV**

PHIC 401 – Philosophical Classics (Indian)  
PHIC 402 – Philosophical Classics (Western)  
PHIC 403 – Philosophy of Rabindranath Tagore  
PHIE 404- (SET 1) Philosophy of Sri Aurobindo  
(SET 2) Environmental Ethics  
(SET 3) Vedānta II  
(SET 4) Frederick Nietzsche and Existentialism  
(SET 5) Consciousness Studies  
(SET 6) Contemporary Political Philosophy -II  
(SET 6) Religious Worldviews  
PHIC 405- Term Paper

#### **COURSE 103**

#### **SYMBOLIC LOGIC**

##### Unit – I

- a) Logic and Symbolic Logic-Tradition and Modernity
- b) Argument -Truth and Validity
- c) Simple and Compound Statements
- d) Argument forms and Truth Tables
- e) Statement forms

##### Unit – II

- a) Formal Proof of Validity
- b) Proving Invalidity
- c) The Rule of Conditional Proof
- d) The Rule of Indirect Proof

##### Unit – III

- a) Proofs of Tautologies
- b) The Strengthened Rule of Conditional Proof
- c) Shorter Truth Table Technique
- d) Symbolization of Sentences into Propositional functions and Quantifiers.

##### Unit – IV

- a) Preliminary Quantification Rules
- b) Proving Invalidity
- c) Multiply -General Propositions
- d) Quantification Rules.

##### Unit – V

- a) Logical Truths involving Quantifiers
- b) Symbolizing Relations
- c) Arguments involving Relation

d) Introduction to Set Theory

**Suggested Readings:**

Patrick Suppes, *Introduction to Logic*, New Delhi: East West Press Pvt. Ltd.  
 I.M. Copi, *Symbolic Logic*, New Delhi, Prentice Hall of India Pvt. Ltd. (Text Book)  
 I.M. Copi, *Introduction to Symbolic Logic*  
 I.M. Copi, & Carl Cohen, *Introduction to Logic*, Delhi: Pearson Education Pvt. Ltd.  
 Basson & O'Connor, *Introduction to Symbolic Logic*  
 Cohen and Nagel, *Logic and Scientific Method*

**COURSE 203**

**PHILOSOPHY AND LITERATURE**

Unit – I a) What is ‘Philosophy and Literature’?

b) Universality and Pluralism of works of Literature

c) Literature and Truth.

Unit – II a) Discourse, Culture and Ideology

b) Linguistic Categories, minds and world views.

Unit – III Hermeneutics and Literary Creation

Meaning and Definition of Hermeneutics: Romantic Hermeneutics, Historical

Hermeneutics, Hermeneutic Philosophy, Critical Hermeneutics

Reader Response Theory

Meaning, Translatability and Language: Literary Texts and Cinematic Texts.

Unit – IV Philosophy in Literature

*Aag ka Daria* (River of Fire) by Qurratulain Hyder

*Gora* by Rabindranath Tagore

Unit – V Philosophy/ Literature

Feminist Literary Theory, Criticism

a) *Steer Patra* ( *A Wife's letter*) –Rabindranath Tagore (Short Story)

b) *A Tempest* – Aime Cesaire

**Suggested Readings:**

- ☐ Barbara Johnstone, (2007), *Discourse analysis*, Wiley-blackwell.
- ☐ Mills, Sara, (1997), *Discourse*, Routledge.
- ☐ Aristotle, *Poetics*.
- ☐ Plato, *Republic*.
- ☐ Waterfield, Robin (1994). *Plato: Republic*. Translated, with notes and an introduction. Oxford: Oxford World's Classics.
- ☐ .K. C. Bhattacharya, (1958), *Swaraj in Ideas*, Studies in Philosophy, Kolkata : Motilal Banarasidass.
- ☐ Peter Jones, (1975), *Philosophy and the Novel*, Oxford.
- ☐ Alka Saraogi, (2005), *Kali Katha Via Bypass*, Rupa & Co.
- ☐ David Martin, *Architecture of Experience*, University of Edinboro, USA
- ☐ Sartre, Jean-Paul, (1988), *“What is Literature?” and Other Essays*. Introduction by Steven Unger, Harvard University Press
- ☐ Szondi Peter, (1995), *Introduction to Literary Hermeneutics*, Tr. Woodmansee Martha, Cambridge, CUP.



- Josef Bleicher, (1980), *Contemporary Hermeneutics*, London, Routledge.
- Paul Ricoeur (1994), *The Conflict of Interpretations: Essays in Hermeneutics*, Paris, Aarhus.
- Wolfgang Iser, (1980), *The Act of Reading: A Theory of Aesthetic Response*, The Johns Hopkins University Press.
- *Aag ka Daria* (River of Fire) by Kurtulan Haider.
- *Gora*, Rabindranath Tagore.
- Duran, Jane, (2007), *Women, Literature and Philosophy*, Ashgate Publishing.
- Humm, Maggies, (1994), *A Reader's Guide to Contemporary Feminist Literary Criticism*, Harvester Wheatsheaf.
- Belsey, Catherine and Jane Moore, ed.( 1989) *The Feminist Readers : Essays in Gender and the Politics of Literary Criticism*, Blackwell.
- *Steer Patra ( A Wife's letter) –Rabindranath Tagore*
- Aime Cesaire, *A Tempest*.
- Beauvoir, Simone de. (1949/2011). *The Second Sex*, Constance Borde and Sheila Malovany-Chevallier (trans.), New York: Vintage Books.

## **COURSE 204**

### **PHILOSOPHY OF HUMAN RIGHTS**

The course aims at the philosophical appraisal of the fundamental notions of the discourse of Human Rights. It expects the students to look into the conceptual understanding of the formative and functional forces, and the categories of Human Rights, both from the historical and contemporary perspectives. The course also makes the students to realize the need to contextualize the various theoretic positions and philosophical claims which validate the legitimacy of Human Rights discourses. As a University-level Open Course, the course has been structured in an interdisciplinary and intercultural mould and manner to discuss and deliver its concerns.

#### **Unit – I Philosophical Foundations of Human Rights**

Human Dignity and the basis of Human Rights, Nature of Human Rights, Sources of Human Rights, Categories of Human Rights, International Human Rights Law, Humanitarian Law & International Humanitarian Law

#### **Unit–II Human Rights in India**

Historical, Social, Political Perspectives of Human Rights in India, Fundamental Rights and Indian Constitution, Education and Human Rights, Human Rights Institutions in India.

#### **Unit-III Modern Human Rights Discourses**

Minority Rights, Women's Rights, Children's Rights, Prisoner's Rights, Refugees' Rights, Intellectual Property Rights, Media and Human Rights, Environmental Rights, Globalization, Life and Human Rights

#### **Unit -IV New Paradigms of Human Rights Philosophy**

Contemporary Democratic Theories and Human Rights, Philosophical Critique of Human Rights Discourse, Philosophy of Cultural Dialogue: Multicultural and Intercultural Perspectives and the Future of Human Rights.

#### **Unit- V Human Rights: Visual Culture, Literature and Social Freedom**

Cinema, Internet/Social Media, Print Media, Television-Radio, Art and Literature.

### Suggested Readings:

1. Finnis, John (1980) *Natural Law and Natural Rights*, Oxford, Clarendon Press
2. Gaete, Rolando (1993), *Human Rights and the limits of Critical Reason*, Aldershot, Dartmouth Publishing Company
3. Sumnev, L.W. (1987) *The Moral Foundation of Rights*, Oxford, Oxford University Press
4. Davison, James Dale and Rees- Mogg (1997) *The Sovereign Individual*, Touchstone Books
5. Muzaffar, Chandra (1993) *Human Rights and the New World Order*, Pernang: Just World Trust
6. Pfeffer, R. J. (1990) *Marxism, Morality and Social Justice*, Princeton, Princeton University Press
7. Stone Julius (1965) *Human Law and Human Justice*, Sydney, Maitland
8. Taylor Charles, (1999), "Conditions of Unforced Consensus on Human Rights", *The East Asian Challenges for Human Rights*, Joanne R, Baner and Daniel A Bell (eds) Cambridge, Cambridge University Press
9. Tenson, Fernando, (1985) "International Human Rights and Cultural Relativism", 25, *Virginia Journal of International law*
10. Young, Avis Marion (1990) *Justice and the Politics of Difference*, Princeton, Princeton University Press.
11. Agnes, Flavia (1999) *Law and Gender Inequality: The Politics of Women's Rights in India*, Delhi, Oxford University Press.
12. Nirmal J. Chiramjivi, (2000) *Human Rights in India*, Delhi, Oxford University Press.
13. Baxi, Upendra, (2002) *The Future of Human Rights*, Delhi Oxford University Press.
14. The Constitution of India
15. Foucault, Michel (2002), 'Confronting Governments: Human Rights', in: James D. Faubion (ed.), *Power: Essential Works of Foucault, Vol. 3*, London: Penguin.
16. . Agamben, Giorgio,(1998), *Homo Sacer: Sovereign Power and Bare Life*, Stanford: Stanford University Press
17. Zizek, Slavoj. (2004), *Against Human Rights*, [libcom.org,tp://libcom.org/library/against-humanrights-zizek](http://libcom.org/tp://libcom.org/library/against-humanrights-zizek)
18. Derrida, Jacques, (2005), *Rogues: Two Essays on Reason*, trans. Pascal-Anne Brault & Michael Naas, Stanford, Stanford University Press, Badiou, Alain, (2001), *Ethics: An Essay on the Understanding of Evil*, Trans. Peter Hallward, London, Verso.
19. Habermas, Juergen, (1998), *The Inclusion of the Other: Studies in Political Theory*, London, Polity.
20. Habermas, Juergen, (1996) *Between Facts and Norms: Contributions to a Discourse Theory of Law and Democracy*, Trans. William Rehg, London, Polity,1996.

### COURSE 303

#### APPLIED ETHICS

Unit- I Applied Ethics and its Branches: Environmental Ethics, Animal Ethics, Business

Ethics, Bio-Medical Ethics, Feminist Ethics, Media Ethics, Teacher Ethics,

Ethics of Public life and Morality and Legal Ethics

Unit- II Corporate Ethics: Ethics of Business, Corporate Social Responsibility, Individual Vs

Corporate Responsibility, Corporate Ethics and the Critique of Consumerism

Unit- III Sanctity of Life: Suicide, Euthanasia, Abortion

Unit- IV Genetic Engineering and Cloning, Organ Donation, Informed Consent

Unit- V Poverty and Equality, War and Just War Theory, War and Human Rights, Terrorism and Human Rights

### Suggested Readings:

Singer, P., *Practical Ethics Cambridge*, Cambridge Univ. Press, 1988.

Blackwell Companions to Philosophy, *A Companion to Ethics*, Edited by Peter Singer  
 Evans, J.D.G., *Moral Philosophy and Contemporary Problems*, CUP  
 Rachels, James (ed.). *Moral Problems* (Third Ed) 1979, Harper & Row  
 Beauchamp, T.L., *Principle of Biomedical Ethics*, Recent Edition  
 Fox, R. & Marco, J.De, *New Directions in Ethics*, Routledge & Kegan Paul  
 Beauchamp, T.L., LeRoy Walters, *Contemporary Issue in Bioethics*, Wadsworth Publishing Company, 1989.  
 Cohen, M and Nagel, T., *War and Moral Responsibility*, Princeton, 1994.  
 Dennett, J.C., *Nuclear Weapons and the Conflict of Conscience*, New York, OUP, 1999.  
 Nathanson, Stephen, *Terrorism and the Ethics of War*, Cambridge, CUP, 2010.  
 Russell, B., *Common sense and Nuclear Warfare*, Penguin, 1980.  
 Hayward. T., *Ecological Thought*, Polity Press, UK, 2001.  
 Thirionx, J.P., *Ethics: Theory and Practice*, California, Glencoe pub. Co. Inc, 1975.  
 Almond, Brenda (ed.), *Introducing Applied Ethics*, Blackwell, UK  
 Velasquez, Manuel, G., *Business Ethics: Concept and Cases*, 5th edition, Pearson Prentice Hall, New Delhi, 2002.

## **COURSE 304**

### **SET 2**

### **GENDER ETHICS**

#### Unit I

*Women Question* in Philosophy, Feminist Philosophy and its Justification, What is Feminism, Theorizing Feminism

#### Unit II

Ethics and Feminism, Feminist Ethics, Sex-Gender System and Sex-Gender Difference

#### Unit III

Conceptual Analysis: Justice and Care, Partiality versus Impartiality, Objectification and Discrimination

#### Unit IV

Care Ethics, Self-Other Relationship

#### Unit V

New Trends in Feminist Ethics: Gender Egalitarianism, Gender Politics and Eco-feminism

### **Prescribed Readings:**

*A Companion to Feminist Philosophy*. Edited by Alison M. Jaggar and Iris Marion Young. Oxford: Blackwell Publishing (2005).

*Blackwell Guide to Feminist Philosophy*. Edited by Linda Martin Alcoff and Eva Feder Kittay, Oxford: Blackwell Publishing (2006).

*In a Different Voice* by Carol Gilligan. Cambridge, MA: Harvard University Press (1994)

*Second Sex* by Simone De Beauvoir, Translated and edited by H.M. Parshley, Vintage Book, London, 1997

Relevant Chapter from *Encyclopaedia of Environmental Ethics and Philosophy*, Vol. 1. Edited by J. Baird Callicott and Robert Frodeman. USA: Macmillan Reference (A Part of Gale Cengage Learning).

Relevant Web-pages from *Stanford Encyclopaedia of Philosophy*.

### **Suggested Readings**

“Vindication of the Rights of Women” by Marry Wollstonecraft in *Vindication of the Rights of Women*, Deidre Shauna Lynch (ed.), third edition, W.W. Norton & co, New York, London, 2009

Subjection of Women by J. S Mill

Mapping the Moral Domain. Edited by Carol Gilligan, Janie Victoria ward and Jill McLean Taylor with Betty Bardige, Harvard University, Cambridge, MA, 2001.

## **COURSE 404**

### **SET 2**

#### **ENVIRONMENTAL ETHICS**

##### **Unit-I**

Introduction to Environmental Philosophy and Environmental Ethics

The relevance of environmental Ethics

##### **Unit-II**

The Distinction between instrumental and intrinsic value theories in

Environmental Ethics; Anthropocentrism, Bio-centrism, Eco-Centrism;

Environmental goods as instrumental goods and environmental goods as values

by themselves; Cost benefit analysis as a method of assessing environmental values.

##### **Unit-III**

The distinction between prudential reasons and moral reasons

The independent moral status of living things

Animal Rights

##### **Unit-IV:**

Sustainable development

Different senses of the word nature

The problem of arguing from biological fact to value

Environmental Justice

##### **Unit-V:**

The naturalistic view of the relationship of human beings to the rest of nature

The Deep green view about human beings being part of nature.

The Claims of Deep Ecology

### **Major Texts:**

PG Syllabus - Revised Page 51

Taylor, P.W., “Respect for nature”, Mill, J.S., “Nature”, Naess, A., “Identification, oneness, wholeness and self-realization”, Fox, W., “Transpersonal Ecology and the varieties of identification”, Plumwood, V., “Nature, Self and Gender: Feminism, Environmental Philosophy and the critique of Rationalism”, Pearce, D., Markandya, A & Barber, E.B., “Economic Valuation of Environmental goods”. All these texts are from Benson, John(2000), *Environmental Ethics : An Introduction with Readings*, London, Routledge,

**Suggested Readings:**

- Benson, John(2000), *Environmental Ethics : An Introduction with Readings*, London, Routledge,
- Routley V and R., (2001) *Environmental Ethics in Practice*, London, Routledge.
- Singer, Peter, (1993), *Practical Ethics*, Cambridge Univ. Press.
- Velasquez, Manuel, G., (2002), *Business Ethics: Concept and Cases*, 5th edition, Pearson Prentice Hall, New Delhi.
- Rolston III, Holmes, (2012), *A New Environmental Ethics*, London, Routledge.
- Westra, Laura, ( 2009), *Environmental Justice and the Rights of the Ecological Refugees*, London, Earthscan.

**DEPARTMENT OF POLITICAL SCIENCE**  
**ASSAM UNIVERSITY**  
**SYLLABUS**

For pursuing M.A. Course in Political Science, a student shall have to study twenty Courses/Papers evenly distributed between four Semesters covering a period of two years. All the Courses in the first Semester are compulsory. In the Second Semester, Course Nos. Psc. 203 and 204 are Choice based Open Courses and student from any discipline can opt for these Courses. The students of the Department of Political Science, however, may opt for only Course No 204 as Choice Based Open Paper. In the Second Semester, students will have to earn minimum of Six (6) credits (One Course) and maximum Twelve (12) credits (two courses) from other departments in the University. Course No. Psc. 304(A), Psc. 304 (B) and Psc. 304(C) in the Third Semester and Course No. Psc. 404(A), Psc. 404(B) and Psc. 404(C) in the Fourth Semester are Optional Courses and a student can opt for any one of the three Courses in the Third and Fourth Semester respectively. In the fourth semester Students have to undertake one Project Work (Course No. 405) carrying twelve (12) credits.

Each Course will carry a maximum of 100 marks of which 30 marks will be for Internal Evaluation and 70 marks for End-Semester Examination. The Internal Evaluation will be made on the basis of Tests, Seminars/Home Assignments etc. The End-Semester Examination will be held on the dates decided by the authority concerned covering the entire Course Content.

**FIRST SEMESTER**

Psc.101 : Political Philosophy: The Classical Tradition

Psc.102 : Modern Political Analysis

Psc.103 : Public Administration: Concepts and Issues

Psc.104 : Theories and Concepts of International Relations

Psc.105 : Government and Politics in India

**SECOND SEMESTER**

Psc.201 : Political Philosophy: The Modern Tradition

Psc.202 : Problems of International Relations

Psc.203 : Indian Constitution and Government \*

Psc.204 : Human Rights: Theory and Practice\*

Psc.205 : Socio-Economic Foundations of Indian Political System

\*Choice based Open Course 2

**THIRD SEMESTER**

Psc. 301 : Classical and Contemporary Marxist Thought

Psc. 302 : Modern Indian Political Thinkers

Psc. 303 : Comparative Politics

Psc. 304(A) : Indian Administration\*\*

Psc. 304(B) : International Law\*\*

Psc. 304(C) : Indian Politics: Issues and Problems\*\*

Psc. 305 : Foundations of Social Science Research

\*\*Optional

\*\*Optional

**FOURTH SEMESTER**

Psc. 401 : Contemporary Issues in Political Theory

Psc. 402 : Political Institutions and Processes in North East India

Psc. 403 : India's Foreign Policy

Psc. 404(A) : Comparative Public Administration\*\*

Psc. 404(B) : Political Institutions and Processes in South Asia\*\*

Psc. 404(C) : Political Sociology\*\*

Psc. 405 : Project Work

\*\* Optional

### Course No. Psc.103- Public Administration: Concepts and Issues

Unit No.	Course Content	No of Credit
I	Study of Public Administration - Evolution- New Public Administration- New Public Management- State-Market Debate	6
II	Traditional Approaches: Scientific Management- Classical- Bureaucratic- Human Relations	
III	Modern Approaches: Decision- Making, Systems - Comparative / Ecological- Development Administration	
IV	Public Policy Making & Implementation Paradigms The Incrementalist Paradigm 1) The Elite/Mass Model; 2) The Group Model; 3) The Institutional and the Neo Institutional Model, 4)The Organized Anarchy Model The Rationalist Paradigm 1)The Public Choice Model; 2) The Exclusion/ Consumption Model; 3) The Technology Assessment Model	
V	Emerging Issues Administrative Ethics - Administrative Accountability - Administrative Ethics -Administrative Corruption - Good Governance- E Governance	

#### Readings:

1. Albrow, Martin: *Bureaucracy*, London, Macmillan
2. Bhattacharya, Mohit: *Public Administration Public Administration Structure, Process and Behaviour*, Calcutta, World Press, 1999
3. \_\_\_\_\_: *Restructuring Public Administration, Essays in Rehabilitation*, New Delhi, Jawahar
4. Fadia B.L.& Kuldeep Fadia: *Public Administration, Administrative Theories & Concepts*, Agra, Sahitya Bhawan Publications, 2003
5. Hughes, Owen E.: *Public Management and Administration: An Introduction*, Palgrave Macmillan, 2003
6. Maheswari, SR: *Administrative Theories*, McMillan.
7. Nicholas Henry: *Public Administration and Public Affairs*, Prentice Hall of India, 2004.

### Course No. Psc. 104: Theories and Concepts of International Relations

Unit No.	Course Content	No of Credit
I	The Historical Setting : Emergence of Modern State – The Age of Revolutions – The Age of Total War	
II	Theories of International Relations: Realism – Idealism –Liberalism – Dependency - Game Theory.	
III	The Concept of Power : Meaning – Constituents – Balance of Power – Collective Security – Changing Nature of Power	

IV	Foreign Policy : Meaning – Determinants – Objectives – Approaches	6
V	Alternative Approaches in IR : Critical Theory - Constructivism – Feminism – Post-modernism	

**Readings:**

1. Keith L. Shimko, *International Relations : Perspectives and Controversies*, Houghton Mifflin Company, New York, 2005
2. Richard W. Mansbach and Kristen L. Taylor, *Introduction to Global Politics*, Routledge, London, 2008
3. Scott Burchill et al, *Theories of International Relations*, Palgrave, New York, 1995
4. Michael R. Sullivan, *Theories of International Relations : Transition vs Persistence*, Palgrave, New York, 2002
5. Norman D. Palmer & Howard C. Perkins, *International Relations : The World Community in Transition*, Houghton Mifflin Company, Boston, U.S.A
6. K. J. Holsti, *International Politics: A Framework For Analysis*, Prentice Hall
7. Jayantanuja Bandhopadhyay, *A General Theory of International Relations*, South Asia Books, 1993
8. Sunil Sondhi, *International Relations*,.....
9. Kanti Bajpai & M. Siddhartha (eds), *International Relations in India: Bringing Theory Back Home*, Orient Long Man, N. Delhi, 2005.

**Course No. Psc. 105: Government and Politics in India**

Unit No.	Course Content	No of Credit
I	Constitutional Foundations-Development of the Constitution of India- Composition and working of the Constituent Assembly- Ideology of the Constitution	6
II	Constitution as an Instrument of Socio-Economic Change- Amendment Process- Major Amendments- Review of the Constitution.	
III	Governmental Structure and Processes: Legislature, Executive, Judiciary, Bureaucracy-Conflicts and Inter-dependence	
IV	Indian Federalism: Centre-State relations, Demand for Greater State Autonomy- Rajamannar Committee Recommendations, West-Bengal Memorandum (1977), Anandapur Sahib Resolution and Sarkaria Commission.	
V	Parties and Politics- Issues and Emerging trends in Party System in India- National and Regional Parties, their Organisation and Ideologies-Coalition politics.	

**Readings:**

1. Arora, Balveer & Verney, Douglas (ed) *Multiple Identities in a Single State: Indian Federalism in a Comparative Perspective*, Konark, 1995.
2. Austin, G. *The Indian Constitution*, OUP, 1966.
3. \_\_\_\_\_ *Working of a Democratic Constitution*, OUP 2000.
4. Baruah Sanjib, *Durable Disorder*, OUP, 2005
5. Brass Paul, *The Politics of India since Independence*, CUP, 2004
6. Chatterjee, P. *State and Politics in India*, OUP,
7. \_\_\_\_\_ *A Possible India*, OUP, 1997.
8. Kohli, A. *Democracy and Discontent: India's Growing Crisis of Governability*, CUP, 1990
9. Hasan, Z. *Parties and Party Politics in India*, OUP, 2002.



10. Hasan,Z, Shridharan, Sudarshan, *India's Living Constitution*, Permanent Black, New Delhi.
11. Mitra, S.K. *The Puzzle of India's Governance*, Foundation Books, New Delhi.
12. Kothari, R. *Politics in India*, Orient Longman.

**Course No. Psc. 203-Indian Constitution and Government\***

Unit No.	Course Content	No of Credit
I	Constitutional Foundation: The Making of the Constitution & its Sources, Basic Features of the Constitution, Preamble	6
II	Fundamental Rights & Duties, Directive Principles of State Policy	
III	Union Govt: President, PM, Council of Ministers, Parliament, Supreme Court	
IV	State Govt: Governor, Chief Minister, Council of Ministers, State Legislature, High Court	
V	Political parties & Electoral Process: National & Regional Pol. Parties – Origin & Development, Ideology & Support Base The Election Commission & Electoral reforms	

\* **Open Course**

**Readings:**

1. Arora, Balveer and Verney, Douglas edited, *Multiple Identities in a Single State : Indian Federalism in a Comparative Perspective*, Konark, 1995.
2. Austin, G. *The Indian Constitution*, OUP, 1966.
3. \_\_\_\_\_, *Working of a Democratic Constitution*, Oxford, 2000
4. Brass, Paul., *The Politics of India Since Independence*, Cambridge University Press, 2004.
5. Hardgrave, R. L. Jr. and Stanley A.K., *India : Government and Politics in a Developing Nation*, 1986.
6. Hasan Zoya, Shridharn, Sudarshan, *India's Living Constitution*, Parmanent Black, New Delhi.
7. Mitra, S.K., *The Puzzle of India's Governance*, Foundation Books, New Delhi.
8. Kothari, Rajni , *Politics in India*.
9. Partha Chatterjee (ed.), *State and Politics in India*, OUP.

**Course No. Psc. 204- Human Rights: Theory and Practice\***

Unit No.	Course Content	No of Credit
I	Human Rights: The Concept and Safeguards: Meaning, Nature-Evolution, Theoretical Foundations-International Bill of Human Rights: UDHR, ICCPR, ICESCR - Emerging Scenario: Solidarity Rights - Cultural Relativism - Human Rights and Globalisation	
II	Human Rights and Vulnerable Groups: International Instruments – Women – Child - Refugee and Internally Displaced persons - Persons belonging to National or Ethnic, religious and Linguistics Minorities -Indigenous peoples	

III	Human Rights In India: Indian Constitution and the Human Rights: Fundamental Rights, Directive Principles of State Policy - Human Rights and Judicial Activism - Rights of Prisoners and Judiciary - Protection of Human Rights: National Human Rights, State Human Rights Commission	6
IV	Promotion and Protection of Human Rights of Vulnerable Groups in India: Women – Children - SC/ST - National Commission for Women, Children, SC, ST, Minorities	
V	Human Rights in the Context of North East India: Sources of Violation of Human Rights: Autonomy Movements, Ethnic Conflicts, Displacement - Role of Enforcement Agencies: Police, Security Forces - Assessment of Armed Forces Special Power Act - Role of State Human Rights Commissions - Role of Human rights Organizations	

**\*Open Course**

**Readings:**

1. Basu Durga Das: *Human Rights in Constitutional Law*, New Delhi, Prentice Hall of India, 1994.
2. Browline, Lane, (Ed): *Basic Documents of Human Rights* (2nd Edition), UK, Claredon Press, 1981.
3. Evans Tony: *Politics of Human Rights ; A Global Perspective*, Pluto Press ,London,2005
4. Dhamala R.R. and Sukalpa Bhattacharjee(ed), *Human Rights and Insurgency in North East India*, New Delhi Shipra,002
5. Donnelly, Jack: *Universal Human Rights: Theory and Practice*, Ithaca Cornell University Press,1989
6. Ellis Anthony, (Ed): *Ethnic and International Relations*, UK, Manchester University Press 1986.
7. Falk Richard, *Human Rights and State Sovereignty*, New York, Holmes and Meur, 1981.
8. Foesythe,David : *Human Rights and World Politics*, Lincoln, University of Nebraska Press 1983.
9. Hatchard John: *National Human Rights Institution: Common Wealth secretariat*, London, 1993.
10. Henkin Louis : *The Rights of Man Today*, Boulder Wintview ,1978
11. Lyer V.R Krishna: *The Human Rights and Law*, Indore Vedpal Law House,1986
12. Jaswal Paramjit S & Nishtha Jaswal (Ed): *Human Rights and the Law* New Delhi,APH,1996.

**Course No. Psc. 304(A): Indian Administration\*\***

Unit No.	Course Content	No of Credit
I	Historical Evolution: Continuity & Change: Historical Legacy of Indian Administration: Ancient to British Period – Perspectives of Indian Administration: Parliamentary Democracy, Federalism. Democratic Socialism, Human Rights, Judicial Activism – The Changing Nature of Union – State Administrative Relations	6
II	Centre, State and District Administration: Admn of the Centre: President, PM, Council of Ministers, Cabinet Committee, Secretariat, Cabinet Secretariat, Ministries and Departments – State Administration: Governor, CM, Council of Ministers, CM's Secretariat & Chief Secretary	
III	The Personnel System: Civil Services: Structures, Recritment, Training – Generalists & Specialists – The Changing Relationship – Public Service Commissions: Union & State	
IV	Indian Administration: Themes & Issues: Administration & Politics – Changing Role of the Indian State – Administrative Corruption – Redressal Machinery – Administrative Reforms in India: Emerging Challenges to Indian Constitution in context of Globalization	
V	Emerging Issues: E. Governance – Right to Information – Liberalization	

**Readings:**

1. Arora, Ramesh K, (Ed) *Indian Administration, Perceptions and Perspectives*, Jaipur, Aalekh Publishers, 1999
2. Arora, Ramesh K. Rajni Goyal: *Indian Public Administration Institutions & Issues* New Delhi, Wishwa Publications, 1997
3. Arora, Ramesh K & Sangeeta Sharma(Ed): *Comparative and Development Administration*. Jaipur. Arihant, 1992
4. Barthwal C.P. (ed): *Public Administration in India*, New Delhi, Ashish, 1993
5. Das, S.K.: *Civil Service Reforms and Structural Adjustment*, OUP, 1998
6. Haldipur, R.N.: *Public Administration: Reflections and Explorations*, New Delhi, Kanishka, 1997
7. Jain, R.B. *Public Administration in India, 21st Century Challenges for Good Governance*, New Delhi, 2002
8. Jain R.B. & Heinz Bongartz (Ed), *Structural Adjustment Public Policy and Bureaucracy in Developing Countries*, New Delhi, Har Anand Publications, 1994
9. Maheshwari, Shriram: *Rural Development in India*, New Delhi, Sage, 1985,
10. \_\_\_\_\_, *Indian Administration*, New Delhi, Orient Longman, 1996.

**Course No. Psc. 304(B): International Law\*\***

Unit No.	Course Content	No of Credit
I	International Law : Meaning, Nature, Evolution & Sources – Relation with Municipal Law – Codification	6
II	State and Government : Recognition, Succession and Intervention – State Territory : Modes of Acquiring and Losing State Territory	
III	International Laws I: Laws of Sea, Air Space, Outer Space and Environment	
IV	International Laws II : Laws of War, Neutrality and Settlement of Disputes - International Humanitarian Law	
V	Diplomacy : Vienna Convention on Diplomatic Relations 1961- Consuls – Nationality – Extradition – Asylum	

**Readings:**

1. Anand, R. P., *New States and International Law*, 1972.
2. Anand, R. P. (ed), *Law of Sea: Caracas and Beyond*, 1978.
3. British Year Book of International Law.
4. Brierly, J. L., *The Law of Nations*, Clarendon Press, Oxford, 1963.
5. Chandra, Satish, *Law of Sea*, Mittal Publications, Delhi, 1985.
6. David, J. Bederman, *International Legal Frameworks*, Foundation press, New York, 1999.
7. Kelsen, H., *Principles of International Law*, Rhinehart and Winston, New York, 1966.
8. Kumar, Mahendra, *Violence and Non-Violence in International Relations*, Thompson Press, New Delhi, 1975.
9. Malcolm, N. Shaw, *International Law*, Cambridge University Press, New York, 1999.
10. O'Connell, D. P, *International Law*, (2 Volumes), Stevens, 1970.
11. Oppenheim, L., *International Law*, Butterworth, London, 1972.
12. Shearer, I. A., *Starke's International Law*, Butterworths, London, 1994.
13. Scott, Shirley, *International Law in World Politics: An Introduction*, Viva Books Pvt. Ltd, N. Delhi, 2005
14. Tandon, M.P., *Public International Law*, Allahabad Law Agency, 2005.
15. Brownlie, Ian, *Basic Documents in International Law*, Oxford University Press, 2009.

**Course No. Psc. 304(C): Indian Politics: Issues and Problems\*\***

Unit No.	Course Content	No of Credit
I	India's Approach to Nation building, Models of Liberal Democracy and Modernisation, Political Culture and Socialization	
II	Parliamentary Democracy in India: Coalition Politics, Role of Opposition, Pressure Groups & Interest Groups, Politics of Defection	

III	Party System in India: Changing Profile of National & Regional Political Parties – Origin & Development, Ideology, Social Base & Leadership, Support structure, Electoral Performance, Election Campaign	6
IV	Regionalism and Sub-Nationalism with ref. to Punjab, Kashmir and Northeast India	
V	Non-Party Movements: Trade Union, Peasant, Dalit, Tribal and Minorities.	

**\*\* Optional Course**

**Readings:**

1. Hasan Zoya(ed), Politics and Party Politics in India, Oxford, New Delhi 2001
2. Kohli, Atul, Democracy and Discontent: India's Growing Crisis of Governability Cambridge University Press, 1990
3. ----- Centralisation and Powerlessness: India's Democracy in a Comprehensive Perspective, in Joemidgal, Atul Kohli and Vivienne Shue (ed) State power and Social Forces, Cambridge University press, 1991
4. Morris Jonnes, Politics mainly Indian Orient Longman, 1970
5. Pai Sudha, State Politics New Dimension: Party System, Liberalization and Politics of Identity, Shipra New Delhi, 2000.
6. Sartori, G., Politics and Party System: A Framework for Analysis, Cambridge University Press 1997.

**Course No. Psc. 403: India's Foreign Policy**

Unit No.	Course Content	No of Credit
I	The Nature of India's Foreign Policy : Basic Principles – Domestic and External Determinants	6
II	Evolution of India's Foreign Policy: Various Phases : Cold War & Non-alignment – End of Cold War & Bi-polarity – Regionalism – Nuclearization	
III	India's Security Concerns: Nuclear Issue/Proliferation - Indian Ocean – South China Sea – Terrorism – Kashmir – Role of China and Pakistan	
IV	India's Engagement with Regional Forums : EU, OPEC, ASEAN, SAARC	
V	India's Relations with External Powers : U.S.A – Russia – Southeast Asia – Japan	

**Readings:**

1. Jayantanuja Bandhopadhyay, *The Making of India's Foreign Policy: Determinants, Institutions, Processes, Personalities*, Asia Book Corporation of America, 1984.
2. Appadorai Rajan, *India's Foreign Policy*.
3. V. P. Dutt, *India's Foreign Policy since Independence*, National Book Trust, 2007.
4. Ashok Kapur, *India from Regional to Global Power*, Routledge, 2006.
5. Harsha V. Pant (eds), *India's Foreign Policy in a Unipolar World*, Routledge, 2009.
6. Sumit Ganguly, *India's Foreign Policy : Retrospect and Prospect*, Routledge, 2010.
7. J. N. Dixit, *India's Foreign Policy and its Neighbours*, Gyan Publishing House, N. Delhi, 2001.
8. Steve Smith, Hadfield & Dunne (Eds), *Foreign Policy: Theories, Actors Cases*, Oxford University Press, 2008.
9. James Rosenau, *The Scientific Study of Foreign Policy*, Frances Pinter & Nichols Publishing, London, 1980.

**Course No. Psc. 404 (C): Political Sociology\*\***

Unit No.	Course Content	No of Credit
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I	Political Sociology: Evolution, Meaning, Scope and Relevance: Political Sociology and other Social Scs	6
II	Influence, Power, Legitimacy and Authority	
III	Elitism & Marxism: Elite Theory, Gaetano Mosca, Roberto Michels, Vilfredo Pareto, James Burnham and C.Wright Mills	
IV	Modern Concepts in Political Sociology: Political Culture, Political Socialization, Political Participation, Political Modernization and Political Development	
V	Political Parties & Pressure Groups, Gender & Politics, New Social Movements	

**\*\* Optional Course**

***Readings:***

1. Ashraf, Ali and L.N.Shama, Political Sociology – A New Grammar of Politics, Universities Press (India) Ltd., Hyderabad, 1995.
2. Bottomore, Elites and Society, Penguin Boks, 1976.
3. Gupta, Dipankar, Political Sociology in India: Contemporary Trends, Orient Longman, 1995.
4. Heywood, Andrew, Political Ideologies: An Introduction, Macmilan, 1999.
5. Mukhopadhyay, Amal, Political Sociology, K.P. Bagchi and Company, Calcutta, 1997.
6. Rush, Michael and Philip Althoff, An Introduction to Political Sociology, Nelson, 1971.
7. Sarah Joseph, Political Theory and Power, Foundation Books, New Delhi, 2004.

**Course No. Psc. 405: Project Work**

Unit No.	Course Content	No of Credit
	Project Work	12

**DEPARTMENT OF SOCIOLOGY  
ASSAM UNIVERSITY  
SYLLABUS**

**SEMESTERWISE COURSE DISTRIBUTION**

Full Marks (Sessionals + End-Semester Exam): 70+30=100

Pass Marks (Sessionals + End-Semester Exam): 28+12=40

No. of Credits:06

Total No. of Lectures: 60

**SEMESTER-I**

SOC 101: Sociological Concepts  
SOC 102: Sociological Thinkers-I  
SOC 103: Methodology of Social Research-I  
SOC 104: Social Stratification  
SOC 105: Indian Social System

**SEMESTER-II**

SOC 201: Sociological Thinkers-II

SOC 202: Methodology of Social Research-II

**\*\*SOC 203(I): Gender and Society  
(II): Environment and Society  
(III): Sociology of Communication  
(IV): Education and Society**

**\*\*SOC 204 (I): Science, Technology and Society  
(II): Globalization and Society  
(III): Sociology of Ageing  
(IV): Sociology of Health**

SOC 205: Kinship, Marriage and Family

**SEMESTER-III**

SOC 301: Theoretical Perspectives in Sociology

SOC 302: Sociology of Change and Development

**\*SOC 303(I): Rural Sociology  
(II): Sociology of Religion**

**\*SOC 304(I): Political Sociology  
(II): Industrial Sociology  
(III): Crime and Society  
(IV): Culture, Personality and Society  
(V): Sociology of Marginalized Communities**  
SOC 305: Sociology of North-East India

**SEMESTER- IV**

SOC 401: Comparative Sociology

SOC 402: Culture and Development in North East-India

\*SOC 403(I): Urban Sociology  
(II): Sociology of Movements

\*SOC 404(I): Population and Society  
(II): Theories of Social Anthropology  
(III): Sociology of Professions  
(IV): Sociology of Information Society  
(V): Sociology of South Asia  
(VI): Study of Indian Diaspora

SOC 405: Fieldwork and Dissertation

*\* Elective Course (SOC 303, SOC 304, SOC 403, SOC404)*

*\*\* Choice based Course (SOC 203, SOC 204)- at a Time Introduced One from the List*

### SOC 103

#### METHODOLOGY OF SOCIAL RESEARCH- I

**Full marks: 70+30=100**

**Pass mark: 28+12=40**

**No. of Credits: 6**

**No. of Lectures: 60**

*This course aims to provide exposure to fundamentals of various research techniques and methods. It tries to build upon basic assumptions in adopting different methodologies for different kinds of research themes. It introduces certain philosophical ideas underlying the emergence of different methodologies in social sciences and attempts to sensitize post-graduate students to develop a critical outlook at the existing perspectives and methods and to evolve conceptual clarity, which can lead them in their future research*

#### COURSE OUTLINE

##### **Unit I            Positivism (Credits- 2)**

Comte, Durkheim and Popper: critique of positivism  
Idealistic tradition-Hegel, Dilthey, Max Weber  
Critique of idealistic tradition-Marx  
Inductive and deductive reasoning, concept and hypothesis

##### **Unit II            Research methods (Credit-1)**

Functional, comparative, evaluative and historical and dialectical

##### **Unit III          Steps in social research (Credit-1)**

Research design and its types-exploratory, descriptive and explanatory

##### **Unit IV          Data and techniques of data collection (Credit-1)**

Sources and types of data, observation, questionnaire, schedule, interview, participatory rural appraisal (PRA), projective techniques

##### **Unit V            Sampling method (Credit-1)**

Probability and non-probability sampling methods

## READING LIST

- Barnes, John A. 1979: Who Should Know What? Social Science, Privacy and Ethics, Harmondsworth: Penguin
- Bleicher M. 1988: The Hermeneutic Imagination, London: Routledge and Kegan Paul (Introduction only)
- Bose, Pradip Kumar, 1995: Research Methodology, New Delhi: ICSSR
- Hughes, John. 1987: The Philosophy of Social Research. London: Longman
- Irvine, J. I. Miles and J. Evans (eds.) 1979: Demystifying Social Statistics, London: Pluto Press
- Madge, John. 1970: The Origins of Scientific Sociology, London: Tavistock.
- Feyerabend, Paul, 1975: Against Method: Outline of an Anarchistic Theory of Knowledge, London: Humanities Press
- Hawthorne. Geoffrey, 1976: Enlightenment and Despair: A History of Sociology, Cambridge: Cambridge University
- Kuhn, T. S. 1970: The Structure of Scientific Revolutions, London: The University of Chicago Press
- Mukherjee, P.N. (eds.) 2000: Methodology in Social Research: Dilemmas and Perspectives, New Delhi: Sage (Introduction)
- Popper, K. 1999: The Logic of Scientific Discovery, London: Routledge
- Shipman, Martin. 1988: The Limitations of Social Research, London: Longman
- Sjoberg, Gideon and Roger Nett 1997: Methodology for Social Research, Jaipur: Rawat
- Smelser, Neil J. Comparative Methods in Social Science
- Goode, W.J. and P.F. Hatt 1952: Methods in Social Research. New York: McGraw Hill Book Co
- Shellitz, Claire, Lowrance, C. Wrightman and S.W. Cook 1976: Research Methods in Social Relations, New York: Hold Reinhart and Winston
- Young, P.V. 1988, Scientific Social Surveys and Research, New Delhi: Prentice Hall of India
- Moser, C. A. 1953: Survey Methods in Social Investigation, New York: The Macmillan
- Weber, Max 1949: The Methodology of Social Sciences, Glencoe: Free Press
- Mayntz, R.K. Holan and Hobbner, R 1969: Introduction to Empirical Sociology, Harmondsworth: Penguin Books
- Naiwa 1996: The A B C of Research, New Age: International (P) Ltd

## Pedagogy

This course communicates message about methodologies and methods do not evolve or emerge in a vacuum. Thus, the teacher is expected to constantly connect research methods to a theoretical framework so as to explain explicitly linkages between theory and practice. Discussions and practical



exercises may form an integral part of the course. Daily discussion on specific topic among students will provide feedback to the teacher and also arouse interest of students.

**SOC 203 (III)**  
**SOCIOLOGY OF COMMUNICATION**

Full marks: 70+30=100

Pass mark: 28+12=40

No. of Credits: 6

No. of Lectures: 60

Popular culture in form of folk theatre, cinema and folk music touches lives of millions of people in cities as well as in countryside. Similarly, mass media communication now plays an increasingly important role in society. Objective of the course is to provide a sociological perspective on role of popular culture and mass media in modern society, especially in the context of Indian society.

**COURSE OUTLINE**

**Unit I Basic concepts (Credit-1.5)**

Popular culture, mass culture, folk culture, elite culture, role of mass media in popular culture, relationship between popular culture and leisure and recreation, identity and community consciousness as mediated and reinforced through popular culture, relationship between popular culture and social and political movement

**Unit II Development in ICT (Credit-1)**

Development in information and communication technology, impact on popular culture, television and commercialisation of leisure, popular music and social reach

**Unit III Globalisation, Popular Culture and Mass Media (Credit-1)**

Global media as an agency of globalisation, syncretism in global culture, control of MNCs over global information flow as well as entertainment, diffusion of global culture through mass media and its impact on values, consumerism, food preferences, fashions and entertainment of youth

**Unit IV Social Uses and Abuses of Media (Credit-1)**

Dissemination of awareness about social issues, social marketing, violence and media, theoretical perspective on popular culture and media-little and great tradition, universalisation and parochialisation, critical theory, medium as message

**Unit V Mass communication: Indian context (Credit-1.5)**

Folk group of musician in traditional Indian society, popular culture as reflected in festival, pilgrimage, folklore, film- their social significance and impact, satellite television and its impact on youth culture, commercialisation of folk culture, media and social policy, television as an agency of dissemination and popularisation of classical and folk music

**READING LIST**

Bathla, Sonia. 1998: Women, Democracy and the Media: Cultural and Political Representation in the Indian Press, Delhi: Sage

Breckenridge, C. : Consuming Modernity: Public Culture in Contemporary India

Brosius, C. and M. Butcher. (eds.) 1999: Image Journey: Audio Visual Media and Cultural Change in India, Delhi: Sage

Curran, J and M. Gurevitch (eds) 1991: Mass Media and Society (London: Edward Arnold)

French, D and Michael Richard (eds). 2000: Television in Contemporary Asia, London: Sage

Gunaratne, S. (eds). 2000: Handbook of the Media in Asia, London: Sage

Johnson, K. 2000: Television and Social Change in Rural India, London: Sage

Manuel, P. 1998: Cassette Culture: Popular Music and Technology in North India

Mitra, A. 1993: Television and Popular Culture in India, Delhi: Sage

Singhal, A. and E.M. Rogers 2000: India's Communication Revolution, Delhi: Sage

Appadorai, Arjun, 1997: Modernity at Large: Cultural Dimensions of Globalisation, New Delhi: Oxford University Press

Axford, B. and Richard Huggins 2001: New Media and Politics, London: Sage

Leach, E.1976: Culture and Communication, Cambridge: Cambridge University Press

Page, D. and William Crawley 2001: Satellites over South Asia, London: Sage

Preston, P. 2001: Reshaping Communications, London: Sage

Robertson, R. 1992: Globalisation, Social Theory and Global Culture, London: Sage

Tunstall, J. 1977: The Media are American, New York: Columbia University Press

Pedagogy

Audio-visual method be used and illustration be drawn from North Eastern region

### **SOC 204(IV)** **SOCIOLOGY OF HEALTH**

Full marks: 70+30=100

Pass mark: 28+12=40

No. of Credits: 6

No. of Lectures: 60

After 60 years of independence and several developmental efforts health status is not up to minimum satisfaction. Though mortality rate come down morbidity rate is high as well as regional imbalance. People still suffer from preventable, communicable and infectious disease. Nutritional disorder is quite high. While primary care is lacking in many parts of India high-tech and high cost medical care is fostered. The course aims (i) to introduce students concept of health and to impress upon them health is primarily a social science subject than of medical science (ii) to make them understand health is one of the basic rights of every citizen (iii) to bring home interrelationship between society and health (iv) to understand problems of health in India in its four dimensions and (v) to understand relationship between political economy and health at national and international level. COURSE OUTLINE

#### **Unit I Sociology of health (Credit-1.5)**

Aim and scope, contribution of sociology to health, definition of health- four dimensions of health, health and its relationship to other social institutions

Evolution of social medicine in India and abroad, social science and four dimensions of health

Social epidemiology- vital and public health, concept and statistics

## **Unit II Epidemiology of disease (Credit-1)**

Natural history of disease, man and his environment, social etiology, social epidemiology and ecology of disease

Social component in therapy and rehabilitation- culture and disease, attitudes, beliefs and values associated with disease, problems of therapy and rehabilitation, sick-role and patient role.

## **Unit III Hospital as social organization (Credit-1)**

Types of hospital- general hospital, specialty hospital, sanatoria, dispensary, teaching and corporate hospital, functions of hospital, co-ordination and supervision in hospital, interpersonal relationship in hospital setting

Hospital as a community organisation, medical social service in hospital

## **Unit IV Community health (Credit-1)**

Concept, community health problems in India, concept of integrated health service, Primary Health Centres: their organisation and functioning

Implementation and utilisation of health programmes in rural and urban communities

## **Unit V State and health (Credit-1.5)**

health as a fundamental right, health policy of government of India, financing of health care, health insurance, drugs- manufacturing, distribution and price, WTO IPR and manufacturing of essential drugs and their distribution in India, food and drug adulteration, medical council of India, Indian medical association, issues of consumer protection and the government

Rehabilitation–concept, principles of rehabilitation, rehabilitation agencies- state and private, rights of the handicapped, care of handicapped

Role of mass media and promotion of health

## **READING LIST**

Albrecht, Gary L. and Fitzpatrick, R. 1994. Quality of life in healthcare: Advances in medical sociology, Mumbai: Jai Press

Coe. Rodney M. 1970. Sociology of medicine, New York: McGraw Hill

Cockerham, William C. 1997. Medical sociology, New Jersey: Prentice Hall

Cockerham, William C. 1997. Readings in medical sociology, New Jersey: Prentice Hall

- Conrad, Peter et al. 2000. Handbook of medical sociology, New Jersey: Prentice Hall
- Dasgupta, R. 1993. Nutritional planning in India, Hyderabad: NIN
- Fox, Renee C. 1988. Essays in medical sociology: Journeys into the field, New York: Transaction Publishers
- Nayar, K.R. 1998. Ecology and health: A system approach. New Delhi: APH Publishing Corporation
- Venkataratnam, R. 1979. Medical sociology in an Indian setting, Madras: Macmillan
- Albrecht, Gary L. 1944. Advances in medical sociology, Mumbai: Jai Press
- Gunatillake, G. 1984. Intersectoral linkages and health development: Case studies in India (Kerala State), Jamaica, Norway, Sri Lanka, and Thailand (WHO Offset series), Geneva: WHO
- Rao, Mohan. 1999. Disinvesting in health: The World Bank's prescription for health, New Delhi: Sage
- Schwartz, Howard. 1994. Dominant issues in medical sociology, New York: McGraw Hill
- Scrambler, Graham and Paul Higgs. 1998. Modernity, medicine and health: Medical sociology towards 2000. London: Routledge

### **Pedagogy**

- Assignment to study and analyse census reports on mortality and morbidity
- Analysing DGHS reports on incidence and prevalence rates of diseases
- Discussion on WHO reports on infectious and communicable diseases and other statistical information
- Visit to hospitals, sanatoria and writing critical report on them
- Write report on functioning of specific primary health centre by assigning one centre for one student
- Discussion sessions on rural health on basis of their own observation
- Organising small group seminar by inviting expert in public health and encouraging discussion
- Participate in NGO activities in the neighbourhood where NGO activity on health is intensive

### **SOC 302**

#### **SOCIOLOGY OF CHANGE AND DEVELOPMENT**

Full marks: 70+30=100

Pass mark: 28+12=40

No. of Credits: 6

No. of Lectures: 60

#### **Objectives of the course:**

- (i) to provide conceptual and theoretical understanding of social change and development as it has emerged in sociological literature
- (ii) to offer an insight into ways in which social structure impinges on development and development on social structure

(iii) to address in particular Indian experience of social change and development to prepare students for professional careers in the field of development planning, including governmental, non-governmental and international agencies engaged in development

## **COURE OUTLINE**

### **Unit I Forms of Social Change (Credit-1.5)**

Evolution, progress, transformation, change in structure and change of structure

Theories and Factors of Social Change-linear, cyclical, curvilinear, demographic, economic, religious, bio-tech, info-tech and media

### **Unit II Changing Conception of Development (Credit-1)**

Economic growth, human development and social development, sustainable development- question of socio-cultural sustainability, multiple sustainability

Critical perspective on development- ecological, liberal, Marxian

### **Unit III Theories of Development and Underdevelopment (Credit-1.5)**

Modernisation theory, centre-periphery, world-system, unequal exchange, Articulation of mode of production

Paths of development-capitalist, socialist, mixed economy, Gandhian Agencies of state, market, non-governmental organisations (NGOs)

### **Unit IV Social Structure, Culture and Development (Credit-1)**

Social structure as facilitator/inhibitor of development, development and socioeconomic disparities, gender and development

Culture and Development-culture as aid/impediment to development, development and displacement of tradition, development and upsurge of ethnicity

### **Unit V Indian Experience of Development (Credit-1)**

Sociological appraisal of five-year plans, social consequences of economic reforms, socio-cultural repercussions of globalisation, social implications of info-tech revolution

## **READING LIST**

Agarwal, B. 1994. A Field of One's Own: Gender and Land Rights in South Asia Cambridge: Cambridge University Press

Appadurai, Arjun. 1997. Modernity At Large: Cultural Dimensions of Globalisation, New Delhi: OUP

Dereze, Jean and Amartya Sen. 1996. India: Economic Development and Social Opportunity, New Delhi: OUP

Desai, A.R. 1985. India's Path of Development: A Marxist Approach, Bombay: Popular Prakashan (Chapter II)

Giddens Anthony, 1996. 'Global Problems and Ecological Crisis' in Introduction to Sociology, IInd Edition: New York: W.W. Norton & Co

Harrison, D. 1989. The Sociology of Modernisation and Development, New Delhi: Sage

Haq, Mahbub Ul. 1991. Reflection on Human Development. New Delhi, OUP

Dube, S.C. 1983 Modernisation and Development: An Alternative Paradigm, New Delhi, Vikas

Dube, S.C. 1990 Tradition and Development, New Delhi, Vikas

Frank, A.G. 1974 Capitalism and Underdevelopment in Latin America, New York, Monthly Review

1986 Gilbert, E. 1985 Rural Development in Asia: Meeting with Peasants, New Delhi, Sage

Harris, Graham 1989 Sociology of Development, London: Longman

Kartar Singh Rural Development: Principles, Policies and Management, New Delhi, Sage

Larrain, Jorge 1989 Theories of Development: Capitalism, Colonialism and Dependency, London, Polity Press

Sharma, S L 1980. 'Criteria of Social Development' in Journal of Social Action, Jan-Mar

Sharma, S L 1986. Development: Socio-Cultural Dimensions. Jaipur: Rawat. (Chapter 1)

Sharma, S.L. 1994. 'Salience of Ethnicity in Modernisation: Evidence from India' in Sociological Bulletin, Vol.39, Nos. 1&2. Pp.33-51

Srinivas, M.N. 1966. Social Change in Modern India, Berkley: University of Berkley

Symposium on Implication of Globalisation. 1995. Sociological Bulletin, Vol. 44 (Articles of Mathew, Panini & Pathy)

World Bank. 1995. World Development Report. New York

Amin, Samir. 1979. Unequal Development. New Delhi: OUP

Giddens, Anthony. 1990. The Consequences of Modernity. Cambridge: Polity Press

Kiely, Ray and Phil Marfleet (eds). 1998. Globalisation and the Third World, London: Routledge

Sharma, S L 1992. 'Social Action Groups as Harbingers of Silent Revolution' in Economic and Political Weekly, Vol.27, No.47

Sharma, S.L. 1994. 'Perspectives on sustainable Development in South Asia: The Case of India' in Samad (Ed.) Perspectives on Sustainable Development in Asia, Kuala Lumpur: ADIPA

Sharma, S.L. 2000. 'Empowerment without Antagonism: A Case for Reformulation of Women's Empowerment Approach' Sociological Bulletin, Vol.49. No.1

UNDP. 1997. Human Development Report, New York: Oxford University Press

Wallerstein, Immanuel. 1974. Modern World System, New York: OUP

Waters, Malcolm. 1995. Globalisation, New York: Routledge and Kegan Paul

### Pedagogy

A special feature of pedagogy of this course be to take students to side of success stories of development as well as failure of development in region. Students may also be encouraged to participate in workshop to critically examine existing indicator of human development and to formulate alternative set of indicator of human development, social development and sustainable development.

### SOC 304 (III) CRIME AND SOCIETY

Full Marks: 70+30 = 100

Pass Marks: 28+12 = 40

No. of Credits: 6

No. of Lectures: 60

#### Objectives

□ Acquainting the learners with the history and development of knowledge of criminology □ To grasp the subject matter of modern criminology against pre-classical and classical notions □ To comprehend the relationship of criminology with other social sciences □ To know about related branches like penology and victimology □ To understand the importance of studying criminology as profession

#### COURSE OUTLINE

**Unit-I Criminology:** Definition and Subject matter, Relationship between Sociology and Criminology, Criminology as Profession, Sociology of Deviant Behaviour (Credit- 1)

**Unit-II Crime:** Concept, Types, Causes of Crime; Sociological Theories: Durkheim, Merton, Sutherland (Credit- 1.5)

**Unit-III Incidence of Crime:** Organised Crime, White Collar Crime, Juvenile Delinquency and Justice, Gambling, Alcoholism, Prostitution and Cyber Crime (Credit- 1.5)

**Unit-IV Penology:** Concept, History of Prison Reforms in India, Prison Conditions in India, Probation, Parole and Furlough (1 Credit)

**Unit-V Victimology:** Concept and Types of Victim, Victim Compensation, Victim's Basic Rights, Victims of Terrorism (1 Credit)

#### READING LIST

1. Ahuja, Ram (2000) Criminology, Rawat Publications, Jaipur.
2. Merton, Robert (1957). Social Theory and Social Structure. Free Press.
3. Mike Maguire, et al. (2007), The Oxford Handbook of Criminology, Oxford University Press, 14th ed.
4. Mohanty, RK and S Mohanty (2012) Criminology, Penology and Victimology, Mumbai, Himalaya Publishing.
5. Paranjape, N.V. (2008) Criminology and Penology, 13th Edn, Central Law Publication, Allahabad.

6. Siddiqui, Ahmad (2003) Criminology – Problems and Perspectives, Eastern Book Co., Fourth Edition.

7. Srivastava, S.S. (2002) Criminology and Criminal Administration, Central Law Agency, Second Edition.

**Pedagogy:** The Course requires to project issues. The students may be encouraged to reflect and cite examples from Indian context.

### **SOC 404 (I)**

#### **THEORIES OF SOCIAL ANTHROPOLOGY**

Full Marks: 70+30=100

Pass Marks: 28+12=40

No. of Credits: 6

No. of Lectures: 60

Anthropology is a discipline which covers social aspects of human beings in society. Beginning with study of 'left out people' it maps out social aspects, including modern society. During academic journey it makes rich theoretical and methodological contributions which enrich knowledge in sociology, philosophy and social sciences. Sociology uses empirical and methodological knowledge. It also reaps benefit from sociological theorization; thus, give and take between the two blurred their boundary. The course aims to familiarise students with its nature and theory which provide a base of various sociological theories

#### **COURSE OUTLINE**

##### **Unit I Anthropology: Meaning, scope and branches (Credit-1.5)**

Meaning, scope and branches- social/cultural anthropology, physical anthropology, linguistic anthropology and prehistoric anthropology

Social anthropology- meaning, social historical development, scope, branches and its relationship with sociology, history and prehistory

##### **Unit II Evolutionary Theories (Credit-1)**

Early evolutionism (Tylor, Morgan, Spencer)

Neo-evolutionism (Childe, White), Cultural ecology (Steward), Cultural Materialism (Harris)

##### **Unit III Diffusionist Theories (Credit-1)**

British- Willbert, Smith, Rivers

German-Schmidt, Graebner, Ratzel

American- Boas, Wissler

##### **Unit IV Functional Theory (Credit-1)**

Durkheim, Malinowski, A R Radcliffe –Brown, Merton

##### **Unit V Structural Theories (Credit-1.5)**



Claude Levi-Strauss, E.R Leach

Marxist Theory, neo-Marxist- Max Gluckman, Lewis Coser

### **READING LIST**

Bruce, G. 1993: History of Anthropology, Minneapolis: Burgers.

Evans Pritchard, E.E. 1981: History of Anthropological Thought, London

Levi Strauss, C. 1968: Structural Anthropology, London: Allen

Radcliffe- Brown, A.R. 1952: Structure and Function in Primitive Society, London: Cohn & West

Evans Pritchard, E.E : Social Anthropology, London

Rex, J. 1961: Problems in Sociological Theory, London: Routledge & Kegan Paul

Zetlin, I. M. 1996: Rethinking Sociology, Jaipur: Rawat

Alexander, J. A. 1985: Neo-functionalism, New Delhi: Sage

Turner, J. H. 1985: The Structure of Sociological Theory, Jaipur: Rawat

Wallace, Ruth A. and Alison Wolf 1986: Contemporary Sociological Theory: Continuing the Classical Tradition, Prentice Hall

Nadel, S. F. 1954: The Theory Social Structure, London

### **SOC 404 (V) SOCIOLOGY OF SOUTH ASIA**

Full Marks: 70+30=100

Pass Marks: 28+12=40

No. of Credits: 6

No. of Lectures: 60

To expose students to strategic importance of South Asia as a civilisational centre as well as a player in international affairs and to acquaint them with social, cultural, economic, religious and political similarities and differences between countries of the region. Students should be acquainted with processes which help shaping emergence of nation-state in region, ethnic, regional and religious identity and conflict in process and different paths to socio-economic development and modernisation adopted by countries of the region.

### **COURSE OUTLINE**

#### **Unit I The South Asia- Socio-cultural identity (Credit-1.5)**

Civilisation, culture and society, social and economic institutions, demographic features, geo-political importance

#### **Unit II Political systems and Democracy (Credit-1.5)**

Political regime, religion, politics and state, ethnicity, ethnic conflict and sub-national movements, nation and nation-building

#### **Unit III Migration and movement of populations (Credit-1)**

Patterns of migration and movement of people

Socio-economic development and demographic changes

#### **Unit IV Conflict and co-operation between South Asian States (Credit-1)**

Conflicts: Nature, types and extent

Cooperation: Nature, types and extent, SAARC

#### **Unit V Gender and Society (Credit-1)**

Types of gender relations, classification and implications, gender inequality

### **READING LIST**

Bjorkman, J.W. 1987. Changing Division of Labour in South Asia, New Delhi: Manohar

Frnacis Robinson 1989: Cambridge Encyclopedia of India, Pakistan, Sri Lanka, Nepal, Bhutan and Maldives: Cambridge: Cambridge University Press

Chaudhary, Jamil 2000: Cultural Cooperation in South Asia: The Search for Community, New Delhi: Manohar

Dube, Leela 1997: Women And Kinship: Comparative Perspectives on Gender in South and South East Asia, New Delhi: Sage Publications

Farmer, B.H. 1983: An Introduction to South Asia, London: Methuen

Gamage, Siri and I.B. Watson (Eds.) 1999: Conflict and Community in Contemporary Sri Lanka, New Delhi: Sage Publications

Ganguli, R. 1998. Kin State Intervention in Ethnic Conflicts: Lessons from South Asia, New Delhi: Sage Publications

Gough, K. and Hari P. Sharma (eds.) 1973: Imperialism and Revolution in South Asia, New York: Monthly Renew Press (article by Hamza Alvi)

Kudasiya, G. 1995. The Demographic Upheaval of Partition Refugees and Agricultural Resettlement in India 1947-87, South Asia, Special Number, pp. 73-95

Kumar, Dharma (ed.) 1982: The Cambridge Economic History of India, Vol. II, Cambridge: Cambridge University Press

Mallick, Ross. 1998: Development, Ethnicity and Human Rights in South Asia, New Delhi: Sage Publications.

Pfaff – Czarnecka, Joanna, Darini Rajasingham–Senanayaka, et.al. 1999: Ethnic Futures: The State and Identity Politics in Asia, New Delhi: Sage Publications

Phadnis Urmila. 1990: Ethnicity and Nation Building in South Asia, New Delhi: Sage

Samaddar, R. 1999: The Marginal Nation: Trans-border Migration from Bangladesh to West Bengal, New Delhi: Sage Publications

Shand, Ric. (ed.) 1999: Economic Liberalisation in South Asia, New Delhi Macmillan India Ltd

Smith Donald E. (ed.) 1966: South Asian Politics and Religion, Princeton, New Jersey: Princeton University Press

Stein, Burton and Sanjay Subramanian (eds.) 1997: Institutions and Economic Change in South Asia, New Delhi: Oxford University Press

Diamond, L., J. Linz and S. M. Lipset (eds.) 1989: Democracy in Aisa, New Delhi: Sage Publications

Maloney, C. (ed.) 1974: South Asia: Seven Communities Profiled, New York: Holt, Rinehart and Winston

Robb, Peter. 1995: Concept of Race in South Asia: Understanding and Perspectives, London: Oxford University Press

Rothermund, Dietmar. 2000: The Role of the State in South Asia and Other Essays, New Delhi: Manohar

Sengupta, Bhabani. 1988: South Asian Perspectives: Seven Nations in Conflict and Co-operation, Delhi: B.R. Publishing Corporation.

Tambiah, S. 1997: Leveling Crowds: Ethno-nationalist Conflict and Collective Violence in South Asia, New Delhi: Sage Publications

Wilson, A.J. and Dennis Dalton (eds.) 1982: The State of South Asia: Problems of National Integration, London

Following Journals may be consulted

South Asia: Journal of South Asian Studies, Published by South Asian Studies Association, New South Wales, Australia

South Asia: Bulletin. Department of History, State University of New York, Albany, New York, U.S.A

South Asian Studies, Biannual Journal of South Asia Studies Centre, University of Rajasthan, Jaipur

### **Pedagogy**

Comparative approach is best suited to capture similarity and difference between countries of region. Ethnography of society of the region may show their unique characteristic and experience. Students should read ethnographic account from different parts of the region, sometime on a single theme, say, village or agrarian structure. Documentary film can be utilised for same purpose.

**DEPARTMENT OF SOCIAL WORK  
ASSAM UNIVERSITY  
SYLLABUS**

**Course Title: Development Issues in North-East**

**Course Code: 204  
Semester: 2nd  
Credits 6**

**Rationale**

Integration of North-Eastern states with the mainland has been a major concern postindependence. Moreover, the diversity of culture in the North-East coupled with geographic isolation has further pushed the region away from other parts of the country. In addition, the lack of understanding with regard to the diverse cultures and lifestyles has resulted in discrimination against these people in other parts of the country. Besides, the issue of ethnic identity has existed in the region for last many decades. Thus, this course will focus on the development issues as well as conflict and its resolution in the North-East. Finally, as a department of social work located in the North-East, this course adds the element of indigenous knowledge base within social work curriculum.

**Objectives**

- ☐ To acquaint students with the challenges to development in the North-East.
- ☐ To acquaint students with the possible alternatives for overcoming these challenges.
- ☐ To acquaint students with major development issues in the North-East.
- ☐ To help the students to understand the nature of conflict in the North-East..

**Unit Contents**

1. Developmental Issues in Historical Perspective: Economic & Political, Seven States Including Sikkim, Major Livelihood.
2. Strategic and Developmental Imperatives: Major Developmental Policies and Programmes of Central Government and Various Institutions.
3. Conflict in North East India: Issues, Causes and Concern. Land, Ethnic Problem, Insurgency, Social Work Intervention.
4. Look East Policies and India's North-East: NEC and the Developmental Initiatives, Infrastructure and management of Environment
5. Future Directions to Development in the North-East: Prospect and opportunities in North East India, Investment in infrastructure, Tourism, Indigenous Medicine, Agriculture, Cane and Bamboo Industry, Indigenous entrepreneurship.

**Readings**

Ahmad, R. and Biswas, P. (2004). Political Underdevelopment of Northeast India. New Delhi: Akansha Publishing House.

Bhambri, C.P. (1998). Politics in India 1947-1987. New Delhi: Vikas.

Biswas, P. (2006). Development as 'Complementary': A Political Economy Critique of Policies and practices of Development in North-East India. In David R Syiemlich. et. al. (Eds.) Challenges of Development in North-East India. New Delhi: Regency Publications.

Chongtham, P. (2005). Manipur's Economy: Historical Roots and Structural Evolution. Eastern Quarterly, 3 (III).

Elwin, V. (1964). A Philosophy of NEFA. Shillong: Advisor to the Governor of Assam. 2nd Reprint.

Guha, A. (1991). Medieval and Early Colonial Assam: Society, Polity, and Economy. Calcutta: Centre for Studies in Social Sciences.

Hussain, M. (1976). Interrogating Development: State, Displacement and Popular resistance in North East India. New Delhi: Sage Publications.

Mohapatra, A. C. (2002). Development and Underdevelopment in the Northeast Region: Search for a Paradigm. In Bimal J. Deb (Ed.). Development Priorities in North east India. New Delhi: Concept Publications.

Mishra, S. N. (1983). Arunachal's Tribal Economic Formations and their Dissolution. Economic and Political Weekly, 22nd October, 1837–1845.

Sharma, H. I. (2006). India's Look East Policy and Manipur's Economy: A Critical Scrutiny. Alternative Perspectives, 1(IV).

### **Course Title Social Work Practice with Elderly/ Geriatrics and Social Work**

**Course Code: 304**

**Semester: 3<sup>rd</sup>**

**Credits: 6**

**Rationale** Certain groups in the society often encounter discriminatory treatment and need special attention to avoid potential exploitation. The advent of increasing pace of elderly population has lead to a serious area of concern for the government and the policy planners. The vulnerability among the elderly is due to various factors like the structural inequalities, their economic dependency. The course will pave away towards understanding the problems and issues of vulnerability of elderly and equip the students with comprehensive understanding, skill development to work for and with the elderly.

### **Objectives**

- ☐ Understand the concepts and context of Elderly Population in India.
- ☐ To sensitize the students to the emerging issues and problems of elderly in contemporary India,
- ☐ To enable them to acquires sociological understanding of these issues and problems over and above their commonsense understanding
- ☐ To empower them to deal with these issues and problems and to serve as change agents both in governmental and non-governmental organizations

## Units Contents

1. Introduction: Definition of Elderly, Concept of aging, Changing roles in Family life and Social relationships Demography of the aging population in India. Productive ageing.
2. Needs and Issues of Elderly: Needs of elderly people: Psychological needs, recreational needs, attitudes towards aging. Issues relating inheritance, destitute women, Elder abuse, Symptoms and signs of elder abuse, Risk factors for elder abuse, Preventing elder abuse.
3. National Policies & Programmes for Welfare of the Elderly: Constitutional Provisions, National Policy on Older Persons, National Social Assistance Programme, Annapurna Yojana, Integrated Programme for Older Persons (IPOP) Maintenance and Welfare of Parents and Senior Citizens Act, 2007.
4. Institutional and Non-institutional Services and the Elderly: Care giving roles between Older Persons and the family, Understanding caregiver stress and burnout, Older Persons and livelihood, family based services, community based services.
5. Social Work Practice for and with Elderly: Role of Social Worker in promoting the services and programs for the Aged; International and Nations organizations working for the welfare, development and empowerment of Elderly. Counselling and legal aid to the Older Persons.

## Readings:

- Aiken, L. R. (1978). The psychology of later life. Philadelphia: WB Saunders Company.
- Beerman, S. and Rappaport-Musson, J. (2008). Eldercare 911: The caregiver's complete handbook for making decisions. Amherst, NY: Prometheus Books.
- Bergmann, K. (1972). Aged: Their understanding and care. London: Wolfe Publications.
- Binstock, R. H. and Shanes, E. (Eds.). (1986). Hand Book of Aging and Social Sciences. New York: V.N. Reinhold Co.
- Blau, Z. S. (1983). Old age in a changing society. New York: New View Prints.
- Bose, A. B. and Gangrade, K. D. (1988). Aging in India: Problems and Potentialities. New Delhi: Abhinav.
- Chowdhry, P. D. (1992). Aging and the aged. New Delhi: Inter India Publications.
- Cook, A. S. (1983). Contemporary Perspectives on Adult Development & Aging. New York: Macmillan.
- Desai, K. G. (1985). Problems of the retired people in greater Bombay. Bombay: TISS.
- Ghosh, B. (1988). Contemporary Social Problem in India. Bombay: Himalaya.
- Homban, D. (1978). Social Challenge of Aging. London: Groom Helm.
- Johnson, E. (1982). Growing old: Social problems of Aging. New York: Holt Rinehart and Winston.
- Kennedy C. (1988). Human Development. New York: Macmillan.
- Kimmel, D. (1974). Adulthood and Aging. New York: Wiley.

Mishra, S. (1987). Social Adjustment of Old Age. Delhi: B.R. Pub. Corp.

Pinkston, P. H. and Linsk, N. K. (1984). Care of the Elderly: A family Approach. New York: Pergamon Press.

Schiamberg, L. B. (1985). Human Development. New York: Macmillan.

Sharma, M. L. and Dak, T. M. (1987). Aging in India: Challenge for the Society. Delhi: Janta Pub.

**DEPARTMENT OF EDUCATION  
ASSAM NIVERSITY: SILCHAR  
PG COURSE**

**Research Methodology and Statistics in Education**

**ED-105**

**(50 Contact Hours-5 Credit Point)**

**Objectives**

To help the students

1. To acquire the concept of educational research
2. To be familiar with various approaches of educational reswarch
3. To be familiar with various ways of acquiring knowledge
4. To be familiar with various tools and techniques of educational research
5. To be familiar with vaious/entire processes of conducting the research
6. To be familiar with the use and application of statistics in educational research

Unit No	Sub Units	Course Content	No. of Conts. Hrs.	No. of Credit
1.	1.1 1.2 1.3 1.4 1.5	Educational Research: Meaning, Nature, Scope, Need and Purpose Methods of acquiring knowledge: Traditional, Experience, Positivistic, Dialectic and Scientific Key concept relating to research: Variables and Constructs Types of research: on the basis of objectives-Basic and Applied On the basis of methods- Historical, Descriptive, Experimental.	10	1
II	2.1 2.2 2.3 2.4	Research problem: Importance and selection procedure Review of related studies: Importance, sources and steps Hypothesis: Selection, steps and types Design: Steps for designing different types of research	10	1
III	3.1 3.2 3.3 3.4	Tools and techniques: Types of tools and their uses- Questionnaire, Interview Schedule, Attitude Scale and Observation Data analysis : Types of data and procedeure for data analysis Difference between quantitative and qualitative data	10	1
IV	4.1	Sample: Concept and types	10	1



	4.2	Sampling techniques		
	4.3	Procedure for preparing a research proposal		
	4.4	Preparation of research report: Significance		
	4.5	Format and style of research report		
V	5.1	Importance of the use of Statistics in educational research	10	1
	5.2	Measuring Central tendencies and Measuring of Variability		
	5.3	Correlation-Rank Difference and product moment		
	5.4	Normal distribution-characteristics and uses		
	5.5	Significance of difference between mean and other statistics and chi-square test.		
		Total	50	5

**Cognitive Science****ED - 403****Full marks: 100****Minimum Pass Marks: 40****External Examination Marks: 70****Minimum Pass Marks in External Exam: 28****Internal Exam Marks: 30****Minimum Pass Marks in internal Exam: 12****Objectives:**

After learning of This course, the students would be able to

1. Know the historical background of Cognitive Science
2. Understand the different concepts and terminologies relating to cognitive science
3. Understand the interdisciplinary nature of cognitive science
4. Understand the cognitive abilities and their relation to teaching learning process
5. Understand the assessment process of cognitive abilities.

Unit No. and Name	Course Contents
I An Introduction to Cognitive Science	Cognitive Science: Epistemological Origin and Historical Background Concept of Cognitive Science Objectives of Cognitive Science Aspects of Cognition or Mind Principles, Methods and Scope of Cognitive Science
II Interdisciplinary Nature of Cognitive Science	Concept of Interdisciplinary study Interdisciplinary nature of Cognitive Science Branches of cognitive Science and Interrelationship among branches Components of Cognition.
III Cognitive Abilities and Their Relation	Cognitive Development of the learners at Different stages: Infancy, Childhood and Adolescence Blooms Tazonomy relating to the cognitive abilities Significance of Cognitive Study in Teaching Learning Process Cognition

to Teaching learning Process	and its Relation to Meta-cognition and Motivation
IV Curriculum and Strategies and Techniques for Cognitive Development	Nature of Cognitive skills: Thinking, Reasoning, Problem Solving, Concept formation, intelligence and Creativity Curriculum for Cognitive science Strategies and Techniques for Cognitive Development Cognitive Teaching-information processing Model.
V Assessing Cognitive Abilities and Developments in Cognitive Studies	Assessing Cognitive Abilities: Intelligence tests, Creativity tests, Aptitude Tests and Achievement Tests Scope and Limitations of the Tools Used for Assessing Cognitive Abilities. Recent Developments in cognitive Studies.

#### References:

- Anderson, B.F.(1975 Cognitive Psychology. New York: Academic Press, Inc
- Andrade, J., & May, J (...) cognitive Psychology, London and New York: Bios Scientific Publishers.
- Ashman, A.F., & Conway, R.N.F (....)An introduction of cognitive Education- Theory and Applications. London and New York: Routledge Publishers.
- Bartlett, F. (1958) Thinking, New York : Basic books
- Bechtel, W. & Graham, G (Eds) (1998) A companion to cognitive Science . Malden , MA: Blackwell
- Bloom, B.S., & et al (1956) Taxonomy of Educational objectives. New York: David McKay Company Inc.
- Boden, MA (2006) Mind as Machine : A History of Cognitive Science. Oxford: Clarendon.
- Clark, A (2001) Mindware: an Introduction to the Philosophy of cognitive Science. New York: Oxford University Press.
- Dawson, M.R. W. (1998) Understanding cognitive science, Oxford: Blackwell.
- Elkind, D., & Flavell (1969) Studies in cognitive development. New York-London-Toronto: Oxford University Press.
- Flavell, J.H (1977) Cognitive Development. New Jersey: Prentice Hall.
- Friedengerg, J.D., & Silverman, g. (2005) Cognitive Science : An Introduction to the study of Mind. Thousand oaks, CA: Sage
- Goldman (A. (1993) Philosophical Applications of Cognitive Science. Boulder: Westview Press.
- Guilford, J.P. (1967) The nature of Human Intelligence, New York: McGraw Hill.
- Nadel L. (Ed) (2003) Encyclopedia of Cognitive Science. London: Nature Publishing Group.
- Searle, J. (1992) The Rediscovery of Mind. Cambridge, MA: MIT Press
- Sobel, C.P. (2001) The Cognitive Sciences : An Interdisciplinary approach. Mountain view, CA: Mayfield.
- Stillings, N., et al (1995) Cognitive Science Second Edition. Cambridge, MA MIT Press
- Thagard, P. (2005) Mind: Introduction to cognitive Science, Second Edition, Cambridge, MA: MIT Press.
- Thagard, P. (Ed) (2007) Philosophy of Psychology and Cognitive Science. Amsterdam Elsevier.
- Von Eckardt, B. (1993) What is Cognitive Science? Cambridge, MA: MIT Press.
- Wilson, R.A., & Keil, F.C. (Eds) (1999) The MIT Encyclopedia of the Cognitive Sciences, Cambridge, MA: MIT Press.

#### Environmental Education

**ED-404**

**Full Marks: 100**

**Minimum Pass Marks: 70**

**Minimum Pass Marks in External Exam: 28**

**Internal Exam Marks: 30**

**Minimum Pass Marks in Internal Exam: 12**

#### Objectives

1. To make student teachers understand about the concept and ideas on environment and environmental changes.

2. To acquaint the student teachers with environmental hazards and enabling them to participate in environmental protection activities.
3. To make students aware about various environmental protection initiatives and to sensitise them to participate in it.
4. To orient student teachers to understand the concept of environmental education and its effective transaction.
5. To enable the student teachers to develop various methods and strategies for realizing the objectives of environmental education.

Unit No	Course Content
I	Concept of environment and its components Ecosystem : structure, Function and Energy flow. Bio diversity: Significance, threats and conservation Biogeochemical cycles. (Carbon, Nitrogen, Oxygen, and water) Natural resources: Importance, exploitation and management.
II	Environmental Hazards and disasters: Natural and Manmade (anthropogenic) hazards and disaster management. Pollution: Causes, effect and control of air, water soil and noise pollution Other environmental issues: Ozone layer depletion, Global warming, Greenhouse effect and Acid rain. Waste management : solid wastes and toxic wastes Population and its impact on environmental resources
III	Industrial growth, scientific and technological inventions and their impact on the environmental system Protecting the environment: Need, Approaches and challenges Role of agencies in environmental protection activities: Ministry of Forest and Environment, UNEP, WWF, IUCN and IUCN red list, IPCC, Green Peace Environmental Impact Assessment and changing pattern of Man-Environment Relation
IV	Concept, Importance and Scope of environmental education Objectives of environmental education Genesis of environmental education as a discipline Guiding Principles, and ecological and pedagogical foundations of environmental education Environmental ethics and values.
V	Multidisciplinary nature of Environmental Studies Methods of curriculum transaction - Discussion, Seminar, field Surveys, Projects and Exhibition Role of Schools in environmental protection Role of Media in environmental education: Print, films, and television Evaluation in environmental education

#### Suggested Reading:

1. Bakshi, Trilochan, S. : Environmental Education, methods and application, New York
2. Bannet, DEAN, B. : Evaluating environmental education programmes, New York
3. Collis Margaret : Using the Environment.
4. Eugene T : Environmental Economics Vriendra Publication, New Delhi
4. Gross Land, R.W : Environmental Studies Projects. An Evaluation report, McMillan, London
5. Fediriv, E. : Man and nature
6. Gerasimov, I.P. : Geography and ecology
7. Linke, R.D : Environmental Education in Australia
8. Surinder Singh Sirohi : Environmental Education Tandon Publication, Ludhiana
8. Rajput, J.S Sexena, A.E : Environment and Primary Education-Bhopal

9. Rajput Sarlu : Teaching Skills for Environmental Apprach Primary Teacher  
 10. Salt Bernard : Environmental Science (Cassell London)  
 11. Tilottama Senapati : Environmental Education and Pollution control, Mittal Rajan  
 Kumar Sahoo Publication, New Delhi

### Guidance and Counseling

**ED-405.2**

**Full Marks: 100**

**Minimum Pass Marks: 40**

**External Examination Marks: 70**

**Minimum Pass Marks in External Exam: 28**

**Internal Exam Marks: 30**

**Minimum Pass Marks in Internal Exam: 12**

### Objectives:

To enable learner-

1. To develop understanding of bases meaning, need and types of guidance
2. to get acquainted with the tools and techniques of appraisal of an individual.
3. To develop understanding of meaning characteristics and types of counselling.
4. To get acquainted with process and techniques of Counselling.
5. To get acquainted with the importance of placement and follow-up services.
6. To develop understanding about Counselling- research, issues and trends.
7. To assess the needs of and individual correctly for solving problems.

Unit No	Course Content
I Introduction to Guidance	Concept, Meaning, Nature, Scope & Functions of guidance, Basic assumptions need of guidance, Influence of family and community of guidance, purposes of Guidance. Bases of guidance Philosophical, Sociological, Pedagogical, Psychological. Types of guidance, Major guidance areas-personal, educational, career, Social health, Marital, Moral. Adjustive guidance, Identification of maladjusted children and the principles of dealing with them.
II Appraisal of an Individual	Testing devices- Intelligence tests, Achievement tests, Aptitude tests, Personality Inventories Interest, Inventories, Attitude Scale Non testing devices- cumulative record Card Sociometric techniques projective techniques Rating Scale, Case Study. Anecdotal Record, Autobiography. Techniques of guidance-home visits, interview, observation. Presenting analyzing, interpreting and reporting the data
III Counselling	Meaning, need, characteristics, principles of counselling Process and types of Counselling Counselling theories (i) Client Centered Therapy (Carl Rogers) (ii) Rational Emotive Therapy (Albert Ellis) (iii) Behavior Therapy (B.F.Skinner) (iv) Gestalt Therapy (Fredric Pearls) (v) Psychoanalytic Therapy (Sigmund Freud)
IV Techniques Of Counselling	Individual counseling: Counselling interviews- Meaning, purpose, conditions of interview, qualities and responsibilities of an interviewer, evaluation of and interview. Group Counselling : Meaning purpose, importance types of group Counselling regular subject classes, core curriculum classes, special groups, school assemblies, clubs. Techniques for group counselling- formal informal discussions committee reports, lectures, dramatics question banks, Case Conference Methods..

	Effective Counsellor, increasing need of School counselor in the present set up
V Placement and follow up and recent trends	Aims and types of placement Responsibility of the school and community about the placement services Importance and purposes of follow up services. Research, Issues, Trends in guidance and counselling.

Practical / Assignment (any one of the following)

1. Job analysis of one occupation
2. Prepare an interview schedule for an effective Counselling
3. Visit a guidance centre and Write a report about its organization and functions
4. Organisation of career talks, career conderence, occupational visits and display of occupational literatrue and career corners: Group guidance.

Reference:

1. J. Agarwal J.C.: Educational vocational Guidance and Counselling, Daoba House, Nai salak, Delhi.
2. Anatasi Anne: Psychological tesing, New York, Mac Millan 1982
3. Mennet M.e.: Guidance and Counselling in groups, McGrow Hill Book Company, 1963
4. Crites J.O: Vocational psychology, New York, GMC Grow Hill Book company 1968
5. Directorate general of Employment and Training (Occupational information Unit) Ministry of labor, employment and Rehabilitation, Govt. of India, Co. New Delhi.
6. Directorate General of Employment adn Training Ministry of Labor, Govt. of India, New Delhi.
7. Gupta SK. : Guidance and Counselling in Indian Education, Mittal Publication Pvt. Ltd.
8. Swedish Mohan: Readings for Careers Teachers, NICER 1985
9. Koceher SK: Educational and Vocational Guidance in Secondary Schools, Sterling Publisher (p) Ltd. Delhi.
10. Jones A.J. : Principles of Guidance, McGraw Hill Book co. New York.
11. Jayawal S.R: Guidance and Couselling. Prakashan Kendra, Lucknow
12. Rogers C.R.: Client Centered Therapy, Mifflin
13. Rao, S.N: Counselling and Guidance, Tata McGraw Hill, Delhi
14. Central Institute for Research and Training in Employment Service (C.ED.G.E & T), Ministry of Labour and Rehabilitation, Govt. of India, New Delhi- Handbook in Vocational Guidance 1972
15. Sarswat K.R.Gaul, J.S: Manual of Guidance Counsellors, NCERT, Delhi, 1993

**DEPARTMENT OF LIBRARY AND INFORMATION SCIENCE**

**ASSAM UNIVERSITY: SILCHAR**

**Paper: LIS303**

**Library Automation Theory**

**Credit: 6**

**Marks: 70 + 30 = 100**

**Unit – 1: Basics of Library Automation**

- ☐ Library Automation: Meaning, importance and purposes
- ☐ Advantages and Disadvantages in library Automation
- ☐ Manual Vs Automated Systems
- ☐ Online Catalogue- OPAC and Web OPAC
- ☐ Library automation scenario in India with special reference to NE India

**Unit 2: Planning Library Automation**

- ☐ Planning and Implementation
- ☐ Automatic Identification Methods: Barcode, RFID
- ☐ RFID technology- Meaning, needs and features, RFID Components
- ☐ Artificial Intelligence
- ☐ Library Management Software: SOUL and Open Source Software

**Unit 3: Housekeeping operations and Retrospective Conversion**

- ☐ Automated Acquisition Control
- ☐ Automated Circulation Control
- ☐ Automated Serials Control
- ☐ Library Administration and Report Generation
- ☐ Retrospective Conversion: Concept, Need, Purpose and Techniques
- ☐ Retrospective Conversion Outsourcing: Planning and Prospects
- ☐ Retrospective Conversion in Academic Libraries of India: INFLIBNET Initiative

**Unit 4: Library Networks**

- ☐ Library Network - Meaning and Scope
- ☐ Library Networking in Indian perspectives: INFLIBNET, DELNET
- ☐ Library consortia in Indian context UGC-INFONET, INDEST, CSIR & Others E-Resources Consortia
- ☐ Internet Based Cataloguing – OCLC, LC, CORC (Cooperative Online Resource Cataloguing)
- ☐ Bibliographic Utility Networks

**Unit – 5: Standardization in Automated Cataloguing**

- ☐ Standardization in Cataloguing – Need and Purpose
- ☐ Standards - ISBD, CCF, ISO-2709 and Z39.50
- ☐ Metadata- MARC and Dublin Core
- ☐ Trends in Library Cataloguing

**Recommended Books**

1. Chidrupananda, Swami. (2006). Making Sense of Library Automation: A Hands on Guide. Kolkata : Meteor.
2. Deepali (Talagala). Web interface for CDS/ISIS : GENISISweb v.3.0. 2003. Sri Lanka Library Association, Colombo.
3. Gopal, Krishan. (2005). Modern Library Automation. New Delhi : Authors Press.
4. Grewal, Gagandeep. (2004). Handbook of Library Security. New Delhi : Dominant.
5. Haravu (L J). Library automation design, principles and practice. 2004. Allied Publishers, New Delhi.
6. INFLIBNET. Software for university libraries user manual. 2003. INFLIBNET, Ahmedabad.
7. Pandey, S. K. (2000). Organisation of Library Automation. New Delhi : Anmol Publications.
8. Reddy, Satyanarayana. (2001). Automated Management of Library Collections. New Delhi : Ess Ess.
9. Sarmah, Mukut. (2013). IT application in college libraries, Estern Book Publishing House, Guwahati, 2013.
10. Siwatch, Ajit S. et al. (2006). Approaches to Modern Librarianship. Delhi : Sanjay.
11. Sujatha, G. (1999). Resource Sharing and Networking of University Libraries. New Delhi : Ess Ess.
12. Tripathi, Aditya et al. (eds.). (2010). Open Source Library Solutions. New Delhi : Ess Ess.
13. UNESCO. CDS/ISIS for windows: reference manual. v1.5. 2004. UNESCO, Paris.

**Paper: LIS304 Library Automation Practice**

**Credit: 6**

**Marks: 70 + 30 = 100**

**Part-A**

Database Creation using CDS/ISIS or WINISIS Database Creation using SOUL

**Part- B**

Installation and use: KOHA Barcode Generation

**Recommended Books**

1. Chidrupananda, Swami. (2006). Making Sense of Library Automation: A Hands on Guide. Kolkata : Meteor.
2. Deepali (Talagala). Web interface for CDS/ISIS: GENISISweb v.3.0. 2003. Sri Lanka Library Association, Colombo.
3. Gopal, Krishan. (2005). Modern Library Automation. New Delhi : Authors Press.
4. Grewal, Gagandeep. (2004). Handbook of Library Security. New Delhi : Dominant.
5. Haravu (L J). Library automation design, principles and practice. 2004. Allied Publishers, New Delhi.
6. INFLIBNET. Software for university libraries user manual. 2003. INFLIBNET, Ahmedabad.
7. Pandey, S. K. (2000). Organisation of Library Automation. New Delhi : Anmol Publications.
8. Reddy, Satyanarayana. (2001). Automated Management of Library Collections. New Delhi : Ess Ess.
9. Siwatch, Ajit S. et al. (2006). Approaches to Modern Librarianship. Delhi : Sanjay.
10. Sujatha, G. (1999). Resource Sharing and Networking of University Libraries. New Delhi : Ess Ess.
11. Tripathi, Aditya et al. (eds.). (2010). Open Source Library Solutions. New Delhi : Ess Ess.
12. UNESCO. CDS/ISIS for windows: reference manual. v1.5. 2004. UNESCO, Paris.

**Paper: LIS305**

**Practical Librarianship and Library Visit/Library Internship**

**Credit:6**

**Marks: 70 + 30 = 100**

**Part-A: Job Diary**

Students will be required to submit “Job diary” based on the works done in a select library located in the city

### **Part- B: Library Visit / Library Internship Report**

Students will prepare a report by visiting/working in libraries under Internship Programme of selected Libraries as suggested by the department (preferably of a metropolitan city) using modern technology and submit a report immediately after visiting/working in the libraries for evaluation.

## **DEPARTMENT OF LIBRARY AND INFORMATION SCIENCE ASSAM UNIVERSITY: SILCHAR (M.Phil. Syllabus)**

### **Course – MPHIL / LIS-501:            Research Methodology**

Course Level: School Level Course

Full Marks:    100/ 4 Credits

#### **Objectives**

- To introduce the different methods and techniques of research;
- To familiarise in the use of data collection tools, organisation and representation of data;
- To introduce different data analysis techniques;
- To guide in preparing research report.

### **Unit 1: Knowledge and Research**

- Knowledge: Universe of knowledge; Modes of acquiring knowledge.
- Research: Definition, concept, objectives, and need; Research ethics.
- Scientific enquiry and Scientific Method: Validity, reliability, objectivity and subjectivity.
- Research Problem: theoretical and applied; methods of identification.
- Literature Search: Purpose and objectives in research, procedures; Review of related literature.

### **Unit 2: Research Questions, Hypothesis and Research Design**

- Research questions: Need, importance and formulation.
- Hypothesis: Definition, meaning, formulation, types and testing.
- Research process: concept, steps, and variables.
- Research Design: Aims, objectives, scope, components and limitations; Problems in research design.
- Literature survey: Need and purpose.

### **Unit 3: Research Methods and Data Collection Tools**

- Research Methods: Basic, Applied and Action research;
- Survey, Historical, and Experimental research.
- Descriptive, comparative, exploratory, case study and Delphi technique;
- Collection of primary and secondary data; Qualitative data Vs Quantitative data; Secondary data: Documentary and Non-documentary sources.



- Tools of data collection: Questionnaire, Interview and Observation; Scales and Check Lists.

#### **Unit 4: Data Analysis Tools and Techniques**

- Sampling methods: Types and techniques.
- Data analysis technique: Statistical techniques – Measures of Central Tendency, Mean, Mode, Median; Measures of Dispersion, Variance and Co-variance; Standard deviation;
- Coding and Tabulation; Graphical Presentation of data: Bar diagrams, Pie-chart, Line Graphs and Histograms.
- Software for statistical analysis: SPSS / MS-Excel.
- Testing of Hypothesis.

#### **Unit 5: Research Report**

- Report Writing: Structure and parts of Research Report.
- Presentation of findings; Preparation of Abstract;
- Footnotes, pagination, Annexure / Appendices; Proof Reading;
- Citation Style: Bibliography-purpose and scope. References Vs Bibliography. Citation Standards for Print, Digital and Internet resources- MLA STYLE SHEET, APA, Chicago Manual. Reference Vs Plagiarism.
- Preparation and Presentation of Research Article.

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#### **Reading List**

- 
1. Frankfort, Chava and Nachims, David. Research methods in social sciences. 6<sup>th</sup> Ed. Worth Publisher, New York. 1999.
  2. Adams, Gerald R and Schvaneveldt, Jay D. Understanding research methods. 2<sup>nd</sup> Ed. Longman, New York. 1991
  3. Babbie, Earl. Survey research methods. 2<sup>nd</sup> Ed. Belmont, California, Wadsworth. 1990.
  4. Bailey, Kenneth D. Methods of social research. 4<sup>th</sup> Ed. Free Press, New York. 1994.
  5. Backstrom, Charles H and Hursh, Gerald D. Survey research. 2<sup>nd</sup> Ed. John Wiley and Sons, New York, 1981.
  6. Blaxter, Loraine, Hughes, Christina and Tight, Malcom. How to research. Viva Books, New Delhi, 2002.
  7. Festinger, Leon and Katz, Daniel. Research methods in social sciences. Amerind, New Delhi. 1970.
  8. Fowler, Floyd J. Jr. Survey research methods. 3<sup>rd</sup> Ed. Sage, California. 2001.
  9. Ghosh, B. N. Scientific methods and social research. Sterling, New Delhi. 1982
  10. Goode, William J and Hatt, Paul K. Methods in Social research. McGraw-Hill, New York. 1952.
  11. Gray, George and Guppy, Neil. Successful surveys: Research methods and practice. 2<sup>nd</sup> Ed. Harcourt Brace, Toronto. 1999.
  12. Reddy, T. Subbi and Rao P. Bappa. Research methodology and statistical measures. Reliance Publishing House, New Delhi. 1995.
  13. Young, P. V. Scientific social survey and research. Prentice Hall, New Delhi. 1982.
  14. Phillips, D. L. Knowledge from what: Theories and methods in social research. Rand McNally, Chicago. 1971.
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**MPHIL / LIS-502: Knowledge Society and LIS Research**

Course Level: Department Level

Full Marks: 100/ 4 Credits

**Objectives**

- To familiarise with knowledge society and knowledge organisation.
- To understand modern management of Library and Information centres.
- To understand trends of research in Library and Information Science.
- To identify and use of digital information resources on LIS.

**Unit 1: Library, Information and Knowledge Society**

- Information Society, Knowledge Society: Definition, Need and Purpose
- Library Profession: Professional Ethics
- Library Legislation: Need & Purpose
- Copy Right, Intellectual Property Right (IPR) and Digital Right Management (DRM)
- National Knowledge Commission: Recommendations and Implication in LIS

**Unit 2: Modern Methods of Knowledge Organisation**

- Modern trends in Library Classification
- Trends in Library Cataloguing : OPAC and WebOPAC
- Standards - ISBD, CCF, ISO-2709, Z39.50 and RDA
- Metadata- MARC and Dublin Core
- Sources of Information : Primary, Secondary and Tertiary ; Web / Digital Resources: Evaluation of reference source; Abstracts and indexes, E-journals, E-books and ETDs

**Unit 3: Modern Management in Library and Knowledge Resource Centre**

- Principles of Management: Implications in LKRC
- Human Resource Management: Concept, need and purpose
- Job Evaluation & Performance appraisal in LICs
- Total Quality Management: Definition, scope and purpose and application to Libraries and information centres
- Knowledge Management: Tools and Techniques

**Unit 4: Advance Research Methods : Techniques and Tools in LIS Research**

- Research Methods in LIS: Historical Research, Survey Research and Experimental Research
- Case Study, Observation Method, Scientific Method, Delphi Method Sampling Techniques
- Data Collection Tools : Questionnaire, Interview, Schedule, Observation, Scales and Check Lists , Historical / recorded,
- Bibliometric Study: Bibliometric Laws, Citation Analysis, Scientometrics, Informetrics and Webometrics
- Computerized data analysis: SPSS / Excel

**Unit 5: Recent Trends in LIS Research**

- Literature Review, Critical Review of Research in LIS in India.
- Sources of Information on Internet: DOAJ, Wikipaedia, Web Resources.
- Citation Style: Structure, Guidelines for Citation / References
- Modern trends of Research in LIS: Electronic theses and dissertations;
- Designing project proposals, Funding agencies, and LIS Schools

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### Reading List

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1. Glazier, Jack D. & Hall, Peter M., eds.: Qualitative Research in Information Management. Englewood, CO: Libraries Unlimited, 1992.
  2. Gorman, G.E. & Clayton, Peter: Qualitative research for the information professional: a practical handbook. 2nd ed. London: Facet Publishing, 1997.
  3. Hafner, Arthur W. Descriptive Statistical Techniques for Librarians. 2nd ed. Chicago: American Library Association, 1997.
  4. Statistical Analysis: A Handbook Supporting Library Decision Making. Norwood, NJ: Ablex Publishing Corporation, 1988.
  5. Kraft, Donald H. & Boyce, Bert R.: Operations Research for Libraries and Information Agencies: Techniques for the Evaluation of Management Decision Alternatives. SanDiego: Academic Press, 1991.
  6. Losee, Robert M., Jr. & Worley, Karen A.: Research and Evaluation for Information Professionals. San Diego: Academic Press, 1993.
  7. Mellon, Constance A.: Naturalistic Inquiry for Library Science: Methods and Applications for Research, Evaluation, and Teaching. New York: Greenwood, 1990.
  8. Moore, Nick: How to Do Research. 2nd ed. London: Library Association. 1997.
  9. Krishan Kumar. Research methods in library and information science. Rev Ed. Har-Anand Publications, New Delhi. 1999.
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**MPHIL / LIS- 503: ICT Application and Digital Library**

Course Level: Department Level

Full Marks: 100 / 4 Credits

**Objectives**

- To acquaint the students with the concepts of library automation
- To understand the library networks in Indian perspectives.
- To develop skills in organisation of digital information bearing objects
- To know the process of design and development of digital library systems

**Unit 1: Library Automation**

- Library Automation : Planning and Implementation
- Library Management Software; Information Search strategies; Software selection criteria; OPAC and Web OPAC
- RFID Technology and Electronic Surveillance
- Library automation scenario in India with special reference to NE India
- DBMS: Creation of Database using any DBMS Package : SOUL / KOHA

**Unit 2: Library Networking**

- Library Networks: Library Networking in Indian perspectives: INFLIBNET, DELNET; IFLANET
- Library consortia in Indian context UGC-INFONET, INDEST, CSIR & Others E-Resources Consortia
- Digital Library: Meaning, digitization, planning and steps; Digital Preservation
- Institutional Repositories: Need and Benefits; OAI and Metadata harvesting,
- Internet and Web 2.0

**Unit 3: Digital Information Resources on LIS**

- Digital Information Resources and formats of digital resources
- Subject Gateways and Digital Libraries on LIS, Subject Directories in Web.
- Journal Portals, Publisher's Portals, Book Reviews, Book Selection.
- Virtual Reference Tools: Commercial Tools (e.g. Xrefer.com), Cross-Publishers.
- Data mining and data warehousing

**Unit 4: Web Technology & Interactive Digital Resources**

- Interactive Digital Information Resources: Nature, Features and Types
- LIS Discussion Forums and Mailing Lists (ListServes) – LIS in general and Lists
- Blogs and Biblioblogsphere: Nature, Features, Types, Projects and Services
- Wikis and Wikipedias in LIS: Nature, Features, Types, Projects and Services
- Library 2.0 Tools: Information Mashup, Social Network etc.

**Unit 5: Design and Development of Digital Library**

- Traditional, automated, digital and virtual library systems – comparative study
- Digital Library Development: Hardware, Software, Process, File formats, Issues, policies and principles
- Free/Libre Open Source Software (FLOSS): GSDL, MyLibrary, WWWISIS, GENISIS etc.
- National & International digital library systems

- Evaluation parameters and models

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### Reading List

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1. Carnaby, P: Next generation e-learning and digital information resources. Buenos Aires:
2. FAO & UNESCO: Digitization and digital libraries module (in CDROM). Rome: FAO, 2005.
3. FAO & UNESCO: Management of electronic documents module (in CDROM). Rome: FAO, 2005
4. Lenhart, A., Fallows, D., & Horrigan, J.: Content Creation Online: 44% of U.S. Internet users have contributed their thoughts and their files to the online world. <Available at [http://www.pewinternet.org/pdfs/PIP\\_Content\\_Creation\\_Report.pdf](http://www.pewinternet.org/pdfs/PIP_Content_Creation_Report.pdf)>
5. LIS Core Cluster: <http://www.db.dk/>
6. LISWiki. Web site: <http://liswiki.org/wiki/>
7. Maness, J. M.: Library 2.0 Theory: Web 2.0 and Its Implications for Libraries. Webology, 3(2), 2006. <Available at <http://www.webology.ir/2006/v3n2/a25.html>>
8. Montague, R.: Web-based information science education (WISE). Oslo: IFLA, 2005.
9. Wiki: <http://en.wikipedia.com/wiki/>
10. World list of LIS schools: <http://informationr.net/wl/>

**DEPARTMENT OF SANSKRIT  
ASSAM UNIVERSITY: SILCHAR**

**COURSE: 304 (OPTIONAL /SPECIAL PAPER)**

**Group-C: DARSANAŚĀSTRA**

**Name of the Paper: ĀSTIKA & NĀSTIKA DARŚANA**

**100 Marks**

UNIT –I: Sāṃkhyakārikā with Sāṃkhyatattvakaumudī Kārikā – 1-20

20 Marks

UNIT – II: Yogasūtra with Vyāsabhāṣya (Samādhipāda)

20 Marks

UNIT – III: Applied Yoga

20 Marks

UNIT – IV: Saugata Darśana

20 Marks

UNIT – V: Arhata / Cārvāka Darśana

20 Marks

**REFERENCE BOOKS:**

1. A History of Indian Philosophy : J.N. Sinha, Calcutta.
2. An Introduction to Indian Philosophy : Dutta and Chattarjee.
3. Cultural Heritage of India, Vol – III
4. History of Indian Philosophy : Hiriyana. M.
5. History of Sāṃkhya Philosophy, by S.C. Vidyabhushan, Calcutta.
6. History of Sāṃkhya Philosophy : S. C. Vidyabhushan, Calcutta.
7. Indian Philosophy (2 Vols.) : Dr. S. Radhakrisnan.
8. Origin and Development of the Sāṃkhya System of Thought, Pulinbihari Chakraborti, Munshiram Manoharlal.
9. Patanjali's Yogasūtra with Vyāsabhāṣya & Tattvavaisaradi : ed. & Tr. By Ram Prasad, New Delhi
10. Sarvadarsanasamgraha Eng. Tr. by Cowell, Delhi.
11. Sarvadarsanasamgraha Hindi Tr. by Umashankar Sharma Caukhamba, Sanskrit Pratisthan, New Delhi.
12. Tattvakaumudī of Vacaspati, ed. and Eng. Tr. by G.N. Jha, Pune. (3rd Edition)
13. Yoga for Wellness : Dr. S. Bhattacharya, ed. by Prof. S. Devi.
14. Yogatattvakhadyotah : Dr. S. Bhattacharya, ed. by Prof. S. Devi

**DEPARTMENT OF STATISTICS  
ASSAM UNIVERSITY  
SYLLABUS**

Course No.	Title
<b>Semester I</b>	
101	Real Analysis
102	Linear Algebra
103	Probability Theory
104	Distribution Theory
105	Statistical Computing (Practical Paper)
<b>Semester II</b>	
201	Linear Models and Regression Analysis
202	Survey Sampling
203	Fundamentals of Data Collection and Analysis (CBCS paper open to PG students of other departments )
204	Statistical Inference I (CBCS paper open to all PG students)
205	Computer Programming (Practical Paper)
<b>Semester III</b>	
301	Design and Analysis of Experiments
302	Statistical Inference – II
303	Stochastic Process
304	Applied Statistics – I
305	Statistical Software (Practical Paper)
<b>Semester IV</b>	
401	Multivariate Analysis
402	Applied Statistics – II
403	(i) Industrial Statistics and Optimization Techniques I or (ii) Actuarial Statistics I
404	(i) Industrial Statistics and Optimization Techniques II or (ii) Actuarial Statistics II
405	Project Work

**Note:**

- Each of the papers shall be of equal credit.
- Students shall be exposed both to statistical theory and statistical computing.
- Any one of the two modules in paper 403 and 404 will be offered to the students as specialization, i.e. either 403(i) and 404(i) or 403(ii) and 404(ii).
- The Project Work shall be an application of statistical theory to practice. Students are supposed to identify a practical problem, collect necessary data, analyse them using statistical methods and report the findings.

**First Semester  
Paper 105  
Statistical Computing (Practical Paper)**

**List of Practicals**

*The objective of this paper is to enrich the computing power of students using spreadsheets and packages like R and Matlab. The paper will help the students to understand how to go around with the computing part of some of the theoretical aspects electronically.*

**To be performed using Microsoft Excel/R/Matlab**

1. Computation of Determinants of matrix
2. Inverses of a matrix by partitioning
3. Rank of a matrix
4. Solutions of matrix equations
5. Characteristic roots and vectors of a matrix
6. Fitting of binomial distribution and testing the goodness of fit
7. Fitting of Poisson distribution and testing the goodness of fit
8. Fitting of negative binomial distribution and testing the goodness of fit
9. Fitting of multinomial distribution
10. Fitting of normal distribution and testing the goodness of fit
11. Fitting of lognormal distribution and testing the goodness of fit
12. Common tests of significance like t-tests, F-test and Chi-Square tests
13. Numerical Integration
14. Root extraction using different methods
15. Random number generation from different distributions
16. Simple exercise on simulation
17. Producing simple statistical graphs in R

#### REFERENCES

- Gardener M. (2010) Beginning R : The Statistical Programming Language, Wiley India Pvt. Ltd., New Delhi
- Bhattacharjee, D. (2010). Practical Statistics using Microsoft Excel, Asian Books, New Delhi
- Levine, D. M., Stephan, D., Krehbiel, T.C. and Berenson, M.L. (2006). Statistics for Managers Using Microsoft Excel, Prentice Hall of India Pvt. Ltd., New Delhi.
- Bruce L.L. and Hanselman D. C. (1996). Mastering Matlab 7,
- Gilat A. (2004) Matlab: An Introduction with Applications, 4th Edition, Wiley India Pvt. Ltd., New Delhi
- Albright, S.C., Winston, W. L. and Zappe C. J. (2009) Decision Making Using Microsoft Excel, Cengage Learning, New Delhi.

### Second Semester Paper 205 Computer Programming (Practical Paper)

#### Objective

*The objective of this paper is to enrich the computing power of students and provide them an overview of the programming skills in C language. The paper will help the students to understand how to go around with the computing by writing their own program.*

#### Programming in C

Introduction to object-oriented programming concepts.

Programming in C: Data types, Variables, Operations and Expressions, functions and parameters, input/output, control statements such as if-else, switch, for, while and do-while, pointers, arrays (one dimensional and multi dimensional), character strings and library functions.

#### List of Practicals

Using the knowledge of C students are expected to program the following:

1. Factorial of a positive Integer
2. Ordering of a given set of observations
3. Finding maximum and minimum of a given set of observations.
4. Mean, variance and quantiles for ungrouped and grouped data.
5. Correlation coefficients for ungrouped data, Intra-class correlation coefficient.
6. Fitting of exponential curve and straight line to the given data.
7. Fitting of Binomial and Poisson distributions.
8. Drawing of random samples from Binomial, Poisson, Normal and Gamma distributions.



9. Fitting of standard distributions and tests for goodness of fit.
10. Method of Estimation: Moments, MLE, MLE for location parameter of Cauchy distribution.
11. Tests of significance: Drawing of power curve of a test. Test based on Chi-square, t and F statistics and related confidence intervals.
12. Large sample tests.
13. Construction of difference table, Forward, Backward and Central difference interpolation formulae. Divided difference table. Newton's divided difference and Lagrange's interpolation formula.
14. Numerical Integration: Trapezoidal Rule, Simpson's 1/3rd rule and Weddle's formula for numerical integration.
15. Operations of Matrix algebra and computation of the inverse of a matrix.

## REFERENCES

- Schildt H. (1990) Teach Yourself C, Osborne/McGraw Hill.
- Kanitkar Y. (2013) Let us C, Thirteenth Edition, BPB Publications
- Srivastava S K and Srivastava D. (2009) C in Depth, BPB Publications
- Kernighan B K and Ritchie, D.M. The C Programming Language (ANSI C Version), Prentice Hall of India.
- Balagurusamy E. (2012) Programming in ANSI C, Tata McGraw Hill.
- Gottfried B., (1996) Schaum's Outline of Programming with C, McGraw Hill.

## Third Semester Paper 305 Statistical Software (Practical Paper)

### Objective

*The objective of this paper is to introduce the students to at least one of the popular Statistical Software Packages that are commonly used. The paper shall provide them with an overview of the application and the different computational facilities provided in the package. Along with common tools of data analysis like regression, Descriptive Statistics, Tests of Significance both parametric and non-parametric, Graphical tools and data manipulation tools shall also be introduced.*

## REFERENCES

- Field A. (2013) Discovering Statistics Using SPSS, Sage Publications.
- Gilat. (2010) MATLAB: An Introduction with Applications, BPB Publications
- Singh YK and Chaudhuri BB (2008) MATLAB Programming, PHI, New Delhi
- Carver RH. and Nash JG. (2012) Doing Data Analysis in SPSS: Version 18.0, CENGAGE Learning.
- Hamilton LC. Statistics with STATA: Version 12, CENGAGE Learning.
- Khan RM. (2013) Problem Solving and Data Analysis using Minitab, Wiley.

## DEPARTMENT OF PHYSICS

## ASSAM UNIVERSITY

SYLLABUS

## • Semester I

Course No.	Name of the Paper	Internal mark (Pass mark)	Final exam Mark(Pass mark)	Total	Lecture/ week	Tutorial /week	Credit
PHY101	CLASSICAL MECHANICS	30(12)	70(28)	100(40)	4	2	6
PHY102	MATHEMATICAL PHYSICS – I	30(12)	70(28)	100(40)	4	2	6
PHY103	QUANTUM MECHANICS -I	30(12)	70(28)	100(40)	4	2	6
PHY104	ELECTRONICS	30(12)	70(28)	100(40)	4	2	6
PHY105	ELECTRONICS PRACTICAL	30(12)	70(28)	100(40)	6 Credits (12 hours practical/week)		

## • Semester II

Course No.	Name of the Paper	Internal mark (Pass mark)	Final exam Mark(Pass mark)	Total	Lecture / week	Tutorial /week	Credit
PHY201	ELECTROMAGNETIC THEORY	30(12)	70(28)	100(40)	4	2	6
PHY202	QUANTUM MECHANICS-II	30(12)	70(28)	100(40)	4	2	6
PHY203	OPEN CHOICE (FOR NON PHYSICS STUDENTS) A: BASIC ASTRONOMY B: WORLD OF NANO C : ELECTRONIC DEVICES AND CIRCUITS	30(12)	70(28)	100(40)	4	2	6
PHY204	OPEN CHOICE (FOR NON PHYSICS STUDENTS/ PHYSICS STUDENTS) A: OUR ATMOSPHERE B: INSTRUMENTATION C: NUMERICAL ANALYSIS AND COMPUTER	30(12)	70(28)	100(40)	4	2	6

	PROGRAMING						
PHY205	LABORATORY	30(12)	70(28)	100(40)	6 Credits (12 hours practical/week)		

• Semester III

Course No.	Name of the Paper	Internal mark (Pass mark)	Final exam Mark(Pass mark)	Total	Lecture/ week	Tutorial /week	Credit
PHY301	MATHEMATICAL PHYSICS –II	30(12)	70(28)	100(40)	4	2	6
PHY302	STATISTICAL PHYSICS	30(12)	70(28)	100(40)	4	2	6
PHY303	SOLID STATE PHYSICS	30(12)	70(28)	100(40)	4	2	6
PHY304	A: ASTROPHYSICS-I B: CONDENSED MATTER PHYSICS -I C: ADVANCED QUANTUM FIELD THEORY-I D: NON-LINEAR OPTICS AND LASER SPECTROSCOPY-I	30(12)	70(28)	100(40)	4	2	6
PHY305	A: LABORATORY ON ASTROPHYSICS-I B: LABORATORY ON CONDENSED MATTER PHYSICS-I C: LABORATORY ON ADVANCED QUANTUM FIELD THEORY I D: LABORATORY ON NON-LINEAR OPTICS AND LASERS	30(12)	70(28)	100(40)	6 Credits (12 hours practical/week)		

• Semester IV

Course No.	Name of the Paper	Internal mark (Pass mark)	Final exam Mark(Pass mark)	Total	Lecture/ week	Tutorial /week	Credit
PHY401	ATOMIC AND LASER	30(12)	70(28)	100(40)	4	2	6

	PHYSICS						
PHY402	NUCLEAR AND PARTICLE PHYSICS	30(12)	70(28)	100(40)	4	2	6
PHY403	MOLECULAR SPECTROSCOPY	30(12)	70(28)	100(40)	4	2	6
PHY404	A: ASTROPHYSICS-II B: CONDENSED MATTER PHYSICS -II C: ADVANCED QUANTUM FIELD THEORY-II D: NON-LINEAR OPTICS AND LASER SPECTROSCOPY-II	30(12)	70(28)	100(40)	4	2	6
PHY405	PROJECT WORK ON A: ASTROPHYSICS B: CONDENSED MATTER PHYSICS-I C: ADVANCED QUANTUM FIELD THEORY D: NON-LINEAR OPTICS AND LASERS	30(12)	70(28)	100(40)	6 Credits (12 hours of work per week)		

• **First Semester**

- **Course: PHY 101: CLASSICAL MECHANICS**
- **Marks: 100 (Internal Assessment 30; Final: 70) Credit: 6**
- (All units carry equal marks of 14. Two questions of equal marks will be set from each unit. Students require to answer one question from each unit.)
- UNIT I: Mechanics of a system of particles: Centre of mass, conservation of linear and angular momentum, energy conservation. Constraints, generalized coordinates, principle of virtual work, D'Alembert's principle, Lagrange's equations. Velocity dependent potential and dissipation function. First integrals of motion and cyclic coordinates.
- UNIT II: Hamilton's principle, Lagrange's equations from Hamilton's principle, Hamilton's principle for non-holonomic systems. Symmetry principles and conservation laws. Two-body central force problem: reduction to one body problem, equations of motion, classification of orbits, differential equation of the orbit, Kepler's laws.
- UNIT III: Hamilton's equations of motion, Hamilton's equations from variational principle, Integrals of Hamilton's equations. Principle of least action. Canonical transformation, infinitesimal canonical transformation, Poisson brackets, fundamental properties of Poisson brackets, equations of motion in Poisson bracket form. Lagrange brackets.
- UNIT IV: Hamilton-Jacobi theory, Hamilton's characteristic function, Harmonic oscillator in Hamilton-Jacobi method, separation of variables in Hamilton-Jacobi equation. Action and angle variables, Kepler problem in action-angle variables.

- UNIT V: Motion of rigid bodies: Angular momentum and kinetic energy, inertia tensor, principal axes and moments of inertia. Euler's angles, Euler's equations of motion. Coriolis force. Force-free motion of a symmetrical top. Small oscillations: equilibrium and potential energy, frequencies of free vibration and normal coordinates. Longitudinal vibration of linear triatomic molecule

- **Text Books:**

- 1. Goldstein, Classical Mechanics Narosa Publishing, Delhi
- 2. Landau & Lifshitz, Course of theoretical Physics, Vol-10, Oxford University, Press
- 3. Joag & Rana, Classical Mechanics, Mc Graw Hill

- **Reference Books:**

- 1. Berger, Classical Mechanics A modern Perspective, Mc Graw Hill International
- 2. Awqhare, Classical Mechanics, Prentice Hall
- 3. Sommerfield, Lectures on theoretical Physics. Vol-I, Academic Press, NY 1952
- 4. Hestness, New foundations for classical Mechanics, Kluwer Academic Publisher
- 5. R. Resnik, Introductions of Relativity, Wiley Eastern 1967
- 6. Corben & Stehle, Classical Mechanics, Wiley NY 1974
- 7. Einstein, The meaning of relativity 5th Ed. Princeton University Press
- 8. K. Fock, Theory of space time and Gravitational 2nd Ed., Peragon 1964
- 9. Schwartz, Introduction on to special relativity, Mc Graw Hill, 1968
- 

- **Course: PHY 102: MATHEMATICAL PHYSICS – I**

- **Marks: 100 (Internal Assessment 30; Final: 70) Credit: 6**

- (All units carry equal marks of 14. Two questions of equal marks will be set from each unit. Students require to answer one question from each unit.)

- **UNIT I: Linear Vector Space and Matrices**

- Vectors in n-dimension, Linear independence, Basis and Dimension, Scalar product, Norm and Orthogonality, Schwartz inequality, Gram-Schmidt orthogonalisation process, Linear operators and their Matrix representation, Eigen values and Eigen vectors of a matrix, Cayley-Hamilton theorem, Orthogonal, Unitary and Hermitian matrices, Infinite dimensional space, Hilbert space.

- **UNIT II: Complex Variables**

- Analytic functions, Cauchy-Riemann conditions, Cauchy integral theorem for simply and multiply connected regions, Cauchy integral formula, Taylor and Laurent series, Poles, Residue theorem, Evaluation of integrals, Conformal mapping, Harmonic function.

- **UNIT III: Fourier Series and Integral Transform**

- Fourier Series, Convergence, Cosine and sine series, Fourier series on arbitrary intervals, Fourier transform, Laplace transform, Derivative, Integral, Inverse transform.

- **UNIT IV: Numerical Techniques**

- Finite difference, Interpolation and extrapolation (forward, backward and central), Roots of functions, Integration by trapezoidal and Simpson's rule, Solution of 1st order differential equation using Runge-Kutta method. Introduction to FORTRAN programming.

- **UNIT V: Curvilinear Coordinates and Tensors**

- Introduction to orthogonal Curvilinear Coordinates, Differential operators in orthogonal curvilinear coordinates, Gauss's theorem, Green's theorem, Stoke's theorem Definition of

Tensor, Covariant and Contravariant tensor, Fundamental operation with tensors, Metric tensor, Covariant differentiation and Christoffel symbols

- **References:**

- 1. Murry R Spiegel, Vector Analysis Mc Graw Hill
- 2. Murry R Spiegel, Complex variables Mc Graw Hill
- 3. A W Joshi, Elements of Group Theory for Physicists New Age International
- 4. A W Joshi, Matrices and tensors in physics New Age International
- 5. I Snedden, Elements of partial differential equations Mc Graw Hill
- 6. Landau and Lifshitz, Classical Theory of Fields Butterworth Heinemann
- 7. G B Arfken, Mathematical Methods for Physicists Academic Press
- 8. Corte S.D. and de Boor, Elementary Numerical analysis, 3rd Ed, McGraw Hill, 1980.
- 9. James B. Scarborough, Numerical Mathematical Analysis, Oxford.
- 10. F.B. Hildebrand, Introduction to Numerical Analysis, McGraw Hill, 1956.
- 11. L.A. Pipes and L.R. Harwill, Applied Mathematics for Physicists and Engineers, McGraw Hill.

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- **Course: PHY 103: Quantum Mechanics-I**

- **Marks: 100 (Internal Assessment 30; Final: 70) Credit: 6**

- (All units carry equal marks of 14. Two questions of equal marks will be set from each unit. Students require to answer one question from each unit.)
- UNIT I: Inadequacies of Classical Mechanics, Photoelectric effect, Compton effect, de Broglie hypothesis, Wave functions and Operators – co-ordinate and momentum representations, Heisenberg Uncertainty Principle, Ehrenfest theorem. Postulates of Quantum Mechanics & introduction of Hilbert space. Dirac bra and ket notation.
- UNIT II: Schroedinger's equation, Stationary states, potential well problems, step potential problems, Tunnel effect, hydrogen atom.
- UNIT III: Generalized uncertainty principle, uncertainty relation of energy time, states with minimum uncertainty product. General formalism of wave mechanics, commutation relations, Representation of states and dynamical variables, completeness of eigenfunctions. Schroedinger, Heisenberg and Interaction pictures.
- UNIT IV: Abstract formalism: Quantum states – state vectors and wave functions, matrix representation of an operator, Continuous basis – Schroedinger representation, Unitary transformation. Harmonic oscillator problem by operator method.
- UNIT V: Symmetry transformations: Space – time translations and rotations, Invariance under the transformations and conservation laws. Central force problem, orbital angular momentum, angular momentum algebra, spin. Addition of angular momenta, Clebsch Gordon coefficients.

- **References:**

- 1. R.L.Liboff , Introductory Quantum Mechanics, Pearson Education(2006)
- 2. L.I. Schiff, Quantum Mechanics, Mc Graw Hill (1998)
- 3. A.K. Ghatak and S. Lokanathan: Quantum Mechanics, Macmillan (2000)
- 4. J.J. Sakurai, Modern Quantum Mechanics, Addison-Wesley (1990)
- 5. E. Merzbacher, Quantum Mechanics, John Wiley & Sons (1999).
- 6. Satya Prakash, Advanced Quantum Mechanics, Kedar Nath (1990)
- 7. V.K. Thankappan, Quantum Mechanics, New Age Intl. Pub (1996)
- 8. S. Gasiorowiz, Quantum Mechanics, Wiley (1995)
- 9. P M Mathews and S Venkateswan, Quantum Mechanics, Tata McGraw Hill (1976)
- 10. N Zettili, Quantum Mechanics, John Wiley (2001)
- 11. John L Powell and B Crasemann, Quantum Mechanics, Narosa (1991).

- **Course: PHY104: ELECTRONICS**
- **Marks: 100 (Internal Assessment 30; Final: 70) Credit: 6**
- (All units carry equal marks of 14. Two questions of equal marks will be set from each unit. Students require to answer one question from each unit.)
- **UNIT I: Semiconductor Devices-I**
- PN junction, Diode as rectifier, clipper, clampers, zener diode and its use as voltage regulator, BJT basics, characteristics curve, stability factor and different types of biasing, Transistor as an amplifier, switch, h-parameters, FET, MOSFET, FET biasing, JFET amplifier, frequency response of BJT, JFET.
- **UNIT II: Semiconductor Devices-II**
- Feedback in an amplifier, different topologies of negative feedback, Oscillator (Hartley, Phase shift, Wein bridge), UJT, elementary idea on the construction, Characteristics and application of LED, Photodiode, Phototransistor, LASER diode, solar cell, High frequency devices (IMPATT, GUNN diode)
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- **UNIT III: OP AMPS and their Applications**
- OP AMPS basics, Differential Amplifier Circuit, DC offset parameters, frequency parameters, inverting amplifier, non inverting amplifier, op amp as adder, subtractor, differentiator, integrator, differential amplifier, unity gain amplifier, instrumentation amplifier, log and anti log amplifier, active filter up to second order, voltage comparator and Schmitt trigger.
- **UNIT IV: Digital Circuits**
- Combinational logic circuits: Boolean operation, simplification of Boolean expression, Karnaugh maps, De Morgan's theorem, Adder and subtractor (half and full), Multiplexer and Demultiplexer, encoder and Decoder, RTL, DTL, TTL, ECL, CMOS families. Sequential logic circuits: Flip flops: RS, JK, Master slave, D and T, Counters, registers. RAM and ROM. Basics of Microprocessor and microcontroller, basic architecture of computer. A/D and D/A converters.
- **UNIT V: Communication Electronics**
- Amplitude modulation: needs for modulation, Modulated wave equation, spectrum, band width, Power, methods of AM, SSB, DSBSC, VSB, ISB (Pilot carrier). demodulation of AM wave. super heterodyne receiver. Frequency modulation. modulated wave equation, spectrum, band width, reactance method for producing FM, demodulation of FM wave. FM receiver. Pulse modulation: Sampling theorem, PAM, PWM, PCM, Optical fiber communication, block diagram, optical fibre, light sources for optical fibre, light detectors noise & Satellite communication elementary idea.
- **Text Books :**
- 1. Millman & Halkias, Integrated Electronics : Analog & digital circuits and digital circuits and system, Mc Graw Hill, 1972
- 2. S.M. Sze, Physics of semiconductor devices, 2nd Edn. Wiley Inter Science
- 3. Millman & Halkias, Electronics Instrumentation, Tata Mc Graw Hill.
- 4. Proakis J.G. Digital communication 3rd Edn. C Graw Hill International
- **Reference Books :**
- 1. Neamen D.A, Semiconductor Physics and devices- Basic Principles, Irwin Homewood, 1992.
- 2. Taub & Schilling, Principle of communication system, Tata Mc Graw Hill
- 3. Kennedy, Electronics Communication system, Tata Mc Graw Hill
- 4. Dennis, Roddy, Coolen J, Electronics Communications, Prentice Hall of India.
- 5. Helfrick A.D. & Cooper W.D. Electronics instrumentation & Measurement Technique, Prentice Hall of India.

- 6. Wang S. Fundamentals of semiconductor theory and Devices physics. Prentice Hall of India.
- 7. Combs C.F Electronics Instruments Hand Book, 2nd Edn. Prentice Hall of India.
- 8. Pankove J.I. Optical process in semiconductor, Prentice Hall Engle wood. NY.
- 9. Stretman B.G. Solid state Electronics devices, Prentice Hall 1995.
- 10. Singh J. Semiconductor devices, Mc Graw Hill, NY 1994.
- 11. Cheo P.K. Fibre optics and opto Electronics Mc Grae Hill. NY 1990.
- 12. Gowar, Optical Communication Prentice Hall of India, 1993
- 

• **Course: PHY 105: Electronics Practical**

• **Marks: 100 (Internal Assessment 30; Final: 70) Credit: 6**

- 1. To study the following Diode characteristics
  - a) Si
  - b) LED
  - c) Photo diode
- 2. To study the characteristics of a Zener diode and its use as a voltage regulator
- 3. To study series voltage regulator using CL-100, BC-547 (OP-AMP 741)
- 4. To study a fixed/variable power supply using (78XX, OP-AMP 723) with current booster.
- 5. To study Transistor characteristics of CE configuration and to find the parameters for the same.
- 6. To study the Drain and Transfer characteristics for the given FET and to find the Drain resistance and trans-conductance.
- 7. To design and implement the RC coupled single stage amplifier and to find
  - a) Cut-off frequencies
  - b) Band width
  - c) Mid band gain
  - d) Input/output impedance
- 8. To design and implement the JFET single stage (common drain) amplifier and to find
  - a) Cut-off frequencies
  - b) Band width
  - c) Mid band gain
  - d) Input/output impedance
- 9. To design and test the ( current series/voltage series/current shunt / voltage shunt) feedback and calculate the following parameters with and without feedback
  - a) Cut-off frequencies
  - b) Band width
  - c) Mid band gain
  - d) Input/output impedance
- 10. To design and construct a (Wein bridge/phase shift) oscillator for a given cut-off frequency.
- 11. To determine the following characteristics of an OP-AMP
  - a) Input off-set voltage
  - b) Input bias current



- c) Slew rate
- d) Bandwidth
- 12. To study the following linear application of OP-AMP
  - a) Voltage follower
  - b) Inverting amplifier
  - c) Non-inverting amplifier
  - d) Adder
  - e) Subtractor
  - f) Differential amplifier
  - g) Instrumentation amplifier
- 13. To design a suitable circuit to study the following non-linear applications of OP-AMP
  - a) Comparator
  - b) Schmitt trigger
- 14. To study OP-AMP as
  - a) Sine wave generator
  - b) Square wave generator
  - c) Triangular wave generator
- 15. To design and test a 2nd order low pass and high pass filter using OP-AMP
- 16. To study the operation of DAC using IC 741
- 17. To study IC 555 as astable multivibrator.
- 18. To study various Logic gate circuits and Simplify Boolean Expression using Karnaugh maps and realize the resultant expression using logic gates.
- 19. To study the truth table of half adder and full adder using logic gates also add two two bits numbers like 11 and 10.
- 20. To study the truth table of half subtractor and full subtractor using logic gates also subtract two bits numbers like 11 and 10.
- 21. To study the truth table of a encoder and a decoder using logic gates.
- 22. To design and implement a 4:1 Multiplexer and 1:4 Demultiplexer using Logic gates.
- 23. To study the operation of the following Flip Flops and verify their truth table
  - a) SR F/F
  - b) JK F/F
  - c) D F/F
  - d) T F/F
  - e) JK Master Slave F/F
- 24. To Study the truth table of 2 bits,3 bits and 4 bits ripple counter

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## • Second Semester

- **Course: PHY 201: ELECTROMAGNETIC THEORY**
- **Marks: 100 (Internal Assessment 30; Final: 70) Credit: 6**

- (All units carry equal marks of 14. Two questions of equal marks will be set from each unit. Students require to answer one question from each unit.)
- UNIT I: Review of special theory of Relativity, concept of invariant interval, Four vector, Lorentz transformation in four dimensional Space, Electromagnetic field tensor in four dimensional space, Maxwell equation, Lagrangian of a charged particle, Lorentz force.
- UNIT II: Motion of a charged particle in electromagnetic field: uniform E and B fields. Non uniform fields, Diffusion across magnetic fields, Time varying E and B Fields, Adiabatic Invariants of electron moment.
- UNIT III: Saha's equation of ionization, Plasma oscillations, Plasma Parameters, Debye Length, Hydrodynamical description of Plasma, Fundamental equations, Hydro-magnetic waves : Magneto Sonic and Alfvén waves, waves, propagation, phase and group velocity.
- UNIT IV: Radiation from an accelerated point charge, Retarded potentials, Lienard-Wiechert potentials, field of a system of charges at large distances. Dipole radiation, Quadrupole and magnetic dipole radiation.
- UNIT V: Scattering: coulomb collision due to a harmonically bound charge , Thompson scattering, Rayleigh scattering, Mie Scattering and phase function formulation – consideration of a large particle- Other scattering formulations (expressions only) : T-matrix , Discrete Dipole Approximation .
- **Text Books:**
  - 1. J.D. Jackson, Classical Electrodynamics, Wiley Eastern, 1989.
  - 2. Griffiths, Introduction of Electrodynamics, Prentice Hall.
  - 3. L.D. Landau & E.M Lifshitz, The classical theory of fields, Butterworth Heinemann Ltd. Oxford.
- **Reference Books:**
  - 1. Berestetskii, Lifshitz, Pitaevskii, Quantum Electrodynamics, , Pergamon Press.
  - 2. Miah M.A.W, Fundamentals of Electromagnetic, Tata Mc Graw Hill.
  - 3. Cook D.M , Theory of Electromagnetic Fluids, Prentice Hall.
  - 4. Lorrain & Corson, Electromagnetic field and waves, Freeman & Company Sanfrancisco.
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- **Course: PHY202: QUANTUM MECHANICS - II**
- **Marks: 100 (Internal Assessment 30; Final: 70) Credit: 6**
- (All units carry equal marks of 14. Two questions of equal marks will be set from each unit. Students require to answer one question from each unit.)
- UNIT I: Time independent perturbation theory - non-degenerate and degenerate cases, Fine structure and Zeeman effect (without spin), Stark effect, Time dependent perturbation theory - Fermi Golden rule, Harmonic perturbation--Adiabatic and sudden approximations, Absorption and emission of Radiation – Einstein's A,B coefficients – selection rules.
- UNIT II: WKB approximation, connection with classical limits, connection formula, validity of WKB approximation, Alpha emission, Variational technique – examples of hydrogen atom, helium atom and harmonic oscillator.
- UNIT III: Scattering Theory: Amplitude and cross-section, CM and Laboratory frame, Scattering by spherically symmetric potentials, partial waves and phase shifts, Scattering by an attractive square well potential, Breit-Wigner formula. Born approximation and its validity, Coulomb scattering.
- UNIT IV: Attempt for relativistic formulation of Quantum Mechanics, Klein-Gordon equation and its significance, Klein Gordon equation in presence of electromagnetic field and its non relativistic reduction, Dirac equation for a free particle, properties of Dirac matrices and algebra for gamma matrices, Solution of the free particle, orthogonality and completeness

relation for Dirac spinors, fine structure of hydrogen atom, interpretation of negative energy solution and hole theory.

- UNIT V: Scalar field Theory: Concept of systems with infinite degrees of freedom, Classical fields, Equations of motion, Hamiltonian. Symmetries and invariance principles – Noether's Theorem. Canonical quantization of scalar field—creation, annihilation operators, Commutation relations. Interpretation of the quantized field --- number operator, connection with harmonic oscillator.

- **References:**

- 1. R.L. Liboff, Introductory Quantum Mechanics, Pearson Education(2006)
- 2. L.I. Schiff, Quantum Mechanics, Mc Graw Hill (1998)
- 3. A.K. Ghatak and S. Lokanathan: Quantum Mechanics, Macmillan (2000)
- 4. J.J. Sakurai, Modern Quantum Mechanics, Addison-Wesley (1990)
- 5. E. Merzbacher, Quantum Mechanics, John Wiley & Sons (1999).
- 6. Satya Prakash, Advanced Quantum Mechanics, Kedar Nath (1990)
- 7. V.K. Thankappan, Quantum Mechanics, New Age Intl. Pub (1996)
- 8. S. Gasiorowiz, Quantum Mechanics, Wiley (1995)
- 9. P M Mathews and S Venkateswan, Quantum Mechanics, Tata McGraw Hill (1976)
- 10. N Zettili, Quantum Mechanics, John Wiley (2001)
- 11. John L Powell and B Crasemann, Quantum Mechanics, Narosa (1991)

- **Course: PHY 203: OPEN CHOICE (FOR NON PHYSICS STUDENTS)**

- **PHY 203A: Basic Astronomy**

- **Marks: 100 (Internal Assessment 30; Final: 70) Credit: 6**

- (All units carry equal marks of 14. Two questions of equal marks will be set from each unit. Students require to answer one question from each unit.)

- **UNIT I: Time and Co-ordinate System**

- Spherical Trigonometry, the celestial sphere; the cardinal points and circles on the celestial sphere. Equatorial. ecliptic and galactic system of co-ordinates. Constellations and nomenclature of stars. Aspects of sky from different places on the earth. Twilight, Seasons, Sidereal, Apparent and Mean solar time and their relations. Equation of time. Ephemeris and Atomic Times. Calendar. Julian date and heliocentric correction. precession, nutation and proper motion on the coordinates of stars.

- **UNIT II: Astronomical Measurements and Telescopes**

- Magnitude systems: apparent and absolute magnitudes, distance modulus, color index; Atmospheric extinction, *seeing* and scintillation. Distances of stars from the trigonometric and moving cluster, parallaxes. Stellar motions. Variable stars as distance indicators. Basic optics and optical telescopes, Detectors: photographic plate, Photo Multiplier Tube (PMT), Charge Coupled Device (CCD).

- **UNIT III: Solar System**

- Origin and evolution of the Solar System - Physical characteristics, Rotation, Sunspots. Inner planets, Jovian planets, Dwarf planets. Asteroids: classification, origin. Comets: Discovery and designation, physical nature, classification, origin. Meteors and Meteorites.

- **UNIT IV: Stars and Our Galaxy**

- Colour –magnitude relation, H R diagrams, Different spectral types of stars, Star formation in Molecular clouds, Stellar Evolution, End state of stars : Supernova, Neutron star and Black hole. Our Galaxy: Milky way, structure and morphology of our galaxy, Galactic rotation, Missing Mass problem.

- **UNIT V: External Galaxies and Cosmology**

- Normal Galaxies, Classification scheme for external galaxies, Hubble's law. The origin and evolution of universe, Standard and Alternate cosmologies.

- **Text Books:**

- 1. Frank Shu, Physical Universe,
- 2. W.M.Smart, Text book of Spherical Astronomy.
- 3. Jay M. Pasachoff, Astronomy: From the Earth to the Universe(Sixth Edition).
- 4. A.E.Roy, Orbital Motion.
- 5. McCusky, Introduction to Celestial Mechanics.
- 6. K.D.Abhyankar, Astrophysics: Stars and Galaxies, Tata McGraw Hill Publication
- 7. G.Abell, Exploration of the Universe.
- 8. A.Unsold, New Cosmos.
- 9. B Basu, T Chatterjee, S N Biswas, Introduction to Astrophysics.

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- **PHY203B: WORLD OF NANO**

- **Marks: 100 (Internal Assessment 30; Final: 70) Credit: 6**

- (All units carry equal marks of 14. Two questions of equal marks will be set from each unit. Students require to answer one question from each unit.)

- UNIT I: Fundamentals of nanomaterial and nanotechnology. Concept of strong and weak quantum confinement. Semiconductor, metal nanomaterials, and their properties. Many-Body Finnis and Sinclair (FS) potentials, Many-Body Embedded-Atom Model (EAM) potentials.

- UNIT II: Concept of Top down and bottom up approaches, their advantages and disadvantages. Different synthesis techniques: Lithography, vapour deposition, laser deposition, sputtering, Molecular beam epitaxy, sol gel methods of preparation.

- UNIT III: Different characterization techniques. UV/VIS/IR spectroscopy, Photoluminescence, X-Ray diffraction, Microscopy techniques (TEM, SEM, AFM).

- UNIT IV: Swift ion irradiation. Phase transitions in nano systems: Gibbs phase rule, comparison of phase transitions between small and large systems. Phase transition in small systems: Evaporation of water, micellization, crystallization.

- UNIT V: Applications of nano materials: Light emitting and detecting device. Filter, photo voltaic cell, gas sensor, antibacterial element, drug delivery system, use of carbon nanotubes.

- **Text books:**

- 1. S. S. Nath, Synthesis of semiconductor quantum dots and their applications, LAP LAMBERT
- Academic Publishing AG & Co. KG, Germany, ISBN: 978-3-8383-6106-2, 2010.
- 2. V. Rajendran, B. Hillebrands, K. Saminathan, K. E. Geckeler, Ed., Synthesis and characterization of
- Nanostructured Materials, MacMillan Publishers, 2010.
- 3. G. Cao, Nanostructures and Nanomaterials, Imperial College Press, 2004.
- 4. G. A. Mansori: Principles of Nanotechnology, World Scientific, Chicago, 2005.
- 5. C. P. Poole and F. J. Owens, Introduction to Nanotechnology, Wiley Interscience: New Jersey, 2003.
- 6. P. J. F. Harris, Carbon Nanotube Science - Synthesis, Properties and Applications, Cambridge
- University Press: Cambridge UK, 2009.

- **Reference books:**

- 1. G. Gope, D. Chakder, S. S. Nath, Preparation of quantum dots and their uses in electronics and optics,
- VDM Verlag Dr. Muller GmbH & Co. KG, Germany, ISBN: 978-3-639-20197-0, 2010.
- 2. K. Klabunde, Nanoscale Materials in Chemistry, Wiley Interscience: New York, 2001.

- 3. V. Rotello (Ed.): Nanoparticles: Building Blocks for Nanotechnology, Nanostructure Science and Technology, Kluwer Academic/Plenum Publishers, New York, 2004.
- 4. P. M. Ajayan, L. S. Schadler, P. V. Braun, Nanocomposite science and technology, Wiley-VCH, 2003.
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- **PHY203C: ELECTRONIC DEVICES AND CIRCUITS**

- **Marks: 100 (Internal Assessment 30; Final: 70) Credit: 6**

- (All units carry equal marks of 14. Two questions of equal marks will be set from each unit. Students require to answer one question from each unit.)

- **UNIT I: Semiconductors**

- Intrinsic and extrinsic semiconductors; n-type and p-type semiconductors; Majority and Minority carriers in semiconductors.

- **UNIT II: Semiconductor Devices**

- P-N junction diode, Zener diode, LED, photodiode; Transistor construction: PNP and NPN; Transistor operation; CB, CE and CC configuration.

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- **UNIT III: Rectifier, Amplifier and Oscillators**

- Half wave, Full wave and Bridge rectifier; Transistor as an amplifier in CE arrangement, Op-Amp as amplifier; Colpitt's oscillator, Hartely oscillator, Phase shift oscillator, Wein bridge oscillator.

- **UNIT IV: Digital Electronics**

- Analog and digital signals; Binary number system, Decimal to binary conversion, Binary to decimal conversion; Logic gates, OR, AND, NOT and NAND gate; Boolean algebra, Boolean theorem.

- **UNIT V: Data Acquisition and Basic Communication System**

- DATA acquisition systems: Pulse height analysis- single and multichannel analysers. Amplitude modulation; Frequency modulation; Pulse modulation.

- **Text Books:**

- 1. Millman & Halkias, Integrated Electronics: Abalog & digital circuits and digital circuits and system, Mc Graw Hill, 1972.
- 2. SM Sze, Physics of semiconductor devices, 2nd Edn. Wiley Inter Science.
- 3. Millman & Halkias, Electronics Instrumentation, Tata Mc Graw Hill.
- 4. J.G. Prokis, Digital communication 3rd Edn. Mc Graw Hill International.
- 5. H.S. Kalsi, Electronic Instrumentation, Tata McGraw-Hill, Company, New Delhi.

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- **Course: PHY204: OPEN CHOICE (FOR NON PHYSICS STUDENTS/PHYSICS STUDENTS)**

- **PHY204A: OUR ATMOSPHERE**

- **Marks: 100 (Internal Assessment 30; Final: 70) Credit: 6**

- (All units carry equal marks of 14. Two questions of equal marks will be set from each unit. Students require to answer one question from each unit.)

- **UNIT I: Atmosphere: Structure and thermodynamics of atmosphere, composition of air, atmospheric pressure, temperature, wind, humidity, radiation.**

- UNIT II: Clouds and Precipitation: Different types of clouds, Formation of clouds, Cloud seeding, Different kinds of precipitation, Rainfall distribution pattern in Northeast India, Seasonal variation of rainfall. Mesoscale convective systems, severe weather.
- UNIT III: Major climatic zones of the world, Spatial and temporal patterns of climate parameters in India. Climate of N-E India, Indian Monsoon- pre monsoon, south west monsoon and north east monsoon, Indian monsoon jet streams, general circulation. Climatic classifications. Climates of Indian region, effect of El Nino & La Nina, Indian ocean dipole on Indian climate.
- UNIT IV: Weather and climate; definition and significance of climatology. elements of weather and climate; their causes. Climate control. Earth and sun relation, rotation and revolution of earth. Rainfall, world patterns of rainfall: regional and seasonal distribution. Air masses and fronts: concept, classification and properties. Atmospheric disturbances: tropical and temperate cyclones; thunderstorms and tornadoes.
- UNIT V: Concepts of climate change: Climatic variability and climate change, consequences of Climate change, global warming, Causes and consequences of Global Warming, Ozone hole. Sea level rise, green house gases. Climatic considerations in Industrial locations, city planning, landscape architecture and abatement/mitigation of pollution. agroclimatology, human and animal bio-climatology, urban
- climatology.
- **Reference Books:**
  - 1. P.K.Das, The Monsoons, National Book Trust, New Delhi, 1968.
  - 2. E P Lydolph, The Climate of the Earth, Rowman and Allanheld, Totowa, N.J.
  - 3. J R Mather, Climatology, McGraw-Hill, New York, 1974.
  - 4. E T Stringer, Foundation of Climatology, Surjeet Publications, Delhi, 1982.
  - 5. G T Trewartha, An Introduction to Climate, International Students edition , McGraw Hill, New York, 1980.
  - 6. Frederick K. Lutgens, The Atmosphere: An introduction to Meteorology,
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#### • **PHY204B: INSTRUMENTATION**

#### • **Marks: 100 (Internal Assessment 30; Final: 70) Credit: 6**

- (All units carry equal marks of 14. Two questions of equal marks will be set from each unit. Students require to answer one question from each unit.)
- **UNIT I: Basics of Circuits and Measurement Systems**
  - Kirchoff's laws, mesh and nodal Analysis. Circuit theorems. One-port and two-port Network Functions. Static and dynamic characteristics of Measurement Systems. Error and uncertainty analysis. Statistical analysis of data and curve fitting.
- **UNIT II: Transducer and digital signal processing**
  - Transducer: classifications, ideal characteristics. Different types of transducers: Optoelectronic transducer, Temperature sensor, Pressure sensor, Flow meter, Displacement transducer and Humidity sensor.
- **UNIT III: Electrical and Electronic Measurements**
  - Bridges and potentiometers. Electromechanical indicating instruments – AC/DC current and voltage meters, ohmmeter; Loading effect; Measurement of power and energy; Instrument transformers; Measurement of resistance, inductance and capacitance; Q-meter and waveform analyser; Cathode ray oscilloscope.
- **UNIT IV: Analytical Instrumentation**
  - Spectroscopy and spectral methods of analysis. Spectrophotometers- basic principle and uses: UV/VIS, Photoluminescence, FT-IR, Raman spectroscopy, X-Ray diffraction, NMR, AAS.

Electron Microscope: Basic principle, different types of Electron Microscopes (SEM, TEM), their advantages and uses.

- **UNIT V: Vacuum Systems**

- Introduction, different types of pumps: rotary, diffusion, turbo molecular and cryo pumps. Measurement of low pressure: Pirani, penning, hot cathode gauges, partial pressure measurements, leak detection, gas flow through pipes and apertures.

- **Text Books:**

- 1. D. Patranabis, Principle of Industrial Instrumentation, Tata McGraw-Hill, Publishing Company, New Delhi.
- 2. D.V.S Murthy, Transducers and Instrumentation, Prentice – Hall of India.
- 3. Albert D. Helfrick & William D. Cooper, Modern Electronic Instrumentation & Measurement Techniques, Prentice – Hall of India.
- 4. D. Patranabis, Sensors and Transducers, Prentice – Hall of India.
- 5. Hermann and Neubert, Instrument Transducers an Introduction to their Performance and design, Oxford University Press.
- 6. H.S. Kalsi, Electronic Instrumentation, Tata McGraw-Hill, Company, New Delhi.
- 7. C.S. Rangan, G.R. Sarma, V.S.V. Mani, Instrumentation, Devices and System, Tata McGraw-Hill, Company, New Delhi.
- 8. A. Roth, Vacuum Technology, Elsevier: Amsterdam, 1998.
- 9. V. V. Rao, T. B. Ghosh, K. L. Chopra, Vacuum Science and Technology, Allied Publishers: New Delhi, 2008.
- 10. R.L. Boylestad and L. Nasheisky, Electronic Devices and Circuit Theory, PHI, 6e, 2001.
- 11. R.J. Smith and R.C. Dorf, Circuits, Devices and Systems, John Wiley & Sons, 1992.
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- **PHY204C: NUMERICAL ANALYSIS AND COMPUTER PROGRAMMING**

- **Marks: 100 (Internal Assessment 30; Final: 70) Credit: 6**

- (All units carry equal marks of 14. Two questions of equal marks will be set from each unit. Students require to answer one question from each unit.)

- **UNIT I: Introduction**

- Process of numerical computing, characteristics of numerical computing, computing environment, introduction to computers and computing concepts, different number system, representation of integers and real numbers in computers, floating point representation, approximation and errors in computing.

- **UNIT II: Linux and FORTRAN 77**

- Introduction to Linux, simple Linux command, introduction to Fortran 77, structured programming, constants and variables, variable declaration, Input/ Output statements, control statements, intrinsic functions, file handling, simple Fortran programs.

- **UNIT III : Roots of Non-linear Equations**

- Evaluation of polynomials, Bisection method, false position method, Newton–Raphson method, secant method, fixed point method, multiple roots by Newton's method, complex roots by Baristow method, Muller's method.

- **UNIT IV: Direct solution of Linear equations, Interpolation and Curve Fitting**

- Basic Gauss elimination method, Gauss elimination with pivoting, Gauss-Jordan method, LU decomposition methods, matrix inverse method, Lagrange interpolation, Newton interpolation, least square regression.

- **UNIT V: Numerical Integration and Solution of differential equations**

- Integration through Lagrange's polynomial interpolation, trapezoidal, Simpson's rule, Gaussian integration, solution of differential equation by Taylor's method, Picard's method, Euler's method, Runge-Kutta method, Fourth order Runge-Kutta method.

- **Reference Books:**

- 1. Fortran 77 and Numerical methods C Xavier, New Age
- 2. Numerical methods E. Balagurusamy, Tata McGraw Hill
- 3. Numerical recipes in Fortran W.H. Press et. al, Cambridge University Press
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- **PHY205: LABORATORY**

- **Marks: 100 (Internal Assessment 30; Final: 70) Credit: 6**

- 1. Experiments with Michelson Interferometer: Determination of wavelength, small difference in wavelength, etc.
- 2. Experiments with Fabry-Perrot Interferometer: Determination of wavelength, small difference in wavelength, etc.
- 3. Study of Zeeman Effect and determination of  $e/m$  of electron.
- 4. Determination of wavelengths of spectral lines using Constant Deviation Spectrometer.
- 5. Analysis of elliptically polarized light using Babinet Compensator.
- 6. Determination of refractive index or thickness of a thin film using Jamin's Interferometer.
- 7. Study of Hall Effect (general model)
- 8. Determination of velocity of ultrasonic wave liquid using Ultrasonic Interferometer.
- 9. Determination of velocity of ultrasonic wave in liquid by study of diffraction of light by the wave.
- 10. Determination of Stefan's Constant.
- 11. Determination of Plank Constant using photo cell.
- 12. Determination of Dielectric Constant (general model).
- 13. Study of plateau of a Geiger –Muller counter and carry out statistical analysis of the data.
- 14. FORTRAN programming based on the optional paper "Numerical methods and computer programming".
- NB: The list of experiments should be considered as suggestive of the standard. and are subject to availability of equipments. The teachers are authorised to either add or delete experiments whenever necessary. \*\*\*\*\*
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- **Third Semester**

- **Course: PHY 301: MATHEMATICAL PHYSICS –II**

- **Marks: 100 (Internal Assessment 30; Final: 70) Credit: 6**

- (All units carry equal marks of 14. Two questions of equal marks will be set from each unit. Students require to answer one question from each unit.)

- **UNIT I: Linear Differential Equations**

- First order linear equations, Second order linear differential equations, Series solution, Picard's existence and uniqueness theorem, Ordinary and Singular points, Partial differential equations, Systems of first order equations.

- **UNIT II: Nonlinear Differential Equations and Dynamical Systems**



- Nonlinear systems, Dynamical flow, Fixed points and stability, Periodic solutions: The Poincare- Bendixon Theorem, Dynamical flow, Bifurcation, Lorenz equation, Strange attractor, Fractals.
- **UNIT III: Special Functions**
- Green's functions, Hypergeometric functions, Legendre, Confluent Hypergeometric functions, Hermite, Laugerre and Bessel Functions.
- **UNIT IV: Group Theory**
- Definition, Group multiplication table, Subgroup, Coset, Direct product, Homomorphism, Isomorphism, Matrix representation, Reducible and irreducible representation, Schur's lemma, Orthogonality theorem, Character table, Lie group and Lie algebra, Generators of Unitary group, SU(2) and O(3).
- **UNIT V: Elements of Probability and Theory of Errors**
- Theory of compound and total probability, Random variables, Limit theorem, Law of large number, Poisson law, Dispersion, Mean and Standard deviation, Binomial, Normal and Poisson distribution, Variance and its estimate, Theory of errors.
- **Reference Books:**
- 1. N Gutzweiler \_Chaos in classical and quantum Mechanics, Springer, 1990
- 2. Steven H Strogatz \_Nonlinear Dynamics and Chaos: With application to Physics, Biology Chemistry and Engineering, Westview
- 3. Balmohan. V. Limaye \_Functional Analysis, New Age International (P) Ltd.
- 4. Rudin Walter \_Functional Analysis, Tata McGraw-Hill
- 5. Erwin Kreyszig \_Introductory Functional Analysis with Applications, WILEY
- 6. Z X Wang and D R Guo \_SPECIAL FUNCTIONS, World Scientific Publishing Co.
- 7. G. Arfken, Mathematical Methods for Physicists. Academic Press.
- 8. I.N. Sneddon, Special Functions of Mathematical Physics and Chemistry, Longman .
- 9. L.A. Pipes and L.R. Harwill, Applied Mathematics for Physicists and Engineers, McGraw-Hill .
- 10. P.K. Chattopadhyay, Mathematical Physics, Wiley Eastern
- 11. C.R. Wylie and L.C. Barrett. Advanced Engineering Mathematics, McGraw-Hill.
- 12. E. Kreyszig, Advanced Engineering Mathematics, Wiley Eastern.
- 13. H.Cohen, Mathematics for Scientists and Engineers, Prentice Hall (1992).
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- **Course: PHY302: STATISTICAL PHYSICS**
- **Marks: 100 (Internal Assessment 30; Final: 70) Credit: 6**
- (All units carry equal marks of 14. Two questions of equal marks will be set from each unit. Students require to answer one question from each unit.)
- **UNIT I:** Revision of Thermodynamic laws and functions, Entropy, Free energy, Internal Energy, Enthalpy, Chemical Potential, Fugacity (definitions and significance). Micro and macro states, Phase space of a classical system, Density of states, Liouville's Theorem.
- **UNIT II:** Micro canonical, Canonical and Grand canonical ensembles. Concept of ensemble average, Equation of state, specific heat and entropy of a classical ideal gas using microcanonical ensemble. Entropy of mixing, Gibb's paradox, Sakura Tetrode Equation. Energy and Density fluctuations; Equivalence of various ensembles, Virial and equipartition theorems. Partition function: Definition and significance. Application to an ideal diatomic gas. Classical harmonic oscillator, magnetic dipoles in a magnetic field.
- **UNIT III:** Inadequacy of classical theory, Quantum mechanical ensemble theory, density matrix, Ensembles in quantum statistical mechanics. Partition functions with examples including: (i) an electron in a magnetic field (ii) Free particle in a box (iii) Linear Harmonic oscillator. Ensembles of ideal Boltzmann, Bose-Einstein and Fermi gas. Identical particles and symmetry requirement, difficulty with Maxwell-Boltzmann statistics, quantum

distribution functions, Bose-Einstein and Fermi-Dirac statistics. Grand partition function for ideal Bose and Fermi gas.

- UNIT IV: Ideal Bose System: Thermodynamic behavior of ideal Bose gas, Bose-Einstein condensation (Experimental evidences), Liquid Helium: two fluid hydrodynamics, Second sound, Theories of Landau and Feynman (qualitative only). Thermodynamics of Black body radiation – Stephan Boltzmann law, Wein's Displacement Law. Ideal Fermi System: Thermodynamic behavior of an ideal Fermi Gas, Degenerate Fermi Gas, Pauli Paramagnetism.
- UNIT V: Fluctuations, Gaussian distribution, Random walk --Brownian motion (Langevin's Theorem). Approach to equilibrium: Fokker -Planck Equation. Fluctuation- dissipation theorem. Phase Transitions: Phenomenology —First and Second order phase transitions, elementary idea of critical phenomena, Universality of critical exponents, scaling of thermodynamic functions. Elementary ideas of Mean field theories, Exact solutions -- Ising model in 1- dimension.
- **Text Books:**
  - 1. RK Patharia, Statistical Mechanics (2nd Ed) Butterworth Heinman,(Elsevier) 2005
  - 2. K Huang, Statistical Mechanics (2nd ed) John Wiley & Sons, 2002
  - 3. F Reif, Statistical and Thermal Physics, McGraw Hill, 1985
  - 4. B B Laud, Fundamentals of Statistical mechanics, New Age International Publishers,1998
  - 5. L D Landau & E M Lifshitz, Statistical Physics, Part I & II, Butterworth and Heinman,1980

• **Course: PHY303: SOLID STATE PHYSICS**

• **Marks: 100 (Internal Assessment 30; Final: 70) Credit: 6**

- (All units carry equal marks of 14. Two questions of equal marks will be set from each unit. Students require to answer one question from each unit.)
- UNIT I: Crystal Structure: Crystal lattice, Unit cell, Bravais lattices, X-ray diffraction, Bragg's law, Reciprocal lattice, Laue diffraction, Crystal structures, Atomic scattering factor, Geometrical structure factor, Neutron diffraction, Electron diffraction, Crystal structure determination by Laue, Powder and Rotating crystal methods.
- UNIT II: Crystal Binding and Crystal Vibration: Type of crystal binding, Crystals of inert gases, van der Waals-london Interaction, Ionic bonding and Madelung constant. Quantization of lattice vibrations, Dispersion relations.
- UNIT III: Failure of free electron theory, Sommerfield modification, Particle in a box, Fermi Dirac statistics and electronic distribution in solid, density of states and Fermi energy, Fermi distribution function, Motion of electron in a periodic lattice: Bloch theorem, Kronig-Penney model and origin of bands in solids, Brillouin zones for simple lattices, Crystal momentum, Effective mass of electrons and holes.
- UNIT IV: Physics of Semiconductor: Intrinsic and Extrinsic Semiconductor, Carrier concentration in intrinsic and extrinsic semiconductor, Fermi levels, Recombination process, Rectifier equation, Continuity equation, I-V Characteristics of p-n junction, Hall effect, Application of Hall Effect.
- UNIT V: Superconductivity: Type I and Type II superconductors, Meissner effect, London-Equations, Thermodynamics of Superconductors, BCS Theory, Quantum tunnelling, Josephson effect, High temperature superconductivity.
- **Text Books:**
  - 1. M. A. Omar, Elementary Solid State Physics, Pearson, 4th ed.( 2004).
  - 2. N.W. Ashcroft & N.D. Mermin ,Solid State Physics (Harcourt Asia, 2001).
  - 3. Charles Kittel, Introduction to Solid State Physics. (7th ed. Wiley)
  - 4. H.V. Keer, Principles of the Solid State. (Wiley Eastern Limited, 1994).
  - 5. J. P. Srivastava, Elements of Solid State Physics. (Prentice Hall of India, 2006).

- **Course: PHY304A: ASTROPHYSICS-I**
- **Marks: 100 (Internal Assessment 30; Final: 70) Credit: 6**
- (All units carry equal marks of 14. Two questions of equal marks will be set from each unit. Students require to answer one question from each unit.)
- **UNIT I: Celestial Co-ordinate system and Observational techniques:** Celestial sphere-Sidereal and solar time, Equation of time-different co-ordinate system, determination of luminosity-Black body radiations-luminosity and magnitude of starrelations with mass, radius,-colour index-distance determination by parallax and other methods.
- **UNIT II: Telescopes and Instrumentations:** Different optical configuration for astronomical telescope plate scale and diffraction limits-telescopes for g-ray, X-ray UV, IR, mm and radio astronomy- photometry with photometers and CCD- spectrometry and polarimetry with various instruments.
- **UNIT III: Star formation in ISM, Interstellar medium(ISM)-various nebula-Jeans condition for collapse-Protostars –star formation. Stellar Clusters :** open and Globular- IMF. Variable stars-period luminosity relations and distance determination- Binary stars-types of binaries.
- **UNIT IV: Stellar structure and Evolution:** Spectral classification of stars- Saha's equation-CNO cycles –HR Diagram--radiative transfer- structure of spectral line-hydrostatic equilibrium-equation of state-main sequence. Evolution of main sequence-late stages-supernovae degenerate remnants: white dwarf Chandrasekhar limit-Neutron star- pulsars-Black Holes-g-ray burst.
- **UNIT V: Sun and Solar system:** Physical characteristics of sun-rotation, magnetic field, granulation, sunspots, other chromospheric activities. Primordial Solar Nebula-Origin and evolution of solar system- planets, comets, asteroids and other minor bodies-formation of comets-Oort cloud planetary dust and gas.
- **Text Books:**
  - 1. K.S Krishnaswamy , Astrophysics, CUP.
  - 2. Baidyanath Basu, Astrophysics, Prentical Hall.
  - 3. KD Abhankar, Astrophysics, Orient Longman.
  - 4. Mclean,Electronic Imaging in Astronomy, Willey.
  - 5. V.B.Bhatia, Text Book on Astronomy and Astrophysics with elements of cosmology, Narosa.
- **Reference Books:**
  - 1. Smith, Observational, Astrophysics.CUP.
  - 2. F Shu, Physical Universe. CUP.
  - 3. Allen,Astrophysical Quantities. Willey.
  - 4. KR Lang, Astrophysical Quantities, Springer Verlag.
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- **Course: PHY304B: CONDENSED MATTER PHYSICS -I**
- **Marks: 100 (Internal Assessment 30; Final: 70) Credit: 6**
- (All units carry equal marks of 14. Two questions of equal marks will be set from each unit. Students require to answer one question from each unit.)
- **UNIT I: Elastic Constants and Elastic Waves**
  - Analysis of elastic Stress, Analysis of elastic strain, Elastic compliance and Stiffness constants, stiffness constants for cubic crystals, Elastic energy density, Elastic waves in cubic crystals, waves in (100), (110), (111) directions, Experimental determination of elastic constants.
- **UNIT II: Thermal properties of Solids**
  - Lattice heat capacity, Classical theory, Einstein's theory, Debye's theory, Born's modification, Heat capacity of array of atoms, Lattice thermal conductivity, phonon-phonon scattering-Umklapp processes, Anharmonic crystal interactions, Gruneisen relation, Thermal

expansion. Thermoluminescence(TL): Theory and Experimental arrangement, methods of analysis of TL peaks.

- **UNIT III: Free Electron Theory of Metals**

- Drude-Lorentz free electron theory, Electrical conductivity, Thermal conductivity, Wiedmann–Franz ratio, Sommerfield quantum theory, Free electron gas in three dimensions, Density of electron states, Fermi dirac statistics and distribution function, Effect of temperature on FD function, Electronic specific heat, Failure of free electron model.

- **UNIT IV: Crystal Imperfections**

- Imperfections in Crystals, Equilibrium concentration of point defects, Colour centres and coloration of crystals, Dislocations, Edge and Screw dislocations, Burger's vector, Dislocation energy, Dislocation densities, Dislocation and Crystal Growth, Diffusion in solids, diffusion constant, self-diffusion, Fick's law.

- **UNIT V: Liquid Crystals and Nano Science**

- Elementary concepts of liquid crystals, thermotropic and lyotropic, nematics and semantics, applications, Nano materials, elementary properties of nano materials and applications, bottom up approaches, topdown approaches, tools for measuring nanostructures, tools to make nanostructures.

- **Text Books:**

- 1. N.W. Ashcroft & N.D. Mermin, Solid State Physics, Harcourt Asia, 2001. 2 Quantum theory of solids, C. Kittel, Academic.
- 2. Charles Kittel, Introduction to Solid State Physics. 7th ed. Wiley.
- 3. M. S. Rogalski and Stuart B. Palmer, Solid State Physics, Gordon and Breach, 2001.
- 4. M. A. Wahab, Solid State Physics, Narosa, 2006.
- 5. H.Ibachs & H. Luths, Solid State Physics, Springer, 1996.
- 6. W.A.Harrison, Elementary electronic structure, World Scientific, 2004
- 7. V. Pagonis, G. Kitis, C. Furetta, Numerical and Practical Exercises in Thermoluminescence, Springer, 2006.

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- **Course: PHY304C: ADVANCED QUANTUM FIELD THEORY-I**

- **Marks: 100 (Internal Assessment 30; Final: 70) Credit: 6**

- (All units carry equal marks of 14. Two questions of equal marks will be set from each unit. Students require to answer one question from each unit.)

- **UNIT I:** Classical field theory, Hamiltonian formalism, conservation laws – Noether's theorem. Non relativistic system with n degrees of freedom, continuum limit, free field quantization of non relativistic field.

- **UNIT II:** Relativistic free fields – quantization of scalar and Dirac fields, creation and annihilation operators, commutation relations, Fock space representation.

- **UNIT III:** Quantization of photon field, Lorentz gauge and Coulomb gauge, Gupta-Bleuler formalism, quantization of massive vector field.

- **UNIT IV:** Interaction picture, S matrix and its expansion, Wick's theorem, 2nd and higher order process.

- **UNIT V:** Feynman rules and Feynman diagrams, Feynman rules in QED, amplitude, cross section and decay rate.

- **Reference Books:**

- 1. S J Chang, Introduction to Quantum Field Theory, World Scientific, 2001.
- 2. Greiner & Reinhardt, Field Quantization, Springer, 2009.

- 3. Greiner & Schafer, Quantum Electrodynamics, 2009.
- 4. A Lahiri & P B Pal, A first book on Quantum Field Theory, Narosa, 2007.
- 5. L H Ryder, Quantum Field Theory, Academic Publisher
- 6. L I Schiff, Quantum Mechanics,
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• **Course: PHY304D: NON-LINEAR OPTICS AND LASER SPECTROSCOPY-I**

• **Marks: 100 (Internal Assessment 30; Final: 70) Credit: 6**

- (All units carry equal marks of 14. Two questions of equal marks will be set from each unit. Students require to answer one question from each unit.)
- UNIT I: Non linear response: graphical representation, physical observation of non-linearity. Non-linear susceptibility: Basic relations, Properties, Models (illustration of non-linearity)- Anharmonic Oscillator and free electron gas. Quantum theory of Non-linear Susceptibility: Calculation of susceptibilities using Schrodinger Equation.
- UNIT II: Wave equations for non-linear medium, Coupled Wave Equation, Manley- Rowe relations. Second harmonic generation, phase matching and methods. Sum- and difference frequency generation, parametric amplification and oscillations, OPO- tuning and bandwidth.
- UNIT III: Intensity dependent refractive index, Mechanics of  $\chi_3$ , Tensor nature of  $\chi_3$ . Processes resulting from intensity dependent refractive index : Self and Cross Phase Modulation, Temporal Soliton, Self Focusing, Four Wave Mixing ,Optical Bistability and Switching.
- UNIT IV: Linear and Quadratic electro-optic effects – theory and application, Optical rectification, Magneto optic (Faraday) and acousto –Optic (Raman-Nath) effect -theory and application. Introduction to Photo-refractive effect.
- UNIT V: Non-Linear optics in two level approximations: Density matrix equation of motion, closed and open system, Response to monochromatic steady state field and determination of susceptibility.
- Optical Bloch equation, Rabi solution of Schrodinger equation. Idea of optical wave mixing in two level systems.

• **Reference Books:**

- 1. R.W. Boyd, Non-Linear Optics, Elsevier
- 2. Y.R. Shen, Principles of Non-linear Optics.
- 3. N. Bloembergen, Non-linear Optics, World scientific.
- 4. E.G. Sauter, Non-linear Optics, Wiley
- 5. G.D. Baruah, Essentials of Non-linear Optics and Lasers, Pragati Prakashan.
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• **Course: PHY305A: LABORATORY ON ASTROPHYSICS-I**

• **Marks: 100 (Internal Assessment 30; Final: 70) Credit: 6**

- 1. Calibration of plate scale of a given astronomical telescope
- 2. Determination of diameter of moon by transit
- 3. Determination of diameter of sun by transit
- 4. Calibration of a photometer for astronomical measurement
- 5. Determination of the width of lunar craters and Maria
- 6. Recording of the number of sunspots and study of its variation
- 7. Determination of the time period and angular velocity of spin motion of sun (from Sun spot studies)

- 8. Determination of photospheric temperature of sun from Planck's law
- 9. Determination of solar constants
- 10. Determination of intensity of solar Fraunhofer lines
- 11. Determination of orbital periods of satellite of Jupiter
- 12. Determination of angular diameter of Saturn Ring
- 13. Application of Image Processing Software(IRAF/Epoch 2002) to determine magnitudes of different stars in a star field.
- 14. Application of image processing software (IRAF/Epoch 2002) to determine angular separations of different stars in a star field.
- This list is tentative, subject to the availability of equipments and other relevant considerations.
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• **Course: PHY305B: LABORATORY ON CONDENSED MATTER PHYSICS-I**

• **Marks: 100 (Internal Assessment 30; Final: 70) Credit: 6**

- 1. To measure the resistivity of a given material by Four Probe Research model.
- 2. Determination of Lande g factor by Electron Spin Resonance (ESR).
- 3. Study the temperature dependence of Hall coefficient of a given semiconducting material.
- 4. Determination of the Curie temperature of a Ferroelectric substance.
- 5. To study Magnetoresistance of a semiconductor.
- 6. Determination of Dielectric constant of a given material using LCR.
- 7. Measurement of Susceptibility of a liquid or a solution by Quick's method.
- 8. To draw the Hysteresis loop and determination of Coercivity, Saturation Magnetization and Retentivity of the given sample by Hysteresis Loop Tracer and CRO.
- 9. Determination of Dispersion curve for the mono-atomic lattice and di-atomic lattice by lattice dynamic kit. Draw the curve between frequencies versus phase angle.
- 10. i. To determine the reverse saturation current  $I_0$  and material constant  $\eta$  at room temperature.
- ii. To determine the Band gap ( $E_g$ ) and hence calculate the wavelength of light emitted by the LED.
- iii. To study the variation of LED resistance with temperature.
- iv. To show the efficiency of an LED decreases with increase of temperature.
- 11. Determination of Lattice parameters by Powder method.
- 12. Study on Thermoluminescence of Alkali Halide crystal.
- This list is tentative, subject to the availability of equipments and other relevant consideration.
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• **Course : PHY305C: LABORATORY ON ADVANCED QUANTUM FIELD THEORY I**

• **Marks: 100 (Internal Assessment 30; Final: 70) Credit: 6**

- List of problems to be solved using pen & paper and/or computational packages like Mathematica or using programming languages like FORTRAN.
- 1. The Lagrangian density of a spinless Schrodinger field  $\psi$  is given by

- (a) Find the equations of motion.
- (b) Express the free fields  $\psi_-$  and  $\psi_+$  in terms of creation and annihilation operators and find the commutation relations between them.
- 2. The Dirac spinor in terms of two Weyl spinors  $\phi$  and  $\chi$  is of the form
- (a) Show that the Majorana spinor equals
- (b) Obtain the anti commutation relations for the creation and annihilation operators for Majorana spinors.
- (c) Write the QED Lagrangian density using Majorana spinors.
- 3. Two perfectly conducting square plates of side  $L$  are placed at  $z = 0$  and  $z = a$ .
- (a) Find the electromagnetic potential inside this capacitor.
- (b) Quantize the electromagnetic field using canonical quantization.
- (c) Find the Hamiltonian and obtain the vacuum energy.
- 4. Find the differential cross section for the scattering of an electron in the external potential for a theory which is the same as QED except the fact that the vertex is replaced by  $\gamma_5$ . The initial electron is moving along  $z$  – axis.
- 5. Consider the theory of interaction of a spinor and scalar field: Calculate the cross section for the scattering of two fermions in the lowest order.
- NB: The list of problems may be modified depending on course requirements.
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• **Course: PHY 305(D): LABORATORY ON NON-LINEAR OPTICS AND LASERS**

• **Marks: 100 (Internal Assessment 30; Final: 70) Credit: 6**

- 1. Study of laser characteristics: temporal and spatial coherence, polarization, intensity distribution.
- 2. Experiments with fibre optics.
- 3. Experiments on electro-optic, magneto-optic and acousto-optic effects.
- 4. Experiments on Holography: recording and reconstruction.
- 5. Non –linear characterisation: determination of  $n_2$  and  $\chi^{(3)}$ .
- 6. Study of harmonic generation, laser Raman spectra.
- NB: The list of problems may be modified depending on course requirements.
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• **Fourth Semester**

• **Course: PHY401: ATOMIC AND LASER PHYSICS**

• **Marks: 100 (Internal Assessment 30; Final: 70) Credit: 6**

- (All units carry equal marks of 14. Two questions of equal marks will be set from each unit. Students require to answer one question from each unit.)
- UNIT I: Review of atomic models and concepts, Hydrogen spectrum from the Bohr and Bohr- Sommerfeld theories, Variation of the Rydberg constant, Unquantized states and continuous spectra, Larmor's precession, Space quantization, Electron spin, Stern-Gerlach experiment, Vector atom model. UNIT II: Hydrogen fine structure, Relativistic correction, Spin-Orbit interaction, Lamb shift, Hyperfine structure, Zeeman and Back-Goudsmit effects in hyperfine structure, Breadth of spectral lines.

- UNIT III: LS and JJ coupling schemes, Derivation of spectral terms under these schemes, Lande Interval rule, Normal and inverted multiplets, Spectra of alkali and alkaline earth elements, Selection and intensity rules, Oscillator strength.
- UNIT IV: Hartree's SCF method, X-ray spectra, Zeeman effect (normal and anomalous), Lande formula, Paschen-Back effect, Stark effect.
- UNIT V: Lasers: Einstein's coefficients, Requisites for producing laser light, Laser rate equations, Optical resonators, He-Ne laser, Solid state laser, Gas lasers, Free electron laser, Semi conductor lasers, Laser applications.
- **Text Books:**
  - 1. H. E. White, Introduction to Atomic Spectra, McGraw-Hill Book Company.
  - 2. B H Bransden and C J Joachain, Physics of atoms and Molecules, Pearson Education
  - 3. A. Beiser, Concept of Modern Physics, McGraw-Hill Science
  - 4. B.P. Straughan and S. Walker, Spectroscopy Volume I, John Wiley & Sons, Inc., New York.
  - 5. K. Thyagarajan and A. K. Ghatak, Lasers: Theory and Application, Plenum Press, New York and London.
- **Reference Books:**
  - 1. H. G. Kuhn, Atomic Spectra.
  - 2. G. Herzberg, Atomic Spectra and Atomic Structure.
  - 3. O. Svelto, Principles of Lasers.
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• **Course: PHY402: NUCLEAR AND PARTICLE PHYSICS**

• **Marks: 100 (Internal Assessment 30; Final: 70) Credit: 6**

- (All units carry equal marks of 14. Two questions of equal marks will be set from each unit. Students require to answer one question from each unit.)
- UNIT I: Nuclear size and distribution of nucleons. Nuclear angular momentum and magnetic moment. Nuclear force: saturation property, exchange character, spin dependence, charge independence and velocity dependence. Deuteron size, binding energy and wave function. S and D states of deuteron, tensor force. Nucleon-nucleon scattering.
- UNIT II: Fermi gas model. Liquid drop model, semi-empirical mass formula, nuclear fission & fusion, Shell Model: Single particle model with square well, harmonic oscillator and spin-orbit potentials. Collective model.
- UNIT III: Nuclear reaction & decay: Direct and compound reactions. Electromagnetic decays, selection rule. Fermi's theory of  $\beta$ -decay, Kurie plot, parity violation, Wu's experiment, 2-component theory of neutrinos, neutrino helicity, concepts of neutrino mass and oscillation (solar and atmospheric neutrino problems), Majorana neutrino. Reaction and scattering cross-section. Rutherford and Mott cross-sections.
- UNIT IV: Elementary particles – classification, quantum numbers, conservation laws, CPT invariance. Muon: production, decay and interaction with matter.
- Quark hypothesis, quantum number. Quark structures of mesons and baryons. Quantum chromodynamics,
- Gluon distribution, strong coupling constant, asymptotic freedom.
- Charged leptons and neutrinos, violation of quantum numbers in weak interactions (hadronic decays, semileptonic
- and leptonic processes) and electromagnetic interactions,  $W^\pm$  and  $Z^0$  bosons. Overview of the Standard Model.



- UNIT V: Synchrotron. Modern colliders. Interaction of heavy charged particles, stopping power, Bethe formula. Energy loss characteristics, Bragg curve, energy straggling. Particle range, range straggling. Radiation exposure, absorbed dose.
- Semiconductor radiation detector, pulse formation, leakage current. Junction properties, reverse biasing.
- Germanium and silicon solid state detectors.
- Data acquisition technique. Single channel and multi channel analysers.

• **Reference Books:**

- 1. R R Roy and B P Nigam, Nuclear Physics, New Age International
- 2. H S Hans, Nuclear Physics – Experimental and Theoretical,
- 3. B L Cohen, Concepts of Nuclear Physics, Tata McGraw Hill
- 4. P H Perkins, Introduction to High Energy Physics, Addison-Wesley
- 5. F Halzen and A D Martin, Quarks and Leptons, John Wiley and Sons
- 6. S N Ghosal, Nuclear Physics, S Chand and Company
- 7. D C Tayal ,Nuclear Physics
- 8. B Povh, K Rith, C Scholz and F Zetsche, Particles and Nuclei, Springer
- 9. A Das and T Ferbel, Introduction to Nuclear and Particle Physics, World Scientific
- 10. John Lilley, Nuclear Physics – Principles and Application,
- 11. G F Knoll, Radiation Detection and Measurement, Wiley-India.
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• **Course: PHY 403: MOLECULAR SPECTROSCOPY**

• **Marks: 100 (Internal Assessment 30; Final: 70) Credit: 6**

- (All units carry equal marks of 14. Two questions of equal marks will be set from each unit. Students require to answer one question from each unit.)
- UNIT I: Molecular Formation and Structure: Nature of bonding in Molecules, Molecular orbital and valence bond theories, LCAO treatment of  $H_2^+$  &  $H_2$  molecules. Bonding and anti-bonding orbitals, Bond order, Correlation diagram, Molecular orbital picture of some homo and heteronuclear diatomic molecules.
- UNIT II: Spectra: Born-Oppenheimer approximation, Origin of molecular spectra, Fluorescence and phosphorescence, Rotational Spectral (Rigid and non-rigid rotator approximations), Rotational spectra of Polyatomic molecules, Isotopic effect on rotational spectra.
- UNIT III: IR Spectroscopy: Vibrational spectra (Harmonic and anharmonic approximations), Isotopic effect, Rotational-Vibrational spectra, Raman spectroscopy.
- UNIT IV: UV Spectroscopy: Electronic spectra in emission and absorption, Vibrational and rotational structures of electronic bands, Frank-Condon Principle and its applications. Isotopic effect on electronic spectra, Molecular electronic states.
- UNIT V: Electronic structure methods: Hartree-Fock (HF) method, Electron correlation, Post HF methods (concepts), Density functional theory (DFT), Hohenburg-Kohn theorem, Kohn-Sham idea, Elementary idea of density functionals.

• **Text Books:**

- 1. B. H. Bransden and C. J. Joachain, Physics of Atoms and Molecules, Pearson Education
- 2. C N Banwell, Fundamentals of Molecular Spectroscopy, Tata McGraw Hill.
- 3. B. P. Straughan and S. Walker, Spectroscopy Volumes II&III, John Wiley & Sons, Inc., New York.
- 4. I N Levine, Quantum Chemistry, Prentice Hall

- **Reference Books:**

- 1. G. Herzberg, Molecular Structure and Molecular Spectra (Vol. - 1,2,3)
- 2. J.M. Hollas, High Resolution Spectroscopy .
- 3. Robert G Parr and Weitau Yang ,Density functional theory of atoms and molecules .

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- **Course: PHY 404A: ASTROPHYSICS-II**

- **Marks: 100 (Internal Assessment 30; Final: 70) Credit: 6**

- (All units carry equal marks of 14. Two questions of equal marks will be set from each unit. Students require to answer one question from each unit.)

- **UNIT I: Star High Energy Radiative Processes in Astronomy**

- Synchrotron emission for a single particle and an ensemble of particles, Energy loss and electron scattering-Compton scattering-Bremstrahlung radiation.

- **UNIT II: Galaxies**

- The Milky way Galaxy, Kinematics, Hubble classification scheme for external galaxies: spirals, elliptical, irregulars. Normal galaxies and AGNs. Quasi-stellar objects. Unified model.

- **UNIT III: General Theory of Relativity**

- Principle of Equivalence. Gravity and Geometry. Metric Tensor and its properties. Curved space time. Tensor calculus: co-variant differentiation, parallel transport, Bianchi Identities. Particle trajectories in Gravitational field. Einstein's Field equations and Stress-energy tensor, Schwarzschild metric.

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- **UNIT IV: Large scale Structure and Cosmology**

- Hubble's law, Friedman-Robertson-Walker Model, Cosmological constant. Theories of origin and evolution of Universe. Standard Cosmological model, thermodynamics of early universe, nucleo-synthesis, Microwave Background radiation, Elementary ideas on structure formations, age of Universe.

- **Unit V: Astroparticle Physics**

- Dark Matter and Dark Energy, Probable compositions, Experimental detection. Nature of Matter and Interaction at High Energies: Neutrino mass, Proton Decay, Neutrino mixing. High Energy phenomena: Charged Particles, Gamma Rays, Gamma ray bursts, Neutrino Astronomy, Gravitational Waves.

- **Text Books:**

- 1. K S Krishnaswamy, Astrophysics, CUP.
- 2. Baidyanath Basu, Astrophysics, Prentice Hall.
- 3. K D Abhaynakar, Astrophysics, Orient Longman.
- 4. Melean,Electronic Imaging Astronomy, Wiley.
- 5. Landau and Lifshitz, The classical theory of Fields Vol-2, Butterworth Heinemann
- 6. J V Narlikar, Introduction to cosmology, CUP.
- 7. J V Narlikar, General relativity and cosmology, McMillan.
- 8. V B Bhatia, Text Book on Astronomy and Astrophysics with Elements of cosmology, Narosa.

- **Reference Books:**

- 1. Smith,Observational Astrophysics, CUP.
- 2. F Shu, Physical Universe, OUP.
- 3. Allen, Astrophysical quantities, Willey.
- 4. K R Lang, Astrophysical quantities, Springer Verlag.

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- **Course: PHY404B: CONDENSED MATTER PHYSICS – II**
- **Marks: 100 (Internal Assessment 30; Final: 70) Credit: 6**
- (All units carry equal marks of 14. Two questions of equal marks will be set from each unit. Students require to answer one question from each unit.)
- **UNIT I: Transport Properties**
- Boltzmann Transport equation, Electrical conductivity, Thermal conductivity of metals, Variation of Electrical and thermal conductivity with temperature, Thermoelectric Power, Wiedmann –Franz law, Hall effect, Viscosity from Boltzmann equation, Free electron in a magnetic field, Magnetoresistance.
- **UNIT II: Band Theory of Solids**
- Electronic Energy bands in solid, Tight-binding method, Applications to simple cubic crystals, Basics of Density Functional Theory (DFT), Hohenberg Kohn theorem, Kohn Sham method, Exchange correlation, Concepts of Plane wave method, Augmented plane wave (APW) method, Linearized augmented plane wave (LAPW) method.
- **UNIT III: Dielectrics**
- Dielectric polarization, dielectric constant and its measurement, Cole-Cole plot, polarizability, frequency dependence of dipolar polarizability, Debye's equations, ionic polarizability, classical theory of electronic polarizability, ferroelectricity, polarization catastrophe in ferroelectrics, theory of ferroelectricity.
- **UNIT IV: Magnetism**
- Classifications of Magnetic materials, Diamagnetism and Paramagnetism, Classical and Quantum Theory of Diamagnetism, Origin of permanent magnetic moment in Paramagnetism, Langevin Theory and Quantum Theory of Paramagnetism, Paramagnetic Cooling,
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- **UNIT V: Optical properties of solids**
- Classical model of optical conductivity (Drude), derivation of plasma frequency. Optical refractive index and relative dielectric constant. Traps, excitons: Frenkel excitons, weakly bound (Mott-Wannier) excitons, color centres. Luminescence: kinds of luminescence, Excitation and emission. Decay mechanism. Concentration dependence of luminescence efficiency.
- **Text Books:**
- 1. N.W. Ashcroft & N.D. Mermin, Solid State Physics, Harcourt Asia, 2001. 2 Quantum theory of solids, C. Kittel, Academic.
- 2. C. Kittel, Quantum theory of solids, Academic Press
- 3. Charles Kittel, Introduction to Solid State Physics. 7th ed. Wiley.
- 4. M. S. Rogalski and Stuart B. Palmer, Solid State Physics, Gordon and Breach, 2001.
- 5. M. A. Wahab, Solid State Physics, Narosa, 2006.
- 6. H.Ibachs & H. Luths, Solid State Physics, Springer, 1996.
- 7. W.A.Harrison, Elementary electronic structure, World Scientific, 2004
- 8. V. Pagonis, G. Kitis, C. Furetta, Numerical and Practical Exercises in Thermoluminescence, Springer, 2006.
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- **Course: PHY404C: ADVANCED QUANTUM FIELD THEORY-II**
- **Marks: 100 (Internal Assessment 30; Final: 70) Credit: 6**
- (All units carry equal marks of 14. Two questions of equal marks will be set from each unit. Students require to answer one question from each unit.)

- UNIT I: Quantum Electrodynamics, calculation of cross section in Coulomb scattering, Moller ( $e^- - e^-$ ) scattering, Bhabha ( $e^- - e^+$ ) scattering.
- UNIT II: Photon – electron interactions, Photoelectric effect – Klein-Nishina formula, electron – positron annihilation. Calculation of cross section of the processes  $e^- e^+ \rightarrow \mu^- \mu^+$ ,  $e^- \mu^- \rightarrow e^- \mu^-$ .
- UNIT III: Higher order processes, vacuum polarization, self energy of the electron, Lamb shift, vertex corrections.
- UNIT IV: Electron proton scattering – elastic case, electromagnetic form factors and their interpretation, deep inelastic scattering, Bjorken scaling and parton model, scaling violation, QCD evolution.
- UNIT V: Discrete symmetry transformations, C, P, T transformations for scalar, Dirac and electromagnetic fields, invariance of S matrix and CPT theorem.

• **Reference Books:**

- 1. J D Bjorken & S D Drell, Relativistic Quantum Mechanics, McGraw Hill.
- 2. J D Bjorken & S D Drell, Relativistic Quantum Fields, McGraw Hill.
- 3. J J Sakurai, Advanced Quantum Mechanics, Pearson.
- 4. D J Griffiths, Introduction to Particle Physics, John Wiley.
- 5. F Halzen & A D Martin, Quarks and Leptons, John Wiley.
- 6. D H Perkins, Introduction to High Energy Physics, Addison-Wesley.
- 7. T P Cheng & L F Li, Gauge theory of elementary particle physics, Oxford.

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• **Course: PHY404 D: NON-LINEAR OPTICS AND LASER SPECTROSCOPY-II**

• **Marks: 100 (Internal Assessment 30; Final: 70) Credit: 6**

- (All units carry equal marks of 14. Two questions of equal marks will be set from each unit. Students require to answer one question from each unit.)
- UNIT I: Resonating cavity- gain, loss and stability, Concepts of mode – longitudinal and transverse. Qswitching, Cavity dumping, Mode locking of lasers. Techniques of generation of femto- and high- power ultra short pulses. Single and multimode lasers, Advantages of laser in Spectroscopy.
- UNIT II: Non-Linear absorption, Saturation of homogeneous and inhomogeneous line profiles, Hole burning, Lamb dip. Experimental techniques of saturation spectroscopy and applications. Basic principle of Polarization Spectroscopy. Profiles, magnitude of polarization signal. Sensitivity and advantage of polarization spectroscopy.
- UNIT III: Two photon and multi photon absorption- theory, Doppler free multiphoton absorption spectroscopy- theory, techniques and experimental methods. Coherent Spectroscopy: Level crossing spectroscopy- models and experimental method. Quantum Beat Spectroscopy- basic principles and experimental techniques, molecular quantum beat spectroscopy. Photon echo.
- UNIT IV: Non-linear Raman Spectroscopy: Basics of Raman Spectroscopy, Stimulated Raman scattering, Quantum theory, coupled wave description of SRS, Inverse Raman Effect, Coherent antistokes Raman Spectroscopy, Hyper Raman Effect. CARS and SRS as techniques of Raman Spectroscopy.
- UNIT V: Developments in laser spectroscopy: Optical cooling- photon recoil, recoil shift measurements, Optical cooling by photon recoil, Optical Mollasses, optical trapping of atoms different arrangements of trapping. Optical levitation.

• **Reference Books:**

- 1. R.W. Boyd, Non-Linear Optics, Elsevier
- 2. Y.R. Shen, Principles of Non-linear Optics,
- 3. Wolfgang Demtroder, Laser Spectroscopy Vol. 2, Springer

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- **Course: PHY 405A, PHY 405B, PHY405C, PHY405D**
- **Marks: 100 (Internal Assessment 30; Final: 70) Credit: 6**
- **Project Work**
- A project of 100 marks to be done on topics in/related to
  - Project on Astrophysics
  - Project on Condensed Matter Physics
  - Project on Advanced Quantum Field Theory
  - Project on Non-Linear Optics and Laser Spectroscopy
- under the supervision of one of the course teachers.

**DEPARTMENT OF ASSAMESE  
ASSAM UNIVERSITY: DIPHU CAMPUS  
Fourth Semester**

**Paper IV  
Course No. AS- 404: 1 (*Introduction to Translation Studies*)  
Optional  
Marks 100 (Theory 75+ Internal 25)**

**Unit I:** Introduction to Translation Studies: Pragmatic, Aspect of Translation.

**Unit II:** Types of Translation, Objective of Translation, Method of Translation, Translation and Culture, Translation and Language and Style.

**Unit III:** Literary and Non-Literary Theory: Translation of Creative Literature, Translation of Non-Literary materials. Translation & Terminology, Difference between Literary and Non-Literary Translation.

**Unit IV:** Practical Problems & Evolution of Literary Translation: Problems Pertaining to the Source text, Problems Pertaining to the Process, Problems Pertaining to the target Text, Evaluation on the basis of Source text, Evaluation on the basis of target readers, Literature and Culture

**Unit V:** Study & Analysis of Translated Works : English to Assamese, Hindi to Assamese, Bengali to Assamese, specially from Pamphlets, Brochures, Leaflets, article and Advertisement.

**Recommended Text Books:**

The Theory and Practice of Translation:	Nida F.A. & Taber
Anubad Parikrama:	Prafulla Kataki
Anubad Tatva aaru Prayog:	Nirajana Mahanta Bezboruah

**Reference Books:**

Translation Studies:	Susan Bassnen
Introduction to Translation Studies, Theory And Application:	Jeremy Monday
A Textbook of Translation:	P. Mewmark
Translation and Understanding:	Sukanta Choudhary
Translation across Culture:	Ed. By Kethrina Reiss
Problems of Translation:	H. Lakhan
A linguistics Theory of Translation:	J.C. Catford
Anubador Kotha:	Abul Leis
Tulanamulak Sahitya aaru Anubador Parichay:	Nirajana Mahanta Bezboruah
Anubadkola:	Nirajana Mahanta BezBaruah

**DEPARTMENT OF COMPUTER SCIENCE**  
**ASSAM UNIVERSITY, SILCHAR**

**MCS 101: Communicative English**

As prescribed in Assam University undergraduate courses in the P.G Department Text/References:  
 As prescribed in Assam University undergraduate courses in the P.G Department

**MCS 105: Laboratory – 1**

(a) Digital Electronics (b) Electronic Devices and Circuits Part B: (For laboratory examination – Minimum of 16 experiments)

1. PN Junction diode characteristics A. Forward bias B. Reverse bias.
2. Zener diode characteristics 3. Transistor CB characteristics (Input and Output)
4. Transistor CE characteristics (Input and Output)
5. Rectifier without filters (Full wave & Half wave)
6. Rectifier with filters (Full wave & Half wave)
7. FET characteristics
8. Measurement of h parameters of transistor in CB, CE, CC configurations
9. CE Amplifier
10. CC Amplifier (Emitter Follower).
11. Single stage R-C coupled Amplifier.
12. FET amplifier (Common Source)
13. Wien Bridge Oscillator
14. RC Phase Shift Oscillator
15. Feed back amplifier (Current Series).
16. Feed back amplifier (Voltage Series).
17. Hartley Oscillator.
18. Colpitts Oscillator.
19. SCR characteristics.

Part C: Equipment required for Laboratories:

1. Regulated Power supplies (RPS) - 0-30v
2. CROs - 0-20M Hz.
3. Function Generators - 0-1 M Hz.
4. Multimeters
5. Decade Resistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Micro Ammeters (Analog or Digital) - 0-20  $\mu$ A, 0-50 $\mu$ A, 0-100 $\mu$ A, 0-200 $\mu$ A
8. Voltmeters (Analog or Digital) - 0-50V, 0-100V, 0-250V
9. Electronic Components - Resistors, Capacitors, BJTs, LCDs, SCRs, UJTs, FETs, LEDs, MOSFETs, diodes (ge & sitype), transistors (nnp & pnp type)

**MCS 205: Laboratory – 2**

- (a) Programming in C
- (b) Scientific Computation

(a) Practical on Programming with C Experiments should include but not limited to:

1. Write a program to produce ASCII equivalent of given number.
2. Write a program to find divisor or factorial of a given number.
3. Write a program to evaluate the following algebraic expressions after reading necessary values from the user. a)  $(ax+b)/(ax-b)$  b)  $2.5 \log x - \cos 30^\circ + x^2 - y^2 + \sqrt{2xy}$  c)  $(x^5 + 10x^4 + 8x^3 + 4x^2)$
4. Write a program to find sum of a geometric series.
5. Write a program to cipher a string.
6. Write a program to check whether a given string follows English capitalization rules.
7. Write a program to find sum of the following series  $1 + \frac{1}{2} + \frac{1}{3} + \dots + \frac{1}{20}$ .
8. Write a program to search whether a given substring exist in an input string or not and then delete this string from input string.
9. Write a recursive program for tower of Hanoi problem.
10. The Fibonacci sequence of numbers is 1, 1, 2, 3, 5, 8,..... Based on the recurrence relation  $F(n)=F(n-1)+F(n-2)$  for  $n>2$ , write a recursive program to print the first m Fibonacci number.
11. Write a menu driven program for matrices to do the following operation depending on whether the operation requires one or two matrices. a) Addition of two matrices b) Subtraction of two matrices c) Finding upper and lower triangular matrices d) Trace of a matrix e) Transpose of a matrix f) Check of matrix symmetry g) Product of two matrices.
12. Write a program that takes two operands and one operator from the user perform the operation and then print the answer.
13. Write a program to print the following outputs: 1 1 2 2 2 2 3 3 3 3 3 3 4 4 4 4 4 4 5 5 5 5 5 5 5 5 5
14. Write functions to add, subtract, multiply and divide two complex numbers  $(x+iy)$  and  $(a+ib)$  Also write the main program.
15. Write a menu driven program for searching an sorting with following options:- a) Searching: (1) Linear searching (2) Binary searching b) Sorting: (1) Insertion sort (2) Selection sort
16. Write a program to copy one file to other, use command line arguments.
17. Write a program to mask some bit of a number (using bit operations).
18. An array of record contains information of managers and workers of a company. Print all the data of managers and workers in separate files.

(b) Practical on Scientific Computation: Problems related to scientific computation should be solved by using the high level programming language C (preferably on Unix/Linux/Solaris operating systems on a network). Following are some sample laboratory programming assignments but the assignments should not be limited to these only:

1. Algebraic Equation: Bisection, Secant, Regular-falsi, Newton Raphson
2. Interpolation: Newton forward & backward, Lagrange

### **MCS 305: Laboratory – 3**

(a) Data & File Structure

(b) Microprocessor and Assembly Language Programming

(a) Practical on Data & File Structure:

Problems related to Data and File Structure should be solved by using the high level programming language C (preferably on Unix/Linux/Solaris operating systems environment on a network). Following are some sample laboratory programming assignments but the assignments should not be limited to these only:

1. Stacks and Queues: adding, deleting elements Circular Queue: Adding & deleting elements



2. Merging Problem: Evaluation of expressions operations on Multiple stacks & queues:
  3. Implementation of linked lists: inserting, deleting, and inverting linked list. Implementation of stacks & queues using linked lists
  4. Polynomial addition, Polynomial multiplication
  5. Sparse Matrices: Multiplication, addition.
  6. Recursive and Non-recursive traversal of Trees
  7. Threaded binary tree traversal. AVL tree implementation.
  8. Application of Trees, Application of sorting and searching algorithms
  9. Hash tables implementation: searching, inserting and deleting, searching & sorting techniques.
- (b) Microprocessor and Assembly Language Programming

#### **MCS 405: Laboratory – 4**

- (a) Data Base Management Systems
- (b) Programming with C++ and Computer Graphics
- (a) Practical on Database Management System:

Database Management System design and implementation problems should form the laboratory assignments for this course. Students should solve assignments by using the standard principles and practices of relational data base design and then develop the appropriate schema for machine implementation on My SQL/SQL/SQLServer/PLSQL/Oracle etc. in Windows/Unix/Linux/Solaris operating systems environment on a network. Following are some samples for laboratory programming assignments but the assignments should not be limited to these only. These programming assignments must be preceded by corresponding database design assignments.

#### **Structured Query Language**

##### **1. Creating Database**

Creating a Database, Creating a Table, Specifying Relational algebraic constructs, Specifying Constraints, Creating Indexes

##### **2. Table and Record Handling**

INSERT statement, Using SELECT and INSERT together, DELETE, UPDATE, TRUNCATE statements, DROP, ALTER statements

##### **3. Retrieving Data from a Database**

The SELECT statement, Using the WHERE clause, Using Logical Operators in the WHERE clause, Using IN, BETWEEN, LIKE, ORDER BY, GROUP BY and HAVING clause, Using Aggregate Functions, Combining Tables Using JOINS, Sub queries

##### **4. Database Management**

Creating Views, Creating Column Aliases, Creating Database Users, Using GRANT and REVOKE, Cursors in Oracle PL / SQL, Writing Oracle PL / SQL Stored Procedures

(b) Practical on Object Oriented Programming with C++: Programming problems should be solved by using the high level and Object Oriented Programming language C++ (preferably on Unix/Linux/Solaris operating systems environment on a network). Following are some areas of C++ for laboratory programming assignments but the assignments should not be limited to these only:

1. Class, constructor, overloading, inheritance, overriding
2. Wrapper class, vectors, arrays
3. Developing interfaces- multiple inheritance, extending interfaces
4. Creating and accessing packages
5. Multithreaded programming, handling errors and exceptions, applet programming and graphics programming

**MCS 505: Laboratory – 5**

(a) Programming in Java

(b) Operating System and Architecture

(a) Practical on Programming in Java Programming problems should be solved by using the high level and Object Oriented Programming language JAVA (preferably on Unix/Linux/Solaris operating systems environment on a network). Following are some areas of JAVA for laboratory programming assignments but the assignments should not be limited to these only.

1. Class, constructor, overloading, inheritance, Method Overriding
2. Garbage Collection, vectors, arrays
3. Developing interfaces- Interfaces, Implementing Interfaces, Interface and Abstract Classes,
4. Multiple and multilevel inheritance, extending interfaces
5. Creating and accessing packages,
6. Multithreaded programming, Exception Handling, handling of errors
7. Applet programming, building user interface with AWT, Swing-based GUI, Layouts and Layout Manager, Container and graphics programming

(b) Practical on Operating Systems and Architecture (with Unix/Linux/Solaris) Problems related to Operating Systems and Architecture (with Unix/Linux/Solaris) should be solved by using Programming languages C/C++/ JAVA (preferably on Unix/Linux/Solaris operating systems environment on a network). Further shell programming in UNIX/LINUX should be performed. Following are some areas of Operating Systems and Architecture (with Unix/Linux/Solaris) for laboratory programming assignments/experiments but the assignments should not be limited to these only:

1. Shell Programming
2. Packet Monitoring software (tcpdump, snort, ethereal)
3. Trace route, Ping, Finger, Nmap
4. Server configuration (FTP, SMTP, DNS)
5. NFS Configuration
6. Firewall Configuration using iptables/ipchains (Linux only)

**MCS 705: Laboratory – 7**

(a) Practical on Design and Analysis of Computer Algorithms

(b) Practical on Artificial Intelligence (a) Practical on Design and Analysis of Computer Algorithms Problems related to Design and Analysis of Computer Algorithms should be solved by using the Programming languages C/C++/JAVA (preferably on Unix/Linux/Solaris operating systems environment on a network). Following are some areas of Design and Analysis of Computer Algorithms for laboratory programming assignments but the assignments should not be limited to these only.

1. Stack and queues, tree, heap and heap sort, graphs and hashing.
2. Divide and conquer method: binary search, merge sort, quick sort, matrix multiplication, minimum spanning tree.
3. Dynamic programming: multistage graphs, all pair shortest paths, optimal binary search trees/I knapsack, travelling sales persons problem, flow shop scheduling.
4. Search and traversal techniques: AND/OR graphs, game trees, bi connected components and depth search.

5. Backtracking: Hamilton cycles, the fast Fourier transform, NP-HARD and NP complete problems.

(b) Practical on Artificial Intelligence Problems related to Artificial Intelligence should be solved by using the Programming languages PROLOG/LISP. Following are some areas of Artificial Intelligence for laboratory programming assignments but the assignments should not be limited to these only:

1. State Space Search, Production System, Control Strategies

2. Search Technique: Depth-First and Breadth-First Search, First Search, A\*, AO\* algorithms, Adding Heuristics, Hill-Climbing, Constraint Satisfaction, Game Playing.

3. Knowledge Representation: Predicate and Propositional Logic, Resolution in Predicate & Propositional Logic, Deduction and theorem Proving, Question Answering, Knowledge representation, Semantic networks, Frames and scripts.

4. Expert System, Design of Rule-Based Expert System, Knowledge Engineering, Conceptual models and Knowledge acquisition. Note: Implementation in LISP and/or PROLOG.

### **MCS 805: Laboratory – 8**

(a) Principles of Compiler Design

(b) Digital Image Processing and Modeling and Simulation

(a) Practical on Compiler Design Problems related to Compiler Design should be solved by using the Programming languages C/C++/JAVA as well as various tools for Compiler Construction and Design like LEX, YACC, BYSON etc. Following are some areas of Compiler Design for laboratory programming assignments but the assignments should not be limited to these only:

1. Construction of a lexical analyzer and LL(1) parser for a subset of FORTRAN/PASCAL/C/C++ (to be done without using any generator).

2. Construction of a lexical analyzer and LALR(1)/LR(1) parser for a subset of C/C++ (generators like LEX, YACC, BYSON to be used)

3. A construction of a translator from a high level to an intermediate language which is also a very simple subset of C (The correctness of this translation may be checked by compiling this intermediate program by a standard compiler)

4. Construction of a target code generator from the above intermediate language program to the assembly language of a suitable target machine (e. g. Intel 8088). Addition of rudimentary code optimization (like peep-hole)/jump optimization

5. Register optimization to the generated compiler. Experiments with incorporation of debugging features

(b) Practical on Modeling & Simulation and Digital Image Processing

Problems related to Modeling & Simulation should be solved by using the Programming languages C/C++/JAVA as well as various tools for Modeling & Simulation. Following are some areas of Modeling & Simulation for laboratory programming assignments but the assignments should not be limited to these only:

Discrete and continuous simulation procedures, Special purpose simulation languages (use of one language depending on the availability in detail) versus conventional general purpose programming language like C/C++/JAVA in simulation and modeling of large systems

### **MCS 905: Laboratory – 9**

(a) Practical on Data Ware Housing and Data Mining

(b) Practical on Artificial Neural Network and Expert Systems

(a) Practical on Data Ware Housing and Data Mining Problems and various algorithms related to Data Ware Housing and Data Mining should be solved and implemented by using the Programming languages C/C++/JAVA/VB as well as various tools for Data Ware Housing and Data Mining.

(b) Practical on Neural Network and Expert Systems Problems related to Neural Network and Expert Systems should be solved by using the Programming languages C/C++/JAVA as well as various tools for Neural Network and Expert Systems.

### **MCS 601: System Analysis and Design**

#### **Unit I**

The system Concept: Elements of a system, types of system. Introduction to system development life cycle, Recognition of need, prototyping, Roles of system Analyst, The analyst/ user interface.

#### **Unit II**

Introduction to system analysis: determining the user's information requirements, problem definition, Background analysis, fact-finding, fact analysis. Introduction to structured analysis, the tools of structured analysis, Feasibility study; oral representation, Data analysis, Cost/ Benefit analysis, the system proposal

#### **Unit III**

Introduction to system designs: The process of design (logical and physical design), Design methodology, structured design, structured walkthrough, Major development activities, Data validation. Introduction to input design, output design, forms design. File structure, File organization, Data Base design, and the role of DBA.

#### **Unit IV**

Introduction to system testing: The Test Plan, Quality assurance, System Conversion, Post implementation review, Software maintenance. Unit V Procedure for Hardware/Software selection, Project Management and Control, Project Control, Gantt Chart, PERT and CPM, System Security.

Text Books: 1. Elias. M. Awad, System Analysis and Design, 2nd Ed., Galgotia Publication, 1997.

#### **References:**

1. Kendall and Kendall, System Analysis and Design, 8th Ed., PHI, 2008.
2. Igor Hawryszkiewicz, Introduction to System Analysis and Design, 4th Ed., PHI, 2000.

### **MCS 401: Computer Graphics**

#### **Unit I**

Development of computer graphics: basic graphics systems and standards, raster scan and random scan graphics, continual refresh and storage displays, displays processor and character generator, color display technique, frame buffer and bit operation, concept in raster graphics.

#### **Unit II**

Points, lines and curves, scan conversion, line drawing algorithm, circle and ellipse generation, polygon filling, conic section generation, antialiasing.

#### **Unit III**

Two-dimensional viewing: Basic transformations, co-ordinate systems, windowing and clipping, segments, interactive picture construction techniques, interactive input/output devices.

#### **Unit IV**

Three dimensional concepts: 3-D representation and transformation, spline curve and surfaces, fractals, quadtree and octree data structure.

#### **Unit V**

3-D viewing, algorithm for 3-D volumes, hidden lines and surface rendering, animation. Introduction to graphics packages and applications.

Texts Books/References:

1. Principles of Interactive Computer Graphics - Newman, W. Sproul, R.F., McGraw Hill, 1980
2. Fundamentals of Interactive Computer Graphics - Foley J.D., Van Dorn, Addison Wesley, 1982
3. Computer Graphics - Hearn D., Baker, PHI, 1986
4. Procedural Elements for Computer Graphics - Rogers D. F., McGraw Hill, 1986

### **MCS 403:**

#### **Data Base Management Systems**

##### **Unit I**

Data modeling for a database: records and files, abstraction and data integration, database management systems; the three levels architecture of a DBMS, components of a DBMS.

##### **Unit II**

Data models: Hierarchical, Network model, Relational; ER Diagrams, Extended ER Diagrams, Data base Schema, Keys, Relational Data base: manipulations; relational algebra.

##### **Unit III**

Relational calculus, SQL Queries, Relational database design.

Unit IV Normalization and Functional dependencies, finding keys, decomposition computing closures of a FD's Query processing: general strategies for query processing and query optimization, query processor,

##### **Unit V**

Transactions and Transaction Processing, ACID Properties, Introduction to Concurrency and Serialization, Concepts of Security and Recovery.

##### **Text Books/References:**

1. Fundamentals of Database System - R. Elmasri & S. Navathe, Pearson Education, 5th Edition.
2. Data Base Management System - Henry F. Korth & Abraham Silberschats, McGraw hills, 1991.
3. An introduction to data base management system vol I & II - Date C.J., Addison Wesley, 1981, 1983
4. Principles of Database Systems - Ullman J.D., Galgotia Publications Pvt. Ltd., 3rd Edition, 2008.

### **MCS 904: Elective – III (d)**

#### **Operations Research**

##### **Unit I**

Introduction, convexity and related results, linear programming problem, Solution by Graphical and Simplex method. Theory of simplex method, optimality condition, Duality, Fundamental Theorem of duality.

##### **Unit II**

Study of transportation Problem – Method for finding initial solutions (North-west corner method, Least cost method, Vogel's Approximation Method), Modi method for optimum solution, Assignment problems- Mathematical formulation and solutions of assignment problems, Hungarian method, Variations of Assignment problems, traveling salesman problem.

##### **Unit III**

Revised Simplex method, Sensitivity Analysis, Integer programming formulation- types of integer programming, concepts of a cutting plane, Gomory's all integer cutting plane method, Gomory's mixed integer cutting plane method, Branch and bound technique.

##### **Unit IV**

Introduction to game theory, Maximum-minimum Principle, games without saddle point, reduction to LPP, Networks Scheduling by PERT and CPM, Critical path analysis. Resource Analysis in Network Scheduling, Project cost, Time cost Optimization algorithm, Probability in PERT Analysis.

#### Unit V

Queuing Theory, Essential features of Queuing system, Operating characteristics of Queuing system, Probability Distribution in Queuing system, Classification of Queuing models, M/M/T etc. Sequencing problem: Introduction, Processing n jobs through m machines, Processing two jobs through m machines.

#### Text Books/References:

1. J. Medhi, Stochastic Process, New Age International Publisher, 1984.
2. H.M. Wagner, Principles of Operations Research, PHI, 1975.
3. H.A. Taha, Operations Research: An Introduction, PHI, 2004.
4. S. I. Gass, Linear programming: Methods and Applications, 5th Edition, Dover Publications, 2003.
5. J.K. Sharma, Operation Research: Theory and Applications, 4th Edition, Mcmillan, 2009.
6. W Feller, An introduction to Probability theory & its applications, 3rd Ed., Wiley Eastern, 1978.
7. M.R. Spiegel, Probability and Statistics, Schaum series, McGraw Hill, 2000.
8. C.W. Chrchman & EL Arnchoff : Introduction to Operation Research, Wiley and Sons, 1957.
9. E. Gillett : Introduction to Operations Research, Tata McGraw Hill, 1976.
10. D. Gross et al., Fundamentals of Queuing theory, John Wiley and Sons, 2008\

### **MCS 501:**

#### Programming in Java

#### Unit I

Introduction To Java, Basic Features, Java Virtual Machine Concepts, A Simple Java Program, Primitive Data Type and Variables, Java Keywords, Integer and Floating Point Data Type, Character and Boolean Types, Declaring and Initialization Variables, Java Operators, Expressions, control statements, Arrays.

#### Unit II

Class Fundamentals, Creating objects, Assigning object reference variables, Introducing Methods, Method overloading, Static methods, Constructors, overloading constructors, This Keyword, Using Objects as Parameters, Argument passing, Returning objects, Method Overriding, Garbage Collection, The Finalize ( ) Method, Inheritance Basics, Access Control ,Multilevel Inheritance, Abstract Classes ,Polymorphism ,Final Keyword, Package, Defining Package, CLASSPATH, Package naming, Accessibility of Packages, Using Package Members, Interfaces, Implementing Interfaces, Interface and Abstract Classes.

#### Unit III

Exception Handling, Multithreaded Programming, I/O in Java, Text Streams, Stream Tokenizer, Buffered Stream, Print Stream, Random Access File, The String Class, String Buffer Class and Methods.

#### Unit IV

Applets Programming, Building User Interface with AWT, Swing-based GUI, Layouts and Layout Manager, Container. Unit V Java Database Connectivity, Establishing a Connection, Transactions with Database.

#### Text Books:

1. Timothy Budd, An Introduction to Object Oriented Programming, 3rd Ed., Pearson Education, 2008.
2. Herbert Schildt, Java2: The Complete Reference, 5th Edition, Tata McGraw Hill, 2008.

3. Patrick Naughton and Herbert Schildt, Java2: The Complete Reference, 3rd Ed., Tata McGraw-Hill, 1999.

References:

1. D. Samanta, Object Oriented Programming with C++ and Java, PHI, 2006
2. Cay Horstmann and Gary Cornell, Core Java 2, Volume I & II (The Sun Microsystems Press Java Series) 7th Edition, 2000.
3. Harvey M. Deitel and Paul J. Deitel, Java: How to Program, 2nd Edition, Prentice Hall, 1998.

**DEPARTMENT OF ARABIC  
ASSAM UNIVERSITY: SILCHAR**

**Course No.** AR-103.

**Title:** Arabic for Communication-I.

This course is intended to give the students skills for day-to-day oral and written communication in Arabic. The prescribed text book for this course is *Al-Arabiyah fi Hayat*, Vol. II (Doh: King Saud University, Riyadh, KSA) which is of five units. Each unit of the book will form a unit of the course. The students are expected to have a thorough knowledge of the contents of *Al-Arabiyah fi Hayat*, Vol. I.

**Reading List:**

1. Mahmood Ismail Sidi et al. *Al-Arabiyah fi Hayat*, Vol. I.
2. Farid M. Yusa, *Al-Malahihah qawafil al-Lughah al-Arabiyah*.
3. David Conrad, *Arabic Literary Analysis*.
4. Ali al-Jariri & Mustafa Amin, *Al-Malahihah al-Fununi fi Al-Arabiyah al-Ashadhiyyah*, Vols. I, II and III.

**Question Paper Pattern:**

All the five units will uniformly have the following question pattern:

1. Four questions of 2.5 marks each in the pattern of the drills given in the text. Each question may preferably have 5 sub-questions of half mark each ( $4 \times 2.5 = 10$  marks).
2. One question of 4 marks from outside the text wherein the student will have to apply the language skills learned from the concerned unit of the text. The nature of this question may vary from unit to unit depending upon the content of the unit. It may, for example, be correction of sentences or a passage wherein the student will have to give up to 8 grammatical or linguistic inputs, e.g. correct use of gender, number, verbal forms etc. or giving discursive marks to a passage of considerable length ( $1 \times 4 = 4$  marks).

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Course No. AR- 203

Course title: Arabic for Communication II.

Zia Ahmed

This course is intended to equip the students with the four skills of language learning, i.e., reading, writing, listening and comprehension. It gives them a hands-on training on these four skills considering their status as non-native users of Arabic. The prescribed text book for this course is *Al-Arabiyah li-Mayan*, Vol. II, (PUBL. King Saud University, Riyadh, KSA) which is of five units. Each unit of the book will form a unit of the course.

#### Reading List

1. Fu'ad Nu'man, *Ma'aladhim (Handbook of Arabic of Arabic)*
2. David Cowan, *Modern Literary Arabic*
3. Ali al-Jariri & Mustafa Amin, *Al-Fahm al-Basit li-Madris al-Thamanyyya*, Vols. 1-4.

#### Question Paper Pattern:

All the five units will uniformly have the following question pattern:

1. Four questions of 2.5 mark each in the pattern of the drills given in the concerned unit of the text. Each question may preferably have 5 sub-questions of half mark each. (4 x 2.5 = 10 marks)
2. One question of 4 marks from outside the text wherein the student will have to apply the language skills learned from the concerned unit of the text. The nature of this question may vary from one unit to another depending upon the content of the unit. It can, for example, be construction of sentences or a passage wherein the student will have to give up to 8 grammatical or linguistic inputs, e.g. correct use of gender, number, verbal forms etc. or giving idiomatic marks to a passage of considerable length. (1 x 4 = 4 marks)

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Course No. : AR- 204

Course Title: Translation.

This course is designed to teach the students the theory and practice of translation. It will impart a hands-on training on different types of translation to and from English. Translations ranging from general to technical will be practiced in this course.

Unit I:	Theory and Principles of Translation.
Unit II:	Literary Translation.
Unit III:	Technical Translation: Science, Commerce & Economics
Unit IV:	Technical Translation: Journalism, Legal, Politics & Sports
Unit V:	Translation of Technologies from different fields.

#### Prescribed texts:

1. R.P. Anandkar, *A Handbook of Commercial Arabic*, Al-Huda Book Stall, Calicut, Kerala.
2. Abdul Hameed, *Jouranal Arabic*, Al-Huda Book Stall, Calicut, Kerala.

#### Reading List:

1. Mahmoud Amin, *Translation from English to Arabic: Methods and Principles*
2. S.A. Rahman, *Form al-Faynana*
3. Basil Hatim, *English-Arabic-Arabic-English Translation*
4. Richard Salford, *Standard Arabic*
5. Peter Newmark, *Approaches to Translation*
6. Hishmah, *Course of Foreigners of English to Arabic and of Arabic to English*

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**Course No. AR-305:**

**Course Title:** Arabic for Communication-III.

This course is intended to enable the students to use Arabic fluently for written and oral communication. The prescribed text book for this course is *al-Arabiyah li-Ilm al-Funun*, Vol. IV (Pub: King Saud University, Riyadh, KSA) which is of five units. Each unit of the book will form a unit of the course.

#### **Reading List:**

1. Fu'ad M. Yous, *Al-Madhal al-Jawid al-Lughawi al-Furusiyya*.
2. David Cohen, *Modern Literary Arabic*.
3. Ali al-Jarim & Mustafa Amin, *al-Mabni al-Fuusi li-Adabiyyat al-Funun* (Vol. 1-5).

#### **Question Paper Pattern:**

Each unit carries 14 marks and does uniformly have the following question pattern:

1. Four questions of 3.5 marks each in the pattern of the drills given in the concerned unit of the text. Each question may preferably have 1 sub-question of half mark each (4 x 3.5 = 14 marks).
2. One question of 4 marks from outside the text wherein the student will have to apply the language skills learned from the concerned unit of the text. The nature of this question may vary from unit to another depending upon the content of the unit. It can, for example, be completion of sentences or a passage wherein the student will have to give up to 8 grammatical or linguistic inputs, e.g., correct use of gender, number, verbal forms etc., or giving detailed marks to a passage of considerable length. (1 x 4 = 4 marks).

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**DEPARTMENT OF ECONOMICS**  
**ASSAM UNIVERSITY: SILCHAR**  
**Course – 204(OE)**  
**Money, Banking and Finance**  
**Full Marks: 100 (70 theory paper+ 30 Internal)**  
**Pass Mark-40 percent (separately)**  
**Credit – 6**

**Unit 1: Money in the Economy**

- 1.1 Money – Meaning and functions, definitions (theoretical and empirical), as a durable good; inside money and outside money
- 1.2 Money in the Utility and Production Functions, Neutrality of money-Don Patinkin's, Meltzer's and Gurley and Shaw's analysis.
- 1.3 Determinants of Money supply, money multiplier, high powered money, mechanical and behavioural theories of money supply determination

**Unit 2: An Overview of the Financial System**

- 2.1 Financial Markets – Function, Structure and Importance, Money and Capital Markets – Money Market Instruments; Capital Market Instruments
- 2.2 Derivatives – Definition, origin, types (forwards, futures, options and swaps) and pricing; Derivatives and Risk
- 2.3 Financial services-Non-banking Finance companies-Merchant Banks, Investment banks, Venture Capital funds-Mutual funds-Microfinance institutions

**Unit 3: Central Bank and Monetary Policy**

- 3.1 Targets and Goals of Monetary Policy, Criteria for choosing operating and intermediate targets, tools of monetary policy, the budget deficit and the monetary base, the monetary and fiscal interface
- 3.2 The monetary transmission mechanism-Money and Credit transmission mechanism-Exogenous/endogenous money- inflation, interest and exchange.
- 3.3 Role of RBI in India – Financial regulator and authority, regulation and supervision of banking system - Basel Norms , Co-ordination between the financial sector regulators like SEBI, IRDA, PFRDA and the RBI –Current Monetary policy

**Unit 4: Regulatory Framework**

- 4.1 Power and functions of the SEBI, Its impact on the working of the capital market in India, Money Laundering -Corporate Governance and Management Guidance and Supervision - Role of stock exchanges and NSDL.

4.2 Evolving areas for Financial Regulation -Subprime Crisis – Regulation of Non-Bank Financial Intermediaries - Mortgage Backed Securities and OTC market - Regulation of Insurance sector-rationale of the IRDA-powers and functions

4.3 Liberalisation of the financial system in India, past reforms and way forward

### **Unit 5: International Financial Markets**

5.1 Increasing Interdependence in the Global Economy-Trends in International Trade and Cross Border Financial Flows-Impact on Risk Management, post Maastricht developments, Euro-dollar and Euro currency markets

5.2 Theory of Exchange Rate-advantages and disadvantages of fixed vs floating exchange rates, Use of Purchasing Power Parity (PPP) and Calculation of PPP Exchange Rates, risk hedging and futures in exchange rates

5.3 International Development Finance-World Bank, Asian Development Bank, Role of NGOs, FDI and Hot money.

### **Essential readings**

1. Glenn Hubbard & Anthony Patrick O'brien (2012), Money , Banking and the Financial System, Prentice hall
2. Frederic S. Mishkin & Apostolos Serletis (2011), The Economics Of Money, Banking And Financial Markets, Pearson
3. Jagdish Handa (2009), Monetary Economics(2009), Rout ledge
4. Peter Howells and Keith Bain (2005), The Economics of Money, Banking and Finance :A European Text, Pearson
5. Levi, Maurice D: International Finance

### **Additional Readings**

1. Ross Levine: Financial Development and Economic Growth Financial Development and Economic Growth: Views and Agenda, Journal of Economic Literature Vol. XXXV (June 1997), pp. 688–726
2. Benjamin Friedman Michael Woodford(series), handbook of Monetary Economics, Elseivier
3. Mervyn Lewis and Paul Mizen( 2000), Monetary Economics. OUP

**Course – 205 (GE)**  
**Statistics for Economics**  
**Full Marks- 100 (70 Theory Paper + 30 Internal)**  
**Pass Marks- 40 percent (separately)**  
**Credit - 6**

### **Unit 1: Correlation and Regression Analysis**

- 1.1 Idea of Correlation (Pearson, Spearman, Bi-serial, Phi and Kendall)
- 1.2 Idea of Regression, regression lines, regression coefficients and their properties.
- 1.3 Total correlation, partial correlation and multiple correlations and their relationship

## **Unit 2: Random Variables and Probability Distributions**

- 2.1 Random variable - discrete and continuous; probability mass and density functions; distribution function; mathematical expectation; moments and moment generating functions
- 2.2 Discrete probability distributions- Binomial, Poisson and Negative Binomial
- 2.3 Continuous probability distributions- Normal, Uniform, Exponential, Pareto and Log normal

## **Unit 3: Sampling and Estimation**

- 3.1 Random and non-random sampling- concepts and types, Methods of sample selection under different sampling methods, determination of sample size in case of known and unknown population
- 3.2 Concepts of parameter, statistic, sampling distribution, standard error; Point estimation and Desirable properties of a point estimator
- 3.3 Interval Estimation

## **Unit 4: Testing of Hypothesis**

- 4.1 Statistical hypothesis, null and alternative hypotheses, Types of errors, level of significance, choice of critical region, one tailed two tailed tests
- 4.2. Large sample tests and their applications
- 4.3 Small sample tests and their applications

## **Unit 5: Analysis of Variance and Non-parametric Tests**

- 5.1 ANOVA with one way classified data
- 5.2 ANOVA with two way classified data
- 5.3 Non-Parametric Tests for hypotheses testing – Sign test, Run test, Spearman's Rank Correlation test, Kendall's rank correlation test,  $\chi^2$  test of goodness of fit.

### **Essential Readings:**

- 1. Casella, R. and Berger (2002), Statistical Inference, Wiley, New York.
- 2. Goon, A. M., M. Gupta and B. Dasgupta (2002), Fundamentals of Statistics, Vols I & II World Press, Calcutta
- 3. Madsen B. (2008), Statistics for Non-statistician, Springer

4. Dekking, F.M, Kraaikamp, C, Lopuhaa, H.P and Meester, L.E (2005), A Modern Introduction to Probability and Statistics- Understanding Why and How, Springer
5. Urdan, TC. (2005). Statistics in Plain English, Lawrence Erlbaum Associates Publishers
6. Cochran, G. William (2011): Sampling Techniques

**Additional Readings:**

1. Gupta S. and Kapoor, V.K (2007): Fundamentals of Mathematical Statistics, S. Chand, New-Delhi.
2. Gopal K. Kanji (2000), 100 Statistical Tests, Sage, London.

**Paper—302**  
**Basic Econometrics**  
**Full Marks: 100 (70 theory paper+ 30 Internal)**  
**Pass Mark-40 percent (separately)**  
**Credit – 6**

**Unit – 1: Introduction to Two Variables CLRM**

- 1.1. Econometrics – Nature, meaning, scope, aims and objectives; Difference between mathematical economics and econometrics and between statistics and econometrics.
- 1.2. Two variable linear regression model, population and sample regression functions, Estimation using ordinary least squares – BLUE property / Gauss- Markov theorem.
- 1.3. Testing and inference in 2 variable OLS, t- test, ANOVA and F test, confidence intervals for coefficients, goodness of fit, empirical applications.

**Unit– 2: Classical Linear Regression Model: Three variables Case**

- 2.1 Three variables CLRM–estimation, t-tests for coefficients in three variable models
- 2.2 ANOVA and F tests for overall significance, testing linear restrictions, restricted least squares.
- 2.3 Total, partial and multiple correlations, goodness of fit –  $R^2$  and adjusted  $R^2$  , Empirical Uses of three variable linear models in micro-and macroeconomics – statistical inference. Pooling regression – Stability analysis – Chow test – Generalized Least square Estimation technique

**Unit – 3: Problems of Single Equation Estimation**

- 3.1 Problem of Multicollinearity – Nature, detection tests, consequences and remedial measures.
- 3.2 Problems of Heteroscedasticity – Nature, detection tests (for small and large sample), consequences and remedial measures
- 3.3 Problem of Autocorrelation-Nature, detection test- Durbin-Watson Test, consequences and remedial measures - Cochrane Orcutt method and Grid search procedure.

**Unit –4: Simultaneous Equation, Problem of Identification and Estimation**

4.1 Single Equation versus Simultaneous Equations System (SES) Features of Simultaneous Equation System (SES), An Example of SES, Simultaneous versus Recursive Systems.

4.2 OLS Estimation of SES: Consequence of Ignoring Simultaneity, Concept of a-prior information, Structural and Reduced Form Equations.

4.3. Identification Problem: Identification by using Mongrel equation, Identification by using Reduced Form, Identification by using Rank and Order conditions – some problems, Introduction to estimation of SES.

### **Unit – 5: Introduction to Time Series**

5.1. Key concept- Stochastic Processes- basic characteristics of time series data.

5.2. Stationarity in time series – trend and difference stationary stochastic processes, UNIT root and stationarity tests – Dickey-Fuller and Augmented Dickey-Fuller tests, transforming nonstationary time series

5.3 The phenomenon of spurious regression, spurious regression and co-integration in time series– elementary concepts, Engel-Granger (EG) Co-integration Test, Error Correction Mechanism (ECM).

### **Essential Readings**

1. Gujarati, D. N.: Basic Econometrics.

2. Ramanathan, R.: Introductory Econometrics with Applications.

3. Maddala, G. S. and K .Lahiri: Introduction to Econometrics.

4. Woolridge: Introductory Econometrics, A Modern Approach Additional Readings 1. Johnston, J.: Econometric Methods

**Paper—303 (GE)**

**Public Economics**

**Full Marks: 100 (70 theory paper+ 30 Internal)**

**Pass Mark-40 percent (separately)**

**Credit - 6**

### **Unit – 1: Role of Government and Theory of Public Goods**

1.1 Economic Rationale of Mixed Economy; Role of Government in a State - Allocation, Distribution and Stabilisation.

1.2 Market Failure and the rationale for Government Intervention- Market failure in the contexts of Natural Monopolies, Non-Existence of Futures Markets, Asymmetric Information; The Problem of Externalities and their Internalisation, Theory of Second best

1.3 Theory of Public Goods: Concept, Characteristics and Types of Public Goods; Demand and Supply, Preference revelation Mechanisms -Clarke Mechanism, Lindahl-Wicksell Mechanism; Theory of Club Goods .

## **Unit 2: Theory of Public Choice**

2.1 Public Choice – Reasons for Public Choice; Public Choice under Direct Democracy Unanimity rule – Lindahl and Wicksell

2.2 Majority Rule - Buchanan and Tullock Model, Bowen-Black Model; Arrow's Impossibility Theorem;

2.3 Public Choice under Representative Democracy – Downs Model on Demand and Supply of Government Policy; Niskanen Model of Bureaucratic Behaviour.

## **Unit 3: Tax Incidence, Public Expenditure and Public Debt**

3.1 Tax Incidence – Partial and General Equilibrium Analysis; Mieszkowski Analysis; Keynesian Short Run Model; Dynamic Analysis.

3.2 Theory of Public Expenditure: Bowen Model, Lindahl Model, Pigou Model, Samuelson Model; Wagner's Theory of Increasing state activities, Contribution of Wiseman, Peacock and Clarke

3.3 Public Debt – Objectives and Sources; Classification and Effect; Burden Controversy of Public Debt – Classical Theory, Modern Theory, Buchanan Thesis, Crowding out and Ricardian Equivalence, Public Debt and Inflation; Public Debt Management and Redemption of Public Debt .

## **Unit 4: Government Budgeting & Fiscal Policy**

4.1 Budgeting-Importance and Classification, Budget Multiplier- Balanced and Unbalanced, Zero Base Budgeting (ZBB), Union Budget of India-trend and pattern of Expenditure and Receipts

4.2 Budgetary Policy of India- Tax reform, Types of taxes, Goods and Service Tax, FRBM Act

4.3 Fiscal policy – Instruments, Importance and Objectives, Classical Vs Keynesian, Effectiveness of Fiscal Policy to achieve internal and external balance.

## **Unit 5: Fiscal Federalism**

5.1 Principles of Multi-Unit Finance; Assignment of Functions among Levels of Government; Tiebout Model and Citizen's Mobility

5.2 Theory of Intergovernmental Grants-types and effects

5.3 Role of Finance Commission in India and Local Finance

### **Essential readings**

1. Jonathan Gruber(2010), Public Finance and Public Policy, MIT
2. David Hyman(2011), Public Finance: A Contemporary Application Of Theory To Policy, Cengage
3. John Cullis and Philip Jones(2009): Public Finance and Public Choice, Oxford University Press
4. Jean Hindriks and Gareth Myles (2014), Intermediate Public Economics, Prentice Hall



5. Economic Survey, (Various Years), Govt of India, <http://mofapp.nic.in:8080/economicsurvey/>
6. Union Budget(Latest), Government of India, <http://www.indiabudget.gov.in/>

### **Additional readings**

1. Atkinson, A. and J. Stiglitz: Lectures on Public Economics
2. Kenneth J. Arrow: Social Choice and Individual Values.
3. Anthony Downs: An Economic Theory of Democracy
4. James M. Buchanan and Gordon Tullock: The Calculus of Consent
5. Martin Feldstein A.J. Auerbach,(Ed):Handbook of Public Economics (Series), Elsevier

**Paper—304(Optional Elective)**  
**Mathematical Economics**  
**Full Marks: 100 (70 theory paper+ 30 Internal)**  
**Pass Mark-40 percent (separately)**  
**Credit – 6**

### **Unit 1: Constrained Optimisation in Consumer and Producer Behaviour**

- 1.1 Consumer Behaviour: Utility maximization using Lagrangian multiplier, Indirect Utility function, Roy's Identity, Slutsky equation, duality, Compensated demand functions and expenditure function, linear expenditure systems.
- 1.2. Different forms of utility functions - Separable and Additive Utility Functions – homogeneous and homothetic, Cobb-Douglas and CES, Revealed Preference, behaviour under Risk and Uncertainty -Von Neumann-Morgenstern Expected Utility.
- 1.3. Producers optimisation problem – constrained output maximisation, factor demand functions, duality – conditional factor demands, output elasticity, elasticity of substitution, Homogeneous and homothetic functions - Cobb-Douglas, CES and trans-log production functions, product exhaustion theorem.

### **Unit 2: Firm Behaviour, Supply Decision and Markets**

- 2.1 Cost Functions - Derivation of Cost function from the production function, average cost and marginal costs, Envelop theorem and Shephard's lemma and supply function, Properties of cost function, competitive supply for firm and industry.
- 2.2 Profit maximisation, Profit function and properties, Envelop theorem and profit function, comparative statics and supply function, case of multi product firm.
- 2.3 Marshallian and Walrasian static stability of equilibrium, dynamic stability in discrete and continuous time, various market forms – monopoly, monopolistic competition, oligopoly, duopoly – strategic interdependence.

### **Unit 3: Game Theory and applications**

3.1 Perfect Information, pure strategy – Nash Equilibrium, theory and applications – Prisoner's Dilemma, Matching Pennies, battle of the sexes, Best response functions, Dominated strategy – iterated elimination, Cournot and Bertrand duopoly.

3.2 Mixed strategy – Nash Equilibrium and best response functions, dominated actions – economic applications, sequential/dynamic games, extensive form games – backwards induction, subgame perfect equilibrium – applications.

3.3 Imperfect information – Bayesian Games, Cournot's duopoly game with imperfect information, providing public goods, auctions, signalling games, finitely and infinitely repeated games– examples.

#### **Unit 4: Linear Programming, Input-output Analysis and Dynamic Optimisation**

4.1 LPP – standard theorems, basic feasible solution, duality and simplex tableau, KuhnTucker conditions and NLPP, economic applications.

4.2 Leontief Static Open Model – Hawkins-Simon conditions, consumption possibility locus, price system, the closed model – output and price systems in closed model, Introduction to Indian plan models.

4.3 Dynamic optimisation – Optimal control – control, state and co-state variables, the Hamiltonian, Current and present value Hamiltonian, first order and transversality conditions, applications in resource and growth economics.

#### **Unit 5: General Equilibrium and Advanced Macroeconomics**

5.1 Walrasian general equilibrium–Cassel-Walras absolute and relative price determination, the Heckscher-Ohlin-Samuelson framework – Rybczynski and Stolper-Samuelson theorems, income distribution and output magnification effects, economic implications.

5.2 Expectations and aggregate supply, Lucas supply function, Friedman supply rule, New Phillips Curve, Rational Expectations Lucas – Sargent – Wallace Model and macroeconomic policy.

5.3 Kalecki and Kaldor trade cycle models, Kydland-Prescott real business cycle, new growth theories – R&D, human capital and endogenous growth – Lucas, Romer, Rebelo.

#### **Essential Readings**

1. Silberberg, E and W. Suen, E.: The Structure of Economics: A Mathematical Analysis Allen, R.G.D: Mathematical Economics
2. Chiang, A.C: Fundamental Methods of Mathematical Economics.
3. Chiang, A.C: Elements of Dynamic Optimisation.
4. Henderson, J.M. and R.E. Quandt: Microeconomic Theory: A Mathematical Approach.
5. Varian, H.: Microeconomic Analysis.

#### **Additional Readings**

1. Gandolfo, G: Economic Dynamics.
2. Rowcroft, J.E: Mathematical Economics: An Integrated Approach.
3. Jha, R: Contemporary Macroeconomic Theory and Policy.
4. Arrow, K.J. and M. Intrilligator (edited): Handbook of Mathematical Economics, Vol- I, II, and III.
5. David Romer: Advanced Macroeconomics.
6. Jagdish Handa: Monetary Economics.
7. Barro, R. And X. Sala-i-Martin: Economic Growth.

**Paper—305**  
**(Optional Elective) Agrarian Economic Theory**  
**Full Marks: 100 (70 theory paper+ 30 Internal)**  
**Pass Mark-40 percent (separately)**  
**Credit – 6**

### **Unit – 1: Concepts and Linkages**

- 1.1. Specificity of Agricultural sector
- 1.2. Modes of Production Debate
- 1.3. Concept of Market and Agrarian institutions

### **Unit – 2: Statistical estimates**

- 2.1. Resource allocations and substitutions
- 2.2. Production functions
- 2.3. Cost and supply functions

### **Unit – 3: Production and exchange relations**

- 3.1. Share Cropping and land market
- 3.2. Wage employment and labour market
- 3.3. Indebtedness and credit market

### **Unit – 4: Agricultural product circulation and prices**

- 4.1. Marketable surplus function
- 4.2. Conduct, performance and structure paradigm
- 4.3. Agricultural prices and cobweb model; terms of trade and price stabilization programme

### **Unit – 5: Globalization and livelihood paradigms**

- 5.1. Globalization in agriculture

- 5.2. Agricultural diversification and agri-business
- 5.3. Rural non-farm sector and rural industrialization

### **Essential Readings**

- 1. A V Chayanov: Theory of peasant economy
- 2. Amit Bhaduri: Economic structure of backward Agriculture
- 3. R N Soni: Leading Issues in Agricultural Economics
- 4. B S Minhas: Planning and the Poor
- 5. B S Sidhu: Land Reforms, Welfare and Economic Growth

### **Additional Readings**

- 1. Reserve Bank Of India: Handbook of Statistics in Indian Economy
- 2. Government Of India: Economic Survey
- 3. S K Ray: Indian Economy

**Paper—401**  
**Environmental Economics**  
**Full Marks: 100 (70 theory paper+ 30 Internal)**  
**Pass Mark-40 percent (separately)**  
**Credit -6**

### **Unit –1: Economics of Natural Resources**

- 1.1 Taxonomy of natural resources, physical and economic measures of resource scarcity, natural resources as limits to growth, the resource curse hypothesis.
- 1.2 Economics of renewable resources: Water – water scarcity and the economy, addressing water scarcity through supply and demand management. Fishery – sustainable harvesting and efficiency, policies for sustainable fishery management, role of property rights.
- 1.3 Economics of exhaustible resources – optimal depletion, inter-temporal efficient allocation, role of substitutes.

### **Unit- 2: Basic Economic Theory**

- 2.1 Pareto optimality and competitive equilibrium: Market failures; Theories of Externality and Public Goods, Solutions to Externality.
- 2.2 Theory of externalities and Public Goods: the Pigovian approach and Pigovian Taxes as a solution to the problem of externalities.
- 2.3 Coase theorem, property rights and transaction costs, market failures and corrective action; Pollution Prevention, Control and Abatement – Command and Control and Market Based Instruments –Taxes Vs Tradable Permits.

### **Unit- 3: Valuation of Environmental Benefits and Damages**

3.1 Environmental benefits, concept of environmental value, Use and Non-use Values.

3.2 Hedonic Pricing method - Housing and labour markets; Travel Cost Method, Random Utility Model (RUM).

3.3 Contingent Valuation Method, Valuing Longevity and Health, Production Function Approach.

### **Unit –4: Environment and Development**

4.1 Environment-Development Trade off, Environmental Costs of Economic Growth, Limits to Growth — Concept and Indicators of Sustainable Development and its policies

4.2 Environmental Accounting – Integrated environmental and economic accounting, measurement of environmentally corrected GDP.

4.3 Inter-Temporal Efficiency, Inter-Generational Equity; Poverty and Environment.

### **Unit -5: Local and Global Environmental Issues**

5.1 Macro Perspectives: Climate Change, Natural Resource Accounting, the policies of Sustainable Development.

5.2 Policy instruments for controlling water and air pollution and forestry policy in India, joint forest management.

5.3 Global Treaties, the Montreal Protocol, Trade and Development, WTO and TRIPS as related to environmental issues, IPCC Assessments.

### **Essential Readings**

1. Bhattacharya, R.N.: Environmental Economics.
2. Baumol, W.J. & W.E.Oates: The Theory of Environmental Policy.
3. Hanley, Shogren and White: Environmental Economics.
4. Fisher, Anthony C.: Resource and Environmental Economics, Cambridge University Press.
5. Conrad, Jon M.: Resource Economics, Cambridge University Press.

### **Additional Reading**

1. Shankar, U: Environmental Economics.

**Paper—402**  
**Demography**  
**Full Marks: 100 (70 theory paper+ 30 Internal)**  
**Pass Mark-40 percent (separately)**  
**Credit -6**

### **Unit-1: Population and development**

1.1 Components of population growth and their interdependence, theories of population, critical review of Malthusian, optimum theory of population.

1.2 Theory of demographic transition, Lebenstein's theory, views of Medows, Enke and Simon.

1.3 Population and development, concept of human resource development and management.

### **Unit-2: Structure of Population**

2.1 World Population trend in the 20th century, population explosion- threatened or real, distant or imminent, International aspects of population growth.

2.2 Population distribution, pattern of age and sex structure in more developed and less developed countries, determinants of age and sex structure.

2.3 Demographic effects of age and sex structure, economic and social implications, age pyramids and projections, problem and measures of population ageing.

### **Unit-3: Fertility and mortality**

3.1 Measures of Fertility, Mortality and Reproduction, Concept of stable Population and Stationary Population.

3.2. Concept of Life Table – Meaning, assumptions, construction and uses.

3.3 Factors affecting fertility, the recent developments in the area, macro and micro level household studies for identifying determinants of fertility. G.S Becker's contribution in this area

### **Unit-4: Migration and Urbanization**

4.1 Theories of migration, migration-temporary, internal and international, trend and pattern of migration in the world.

4.2 Impact of migration on population growth and age-group distribution of population, Concept of displacement and its pattern.

4.3 Growth of urbanization, distribution of rural, urban population in developed and developing countries, the problems of urbanization in India.

### **Unit –5: Population and development with reference to India and its north-east**

5.1 Population Trend in Northeast, important features like population ageing and migration.

5.2 Level and trend of vital statistics in India with special reference to Northeast.

5.3 Analysis of State Human Development Reports with special reference to demographic features and economic development.

**Essential Readings**

1. Bose, A: India's Basic Demographic Statistics.
2. Simon, J.L: Population and Development in Poor Countries.
3. Srinivasan, K: Basic Demographic Techniques and Applications.
4. Srinivasan, K and A. Shariff: India: Towards Population and Demographic Goals.

**Additional Readings**

1. Bouge, D.J: Principles of Demography.
2. Sudarshan and A.Shariff: Gender Population and Development.
3. Becker, G.S: A Treatise on the Family

**Paper—403 (GE)**  
**International Economics**  
**Full Marks: 100 (70 theory paper+ 30 Internal)**  
**Pass Mark-40 percent (separately)**  
**Credit -6**

**Unit 1: Pure Theory of International Trade**

1.1 Generalization of the Ricardian Model of Trade and Comparative Advantage- Multicommodity and Multi-Country Cases; Public Policy and Induced Comparative Advantages; Revealed Comparative Advantages.

1.2 Trade Equilibrium under Different Costs Conditions; Decomposition of Gains from Trade, Measuring Welfare Change- Compensating and Equivalent variations.

1.3 Offer Curve Analysis- Derivation of Offer curve, Backward bending offer curve; Determination and Shifting of Terms of Trade.

**Unit 2: Modern Theory of International Trade**

2.1 Heckscher-Ohlin Theory, Factor Reversal, Demand Reversal and Leontief Paradox.

2.2 Effects of Factors Growth on Trade Position: Rybezynski Theorem; Impact of Technical Progress on Trade Position.

2.3 New Trade Theories: Product Life Cycle and Technology Gap Models; Theories of IntraIndustry Trade.

### **Unit 3: Trade Multiplier and Foreign Exchange Market**

3.1 Foreign Trade-Multipliers: with and without Foreign Repercussions, Transfers and Trade Balance.

3.2 Foreign Exchange Market: Spot Rate and Forward Rate; Covering Foreign Exchange Risk through Hedging.

3.3 Interest Arbitrage- Covered vs Uncovered, Covered interest Arbitrage Parity, Covered Interest Arbitrage Margin; Stabilizing vs Destabilizing Speculation.

### **Unit 4: Exchange Rate Regime and Balance of Payment Policies**

4.1 History of International Monetary System, Current IMF Operation and its loopholes, Proposals for Reforming Present Exchange Rate Arrangements

4.2 Intervention in the Foreign Exchange Market: A Dirty or Managed Float; Overvalued Pegged Exchange Rate Regime and Target-Zone

4.3 Balance of Payment Policies- Expenditure Reducing and Expenditure Switching Policies; Internal and External Balance and the Policy Conflict.

### **Unit 5: Trade Intervention and Coordination**

5.1 General Equilibrium Analysis of Tariff; Stopler-Samuelson Theorem; Metzler Paradox, Measurement of Optimum Tariff

5.2 Import Tariff vs Import Quota; Voluntary Export Restraints, Dumping, Political Economy of Trade Policy.

5.3 Trade Creating and Trade Diverting Custom Unions, Economic Integration among Asian Countries.

### **Essential Readings**

1. Dominick Salvatore: International Economics
2. Rajat Acharyya: International economics: An Introduction to Theory and Policy
3. Dunn, R.M and J.H.Mutti: International Economics
4. Krugman, Paul R. and Maurice Obstfeld.: International Economics: Theory and Policy
5. Södersten, Bo. International Economics

### **Additional Readings**

1. Kenen, Peter. The International Economy
2. Lindert, Peter H.: International Economics



3. Sawyer W Charles, Sprinkle, Richard L.: International Economics.
4. Chocholiades, M.: The Pure Theory of International Trade
5. Bhagwati, J. (edited): International Trade: Selected Reading

**Paper—404**  
**(Optional Elective) Advanced Econometrics**  
**Full Marks: 100 (70 theory paper+ 30 Internal)**  
**Pass Mark-40 percent (separately)**  
**Credit -6**

**Unit-1: Estimation of Simultaneous Equation System**

- 1.1. Method of estimation in simultaneous equation model: Single Equation Methods and System Methods. Estimation of an exactly identified equation- Indirect Least Squares (ILS).
- 1.2. Single Equation Methods: Two-stage Least Squares (2SLS), Instrumental Variable Method (IV), K-class Estimators.
- 1.3. System Methods: Three-stage Least Squares (3SLS), Full Information Maximum likelihood Method (FIML)

**UNIT –2: Advanced Time Series Analysis**

- 2.1 ARIMA Forecasting: AR, MA and ARMA Modelling of Time Series Data, The Box-Jenkins (BJ) Methodology- steps, merit and demerit.
- 2.2 Vector Autoregressive (VAR) Model- specification, estimation and forecasting. Vector Error Correction Model-Impulse Response Analysis, Variance Decomposition, Merits and Demerits
- 2.3 Causality Tests: Granger Causality Test, Granger Causality in VAR.

**UNIT – 3: Dummy Variables**

- 3.1. Definition, Single Regression Model with Dummy Variable- Dummy Variables for Multiple Categories. Interaction Dummy- Comparing Two Regressions
- 3.2 Models with Dummy Dependent Variables: Linear Probability Model (LPM), Logit Model, Probit Model, Comparison between Logit and Probit Model, Problem of Disproportionate Sampling.
- 3.3 Measuring Goodness of Fit: Effron's  $R^2$ , McFadden's Pseudo-  $R^2$ , Estimating the overall Significance of Regression.

**Unit-4: Distributed Lag Models**

- 4.1 Definition and Specification, Geometric Lag Approach. Estimation of Geometric Lag Model: The Koyck Method- advantage, problems
- 4.2. Median and Mean Lags in Koyck Model, Short-run and Long-run Multipliers, Almon's scheme of polynomial lags.

4.3. Adaptive Expectations Model: Estimation of AEM, Other Problem of AEM.

### **Unit-5: Panel Data Analysis**

5.1 Definition, Types and Usefulness of Panel Data

5.2 Panel Data Models: The constant Coefficients Model (CCM), The Fixed-Effects Model and Random Effects Model.

5.3. Choosing between FEM and REM: The Hausman Test, SUR model, Random coefficient model.

### **Essential Readings**

1. Maddala, G.S. Introduction to Econometrics
2. Johnston, J and J. Dinardo: Econometric Methods
3. Gujarati, D. N.: Basic Econometrics
4. Greene, W.H.: Econometric Analysis
5. Bhaumik, S.K.: Principles of Econometrics

### **Additional Reading**

1. Ramanathan, R.: Introductory Econometrics with applications
2. Wolridge, J.: Introductory Econometrics – A Modern Approach

**Paper—405**  
**(Optional Elective) State of Agriculture in India**  
**Full Marks: 100 (70 theory paper+ 30 Internal)**  
**Pass Mark-40 percent (separately)**  
**Credit -6**

### **Unit – 1 Green Revolution in India**

- 1.1 Agricultural growth in India – Trends and regional variations
- 1.2 Green revolution in India – its impact on agricultural output and environment
- 1.3 Dynamics of cropping pattern change and its role in agriculture

### **Unit -2 Input and output market in Indian Agriculture**

- 2.1 Markets of water and agricultural capital goods; Sources of credit, institutions and governmental policies.
- 2.2 Agricultural markets and marketing efficiency- market functions and costs.
- 2.3 Market structure and imperfections; Regulated markets; Marketed and marketable surplus.

### **Unit – 3 Food Security, Investment and Labour market in India**

- 3.1 Food security in India and public distribution system.

3.2 Public and private investment and capital formation in Indian agriculture.

3.3 Rural Labour Market, agricultural wages and unemployment.

#### **Unit – 4 Indian Agriculture and External Sector**

4.1 International trade in agricultural commodities; Commodity agreements — Role and impact of World Trade Organization, Globalisation and Indian agriculture

4.2 Issues in liberalization of domestic and international trade in agriculture.

4.3 Nature and features of agri-business; Role of MNCs.

#### **Unit -5 Selected Issues of Indian Agriculture**

5.1 Agrarian distress in India – genesis, farmer suicides and policy options

5.2 Impact of climate change on Indian agriculture and its mitigation

5.3 Prospective areas of reforms in Indian agriculture

#### **Essential Readings**

A N Sadhu and J Singh – Agricultural Problems In India

S R Bilgrami (1996), Agricultural Economics, Himalaya Publishing House, Delhi  
R N Soni – Leading Issues In Agricultural Economics

B S Minhas – Planning And The Poor

B S Sidhu – Land Reforms, Welfare And Economic Growth

Dantwala, M.L. et.al (1991), Indian Agricultural Development Since Independence, Oxford & IBH, New Delhi.

Gulati, A. and T. Kelly (1999), Trade Liberalisation and Indian Agriculture, Oxford University Press, New Delhi.

Kahlon, A.S. and Tyagi D.S. (1983), Agriculture Price Policy in India, Allied Publishers, New Delhi  
Goswami et al (2018), Indian Agriculture after the Green Revolution- Changes and Challenges, Routledge, New York.

Basu et al (2010), Agrarian Questions, Oxford India Paperbacks

Rudra, A. (1982), Indian Agricultural Economics : Myths and Reality, Allied Publishers, New Delhi

# Diploma Course in Centre for Biodiversity

## Post Graduate Diploma in Biodiversity Conservation (PGDBC)

**Objective:** To create trained Field Biologists for Biodiversity Conservation in NE India.

**Target Group:** Enthusiast and adventurous young people who desire to opt for Biodiversity Conservation as their carrier.

**Preferable:** Adventurous and genuine interest in Field Work.

Intake capacity: 15 (Ten)

**Duration:** 12 months (practical and dissertation inclusive).

(Total 2 Semesters and each semester is of 6 months duration).

### **Instructional system:**

1. Classroom teaching
2. Field visit
3. Assignments
4. Project work
5. Seminar sessions

**Faculty:** Blending of academics and field research.

## PREFACE

Biological diversity is the essence of life. The vast biological wealth of earth is represented by the biodiversity that surrounds us. The future well-being of humankind depends on the conservation practice we undertake today to preserve and enhance that biodiversity. The earth's biological asset today faces an unprecedented crisis. The rate at which species are being lost is alarming, even when compared with the extinction episode of 70 million years ago. The current extinction rate is 10,000 times greater than it would have been under any circumstances. Species are threatened in every habitat and on every continent. We realize that we do not know enough about the animals and plants to nullify these threats because things are getting lost even before they are being discovered.

India is a mega diversity hotspot and North East India is the richest biodiversity area in the country which comprises of many endemic, rare, threatened and endangered species. Scientists predict that substantial human-induced environmental changes are likely to continue in the mega diversity hotspots causing degradation of habitat and extinction of species. These concerns coupled with the alarming loss of semi-natural habitats, climate change, environmental pollution and exploitation of our natural resources, have led to an urgent need to study the natural environment and man's use of it. If conservation has to succeed in the region it must be based on a sound knowledge of ecosystems function and the pressures that man inflicts on them. The study of wild plants and animals and their interactions with each other and their environments assumes great importance. When we are equipped with such information we can begin to plan realistic measures to protect our wild animals, plants and their habitats. Gathering scientific information in a systematic manner will strengthen our ability to deal with crisis and also help in formulation of long-term policies. **The Centre for Biodiversity and Natural Resources Conservation (CBNRC), Assam University Silchar** was evolved with the intention of looking into these concerns with a greater focus and creating skilled wildlife biologists in the region who will play an important role in the conservation of biodiversity and help in management of the natural resources particularly in North East India under the banner of **Assam University Silchar**.

The intricately structured course will ensure the right amalgamation of theory and practical training. It will instil in the young minds the spirit of scientific enquiry and acute sensitivity towards environmental issues. The current course will generate enough interest among the young people and will help in generation of sound scientific knowledge which will pave the way for an efficient management of the natural resources of the North East India.

## INTRODUCTION

### 1.1 Objectives

- To study and analyse the status, ecology and initiate conservation of flora and fauna in the region.
- To study the natural resource utilization pattern and management by the communities in both hills and plains.
- To study the landscape ecology.
- To study the land use pattern.

### Admission to the Post Graduate Diploma course (Eligibility)

#### 1.2 Admission to the Post Graduate Diploma (PGDBC) Course at CBNRC, AUS

This course is primarily designed for candidates who hold a Bachelor of Science degree. Students with degrees in Botany, Zoology, Eco-restoration, Veterinary Science, Forestry, Agriculture and Environmental Sciences are eligible for this course. The candidate should have secured an aggregate of 55% in his/her Bachelor's Degree examinations. In addition graduates, foresters who have a suitable degree and an aptitude for wildlife research may join the course on an in-service basis. Interested individual with post graduate degree can also opt for the course. The course is open to nationals from any country and region. The PGDBC course at Assam University is presently being offered in Silchar campus only. The entry eligibility of PGDBC should match the requirements of Assam University. This includes the stipulation of 15 years of formal education (10+2+3) educational pattern. Taught courses will take place at the Centre in Assam University, Silchar and practical courses in various field sites. This course will start in July every year. Applications are invited by advertisement in the Assam University prospectus and website, and regional and national newspapers. The course admits only 15 students and entry will be through a vigorous selection process involving scrutiny of application forms, entrance examination and an interview at Silchar campus.

The one year course is organized in two semesters. The first semester is used for lectures, seminars, practicals and field works. Field based research is conducted in the latter part of the end semester which is also utilized for writing-up a dissertation based on the field research projects.

Biodiversity Conservation is essentially a field oriented subject and therefore, emphasis is given more to field research included throughout the semesters. An important activity during the course is critical review of published research. The students are expected to read and discuss original research papers as background to lectures and seminars. In order to inculcate the attitude and the knowledge of an astute field biologist, critical review and seminar based discussions of research papers form a major part of the course work. There will be various

field visits both to the nearby wildlife areas and to other popular wildlife areas in North Eastern India.

The successful completion of the course will lead to the award of **Post Graduate Diploma in Biodiversity Conservation** by Assam University, Silchar.

### Course Structure

<b>Semester-I</b>	<b>Duration- 6 months</b>	
<b>Course Code</b>	<b>Course Name</b>	<b>Total Marks = 800</b>
PGDBC 01	Biodiversity Conservation and Phytogeography	75 + 25 = 100
PGDBC 02	Population Ecology and Forest Ecology	75 + 25 = 100
PGDBC 03	Practical Paper-I: Biodiversity Evaluation Methods	75+25= 100
PGDBC 04	Practical paper-II: Wildlife Population Estimation and Management	75+25= 100
<b>Semester-II</b>	<b>Duration-6 months</b>	
PGDBC 05	Remote Sensing & GIS, Behavioural Ecology and Conservation Biology	75 + 25 = 100
PGDBC 06	Wildlife Management and Natural Resource Conservation	75 + 25 = 100
PGDBC 07	Practical paper-III: Natural Resource Management and Behavioural Ecology	75 + 25 = 100
PGDBC 08	Dissertation Project	75 + 25 = 100

### SEMESTER: I

#### Paper-101: Biodiversity Conservation and Phytogeography

**Full Marks: 100**

**Theory: 75**

**Assignment: 25**

## **Unit-I: Biodiversity**

Biodiversity: definition, levels and types; Biodiversity hotspots; Agro-biodiversity; Biodiversity values; Keystone species, flagship species, endemic species, indicator species.

## **Unit-II: Biodiversity Conservation Strategies**

Biodiversity conservation strategies: *in situ* and *ex situ* conservation; Protected Area Network (PAN): Biosphere Reserves, National Park, Wildlife Sanctuary, Community Conservation Area, Important Bird Areas; Important protected areas of NE India;

## **Unit III: International Programmes for Biodiversity Conservation**

International Programmes for Biodiversity Conservation: Convention on Biological Diversity (CBD), International Union for Conservation of Nature and Natural Resources (IUCN), Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Trade Records Analysis of Flora and Fauna in Commerce (TRAFFIC). Convention on Wetlands of International Importance (Ramsar Convention).

## **Unit-IV: Phytogeography & Soil Ecology**

The major vegetation types of India, Champion & Seth's classification of Indian vegetation; Floristic diversity and phytogeographic regions of India. Soil definition and importance, soil formation and development, soil profile, soil erosion and conservation.

## **Unit- V: Ecosystem Development**

Concept of ecosystem; Ecotone and edge effect; Ecological succession: Types of succession, concept of climax community;. Energy flow and trophic dynamics. Biodiversity and ecosystem services.



**Essential readings:**

- Ambasht R. S. and Ambasht, N. K. 1995. *Text Book of Ecology*. Friends Book Depot, Varanashi.
- Brady, N.C. 2003. *The Nature and Properties of Soils* (13<sup>th</sup> Edn.), Pearson Education.
- Coleman, D.C. Crossley, D.C.; Hendrix, P.F. 2004. *Fundamentals of Soil Ecology*. (2<sup>nd</sup> Edn). Elsevier.
- Gaston, K.J. and Spicer, J.T. 2010. *Biodiversity: An Introduction*. (Second edition). Wiley and Black.
- Huston, M.A. 1994. *Biological Diversity: The Coexistence of Species in Changing Landscapes*. Cambridge University Press.
- Odum, E. P. 1971. *Fundamentals of Ecology*. W B Saunders, Philadelphia,
- Richards, P. W. 1996. *The Tropical Rain Forest* (2<sup>nd</sup> ed.), Cambridge University Press.
- Singh, J.S, Singh, S.P. and Gupta S.R. 2006. *Ecology, Environment and Resource Conservation*. Anamaya Publishers, New Delhi.
- Whitmore, T.C. 1998. *The Tropical Rain Forest*. Oxford University Press.

**Additional Readings:**

- Kormondy, E.J. 1996. *Concepts of Ecology* (4<sup>th</sup> Edn) Prentice Hall of India, New Delhi
- Odum, E.P. and Barrett, G.W. 2005. *Fundamentals of Ecology*. (5<sup>th</sup> Edition) Thompson.
- Sehgal J. and Abrol, I. P. 1994. *Soil degradation in India*. Oxford and IBH Publishing Company, New Delhi.

**Paper-102: Population Ecology and Forest Ecology****Full Marks: 100****Theory: 75****Assignment: 25****Unit-I: Population Ecology**

Population ecology of plants and animals; Population Dynamics: exponential, logistic and other forms of growth of population, Carrying capacity.

**Unit-II: Habitat Ecology**

Introduction to Habitat Ecology: Ecological concept of habitat. Ecological niche: niche overlap, niche separation. Ecology of major habitats: *Grasslands* (characteristics, composition, grassland ecosystem and its distribution in northeast India), *Forests* (types of forest, canopy cover, species composition in different forest types).

**Unit-III. Wetland Ecology**

*Wetlands*: Wetland definition, characteristics and distribution in northeast India, Wetland formation, Ecological role of wetland as wildlife habitat with special reference to Northeast India.

**Unit-IV: Forest Ecology**

Forest and forest environment: Structure of forest ecosystem; Forest fragmentation, Characteristic of tropical trees; phenology of trees; forest seed dormancy and germination; regeneration of forest trees.

**Unit-V: Biodiversity and Related Acts**

Indian Forest Act 1927; Forest Rights Act 2006; Wildlife Protection (1972) Act; Biological Diversity Act 2002, People Biodiversity Register.

**Essential readings:**

- Ambasht R. S. and Ambasht, N. K. 1995. *Text Book of Ecology*. Friends Book Depot, Varanashi.
- Barnes, B. V., Zak, D. R., Denton, S. R. and Spurr, S. R. 1998. *Forest Ecology* (4<sup>th</sup> ed.), Wiley and Sons.
- Begon, M. Harper, J.L. and Townsend C.R. 2006. *Ecology: Individuals, Populations and Communities*. Blackwell Scientific Publications.
- Boughey, A. S. 1968. *Ecology of Populations*, McMillan, New York.
- Chapman, J.L.K. and Reiss, M.J. 1997. *Ecology: Principles and Applications*, Cambridge University press.
- Dash, M.C. 1993. *Fundamentals of Ecology*, Tata McGraw—Hill Publishing Co., New Delhi.
- Dwivedi, A. P. 1993. *Forestry in India*. Surya publication, Dehradun.
- Kormondy, E.J. 1996. *Concepts of Ecology* (4<sup>th</sup> Edn) Prentice Hall of India, New Delhi
- Negi, S.S. 2002. *Handbook of National Parks, Wildlife Sanctuaries and Biosphere Reserves in India*
- Odum, E. P. 1971. *Fundamentals of Ecology*. W B Saunders, Philadelphia,
- Odum, E.P. and Barrett, G.W. 2005. *Fundamentals of Ecology*. (5<sup>th</sup> Edition) Thompson.
- Silverton, J.W. 1982. *Introduction to Plant Population*, Longman.
- Singh, J.S, Singh, S.P. and Gupta S.R. 2006. *Ecology, Environment and Resource Conservation*. Anamaya Publishers, New Delhi.
- Kimmins, J.P. (2004) *Forest Ecology* (2<sup>nd</sup> Edition) Pearson Education.
- Newton, A. (2007) *Forest Ecology and conservation*. Oxford University Press.

**Additional readings:**

- Champion, H.G. and Seth, S.K. 1968. *A Revised survey of the Forest types of India*. (Reprinted 2004) Natraj Publicaiton, Dehradun.
- The Wildlife Protection Act, 1972 (as amended up to 2004), Natraj Publisher, Dehradun.
- Tikadar, B. K. 1983. *Threatened animals of India*. Zoological Survey of India publication. Kolkata.
- Evans, J. and Turnbull, J. 2004. *Plantation Forestry in the Tropics*. (3<sup>rd</sup> Edition), Oxford University Press
- FSI (2009) *State of Forest Report 2009*. Forest Survey of India, Dehradun.
- Das, C. 2007. *A Treatise on Wildlife Conservation in India*.

## **Practical Paper: Paper-103: Biodiversity Evaluation Methods**

**Full Marks: 100**

**Practical: 75**

**Practical Record, Field Reports & Viva Voce: 25**

- 1) Field and Herbarium techniques; Description and identifications of plants; Identification test of plant specimen, study of AUS campus flora; Vegetation quantification: field sampling;
- 2) Sampling approaches: Completely Subjective Approach, Complete Random Design, Stratified Random Design, Complete Systematic Design, Random Systematic Design, and Sampling methods for estimation of terrestrial vegetation: the nearest individual method, point-centred quarter method, line intercept method, quadrat sampling method, crown-canopy estimation method, estimation of canopy cover using ocular method. Species-area curve.
- 3) Estimation of quantitative and qualitative characteristics of community: frequency, density, abundance, basal area, physiognomy, phenology and productivity.
- 4) Soil Sampling: Bulk density and porosity of soil samples. Soil texture and soil profile study. Measurement of water-holding capacity of soil.
- 5) Visit to Wildlife Sanctuary and National Park for proper orientation with wildlife diversity; Field report preparation.
- 6) Aquatic biomass estimation using macrophyte species.
- 7) Seminar presentation and viva-voce.

### **Essential Readings:**

- Brewer, R. and McCann, M.T. 1982. Laboratory and Field Manual of Ecology, Saunders College Publishing.
- Javed, Salim and Kaul, Rahul 2002. *Field Methods for Bird Surveys*. Bombay Natural History Society; Department of Wildlife Sciences, Aligarh Muslim University, Aligarh and World Pheasant Association, South Asia Regional Office (SARO), New Delhi, India.
- Michael, P. 1984. Ecological Methods for field and laboratory investigation. Tata McGraw-Hill, New Delhi.
- Misra, R. 1968. Ecology Work Book, Oxford and IBH Publishing Co. Calcutta.
- Moore, P.D. and Chapman, S.B. 1986. Methods in Plant Ecology. Blackwell Scientific Publications.
- Mueller Dombois and Ellenberg, H. (1974) *Aims & Methods of Vegetation Ecology* John, Wiley & Sons.
- Southwood, T.R.E. and Henderson, P.A. 2000 (third edition) *Ecological Methods*. Blackwell Science.

## **Paper-104: Wildlife Population Estimation and Management**

**Full Marks: 100**

**Practical: 75**

**Practical Record, Field Reports & Viva Voce: 25**

- 1) Concept of data collection, datasheet preparation, work plan designing.
- 2) Germination and Regenerative strategies of plants. Evaluating habitat availability, quality and utilization; habitat suitability index.
- 3) Wildlife population estimation by: Line transect method, point count method, belt transect method, marked-recaptured technique; encounter rate; Indirect Methods: Pellet Group counting methods, scat/dung analysis, sign survey analysis.
- 4) Identification test of wildlife specimen.
- 5) Excursions to nearby forests, grasslands and wetlands under various management regimes; field report preparation.
- 6) Term paper: review article on some prescribed topic. Abstract writing. Seminar presentation and viva-voce.

### **Essential readings:**

- David Ford. E. 2000. Scientific method for ecological research. Cambridge University Press
- Hainsworth, M.D. 1967. *Experiments in Animal Behaviour*, Macmillan, London.
- Jain, S.K. 1995. *A Manual of Ethnobotany*, Scientific Publishers.
- Jain, S.K. and Rao, R.R. 1977. *A Handbook of Field and Herbarium Methods*, Today and Tomorrow's Printers and Publishers, New Delhi.
- Marten, P. and Bateson, P. 1986. *Measuring Behaviour-An introductory guide*, Cambridge University Press. New York, Collier Macmillan Publishers.
- Morrison, M.L. et al. 2001. Wildlife study design. Springer-Verlag, New York, NY
- Mueller Dombois and Ellenberg, H. 1974. *Aims & Methods of Vegetation Ecology*. John, Wiley & Sons.
- Southwood, T.R.E. and Henderson, P.A. 2000 (third edition) *Ecological Methods*. Blackwell Science.

**SEMESTER – II****Paper-201: Remote Sensing & GIS, Behavioural Ecology and Conservation Biology****Full Marks: 100****Theory: 75****Assignment: 25****Unit-I: Remote Sensing and GIS**

Remote Sensing and GIS: Principles of remote sensing; Techniques of image processing and interpretation; Concept of GIS; Applications of GIS.

**Unit- II: Behavioural Ecology**

Concept of Ethology. Home Range; Territoriality (site fidelity), Competition for resources: ideal free distributions and resource. Communication; Social behaviour in animals: Aggressive behaviour; Parental care and mating systems.

**Unit- III: Introduction to Conservation Biology**

Conservation values; Conservation of biodiversity: Patterns and processes, patterns of losses; loss of biodiversity, causes and factors of mass extinctions and critical hot spots extinctions; conservation of rare species.

**Unit- IV: Conservation Genetics**

Concept of conservation genetics and its importance in conservation biology. DNA fingerprinting; Conservation of diversity within species; Management and conservation of genetic variation in natural populations.

**Unit V: Population Genetics:**

Heterozygosity, variation within population, variation among populations, demographic bottleneck and inbreeding depression.

**Essential readings:**

- Albrecht, Jochen 2007. *Key Concepts & Techniques in GIS*. SAGE publications.
- Das, Chhanda and Negi, S.S. 2007. *A Treatise on Wildlife Conservation in India*, Himalayan Wildlife: *Habitat and Conservation*.
- Dasman, R.F. 1983. *Environment Conservation*, John Wiley and Sons. New York
- Dobzhansky, T. 1973. *Genetics and the Origin of Species*. Oxford & IBH Publishing Co.
- Gupta, P.K. 1990. *Cytology, Genetics, Evolution and Ecology*. Rastogi Publications, Meerut.
- Harvey, Francis 2008. *A Primer of GIS: Fundamental Geographic and Cartographic Concepts* The Guilford Press, New York London.
- Jensen, John R. 2004. *Introductory Digital Image processing: A Remote Sensing Perspective*. (3<sup>rd</sup> edition). Prentice Hall Inc.
- Joseph, George 2005. *Fundamentals of Remote Sensing*, Universities Press (2<sup>nd</sup> edition)
- Mukherjee, A. K. 1982. *Endangered animals of India*. Zoological Survey of India publication. Kolkata
- Patar, Kamal Chandra 2005. *Behavioural Patterns of the one horned Indian Rhinoceros* (Observations in Kaziranga National Park)
- Singh, J.S, Singh, S.P. and Gupta S.R. 2006. *Ecology, Environment and Resource Conservation*. Anamaya Publishers, New Delhi.

**Additional Readings:**

- Burrough, P.A. and McDonnell, Rachel A. 1998. *Principles of Geographical Information Systems* (2<sup>nd</sup> edition), Oxford University Press.
- Negi, S.S. 2002. *Handbook of National Parks, Wildlife Sanctuaries and Biosphere Reserves in India*
- Negi, S.S. 2007. *Forests, Forestry and Wildlife in North-East India*.

## **Paper-202: Wildlife Management and Natural Resource Conservation**

**Full Marks: 100**

**Theory: 75**

**Assignment: 25**

### **Unit-I: Wildlife Management**

Concepts of wildlife management; Wildlife corridors; Human-animal conflict; Introduction, re-introduction and translocation. Conservation breeding. Alien invasive species and its control; Community forestry, Sacred groves; Home garden and its practices in NE India.

### **Unit- II: Natural Resource Conservation**

Concept of resources, classification of resources, use and service value of resources; Forest resources: Timber and non-timber products; Agro-forestry; Common property resources and livelihood; conservation and management of resources; conservation and sustainable development.

### **Unit- III: Biodiversity and Livelihood**

NTFP: classification, prospects for enterprise development (with special reference to bamboo, cane, broom stick, medicinal plants, etc.). Eco-tourism: Potential, prospect of Nature based Tourism; Tools and techniques of Participatory Rural Appraisal (PRA).

### **Unit- IV: Basic Knowledge in Biostatistics**

Sampling unit, sample and population, parametric and non-parametric statistics; graphical representations; central limit theorem; sampling error; statistical hypothesis; one tailed and two tailed test.

### **Unit V: Biostatistical Tests**

Biostatistical Tests: Correlation, regression, ANOVA, t-test, z-test, Spearman Rank correlation, Mann-Whitney U test, Wilcoxon matched paired test, Chi-square test, G- test, Kruskal-Wallice test.



**Essential readings:**

- Agoramoorthy, Govindasamy 2008. Animal Welfare: Assessing Animal Welfare Standards in Zoological and Recreational Parks in South East Asia.
- Ali, S. and Ripley, S. Dilon 1983. *Birds of India and Pakistan*. Bombay Natural History Society publication.
- Bhattacharjee, D. and Bhattacharjee, D. 2010. *B.Sc. Statistics* Vol. I and Vol. II Kalyani Publishers, Ludhiana, India.
- Bishop, O.N. 1980. *Statistics for Biology*, Longman, London.
- Gangstad, E.O. 1990. *Natural Resource management of Water and Land*, Van New York.
- Gardner, R.H., Robert, V., O'Neill, Turner, M.G. 2001. *Landscape Ecology in Theory & practice. Pattern and Process*. Springer-Verlag, USA.
- Gaston, K.J. and Spicer, J.T. 2010. *Biodiversity: An Introduction*. (Second edition). Wiley and Black.
- Goon, A.M., Gupta, M.K. and Dasgupta, B. 1996. *Basic Statistics* vol. I and II, The World Press Pvt. Ltd.
- Krebs, J.R. and Davis, N.B. 1991. *An Introduction to Behavioural Ecology*. Blackwell Scientific Publications.
- Mather, A.S. and Chapman, K. 1996. *Environmental Resources*. Prentice Hall.
- Mukherjee, A. K. 1982. *Endangered animals of India*. Zoological Survey of India publication. Kolkata
- Negi, S.S. 2002. *Handbook of National Parks, Wildlife Sanctuaries and Biosphere Reserves in India*
- Snedecor, G.W. and Cochran, W.G. 1967. *Statistical Methods*, Oxford and IBH, New Delhi.
- Zar, J.H. 2003. *Biostatistical, Analysis*, Pearson Education.

**Additional Reading:**

- Alcock, J. 1993. *Animal behaviour-An evolutionary Approach*. Sinaver Associates Inc. Publishers.
- Besten, Jan Willem den 2008. Birds of India and the Indian Subcontinent
- Bookhout, T.A., Editor. 1996. *Research and management techniques for wildlife*
- Field, Andy 2009. *Discovering statistics using SPSS*. SAGE publication.
- Middleton, N. (1995). *The Global Casino*, Edward, London.
- Mountfort, Guy and Hashim Tyabji 2007. Wild India: The Wildlife and Landscapes of India.
- Mueller Dombois and Ellenberg, H. 1974. *Aims & Methods of Vegetation Ecology* John, Wiley & Sons.
- Negi, S.S. 2007. Forests, Forestry and Wildlife in North-East India
- Parker, R.E. 1979. *Introductory Statistics for Biology*, Edward Arnold, London.

## Practical Paper: Paper-203: Natural Resource Management and Behavioural Ecology

**Full Marks: 100**

**Practical: 75**

**Practical Record, Field Reports & Viva Voce: 25**

- 1) Research questions and research hypotheses designing. Research methodology exercise. Project proposal preparation.
- 2) False colour composition (FCC) interpretation, manual landscape mapping, data collection by hand-held GPS.
- 3) A study of habitat specificity in birds or small mammals in campus. Methods of behavioural observation: focal animal, all-occurrence and one-zero sampling, Scan animal sampling; collection and analysis of behavioural data on some common availability species, preparation of ethograms, time-activity budgets and social interaction matrices;
- 4) Questionnaire preparation. Analysis of pressure and resource dependency of local communities upon PAs; and Community survey methods including participatory learning methods.
- 5) Statistical analyses of data collected during field exercise.
- 6) Field trips to wildlife sanctuaries and national parks for orientation of park management; field report preparation.
- 7) Seminar presentation and viva-voce.

### Essential Reading:

- Banerjee, Ananda. *Common Birds of The Indian Subcontinent : A Field Guide for Beginners* David Ford. E. 2000. Scientific method for ecological research. Cambridge University Press
- Javed, Salim & Kaul, Rahul 2002. *Field methods for bird surveys*. Bombay Natural History Society.
- Lillesand. M. Kiefer, R.W. and Chapman, J.W. 2008. *Remote Sensing and Image Interpretation*. John Wiley and sons.
- Morrison, M.L. et al. 2001. *Wildlife study design*. Springer-Verlag, New York, NY
- Southwood, T.R.E. and Henderson, P.A. 2000 (third edition) *Ecological Methods*. Blackwell Science.
- Turner, M.G. & Gardner, R.H. 1994. *Quantitative Methods in Landscape Ecology*. The Analysis and interpretation of landscape Heterogeneity. Springer-Verlag, Publishers, USA.

**Paper-204: DISSERTATION PROJECT****Full Marks: 100****Dissertation work: 75****Records and Viva Voce: 25****DISSERTATION PROJECT**

The student is required to undertake a 6 month project consisting of approximately three months field investigation, followed by 1 months data analysis and writing up. Projects will be selected in consultation with faculty members during the beginning of 2<sup>nd</sup> semester. The faculty member(s) will be supervisors for the dissertation study. Once his/her dissertation topic has been selected and supervisors identified, the student should familiarize with existing literature on the subject. The students will be encouraged to develop a study design and improve it through consultations. A detail proposal to execute the study will also be essential.

The supervisors should be frequently consulted at every stage of the dissertation project, from preparation of proposal to writing the thesis. This exercise is important as it provides the student with the experience to develop a research proposal and execute it efficiently. Students are generally encouraged to start data entry and analyses in the field to save time. Dissertations will be of the following sequence: Introduction, Methods, Results, Discussion, and Literature cited. The examiners will evaluate the student's ability to identify and discuss ecological problems, develop a hypothesis about the problem, devise a methodology to suite the hypothesis, collect and analyze results with clear understanding of the biases in the data and the results that come out of it, draw conclusions and interpret the results in the context of the research question.

## Post Graduate Diploma in Marketing Management

### FIRST SEMESTER

Subject Code	Paper Name	Credit	Full Marks
101	Principles of Management	6	100
102	Principles of Marketing	6	100
103	Business Economics	6	100
104	Marketing Research (Dissertation -1)	6	100
105	Marketing Communication	6	100

### SECOND SEMESTER

Subject Code	Paper Name	Credit	Full Marks
201	Advertising & Sales Management	6	100
202	Consumer Behaviour	6	100
203	Rural Marketing	6	100
204	Computer Application in Marketing	6	100
205	Dissertation	6	100

### PAPER 101- PRINCIPLES OF MANAGEMENT

**Marks: 100 [ Terms and Examination 70]  
[ internal Assessment -30]**

**Objective: The course attempt to build a strong theoretical foundation of the various functions of management .**

UNIT- I Management concepts & Evaluation of Management:

Management- Meaning, Nature, importance of Management, management as Art, Science, Profession.

Pre- Scientific Management School, Scientific Management, Administrative Management, Human Relations, Approach, Contingency approach, System Approach, Human Recourse Management Approach.

UNIT- II Business and Society.

Business Ethics and Values / Standard of Ethics, Business and Environment , Social responsibilities and Obligations of Business, Changing Scenario of Business Responsibilities.

UNIT- III Functions of Management: I

Planning: Meaning, Nature, Features, Types, Importance, steps, Objectives, Budget, Mission, Strategy, Policy, Principles, Rules, Procedures, Methods, Advantages and Limitations of Planning,

Decision making, Meaning, Types, Methods and Techniques, Business Forecasting, MBO, MBE.

UNIT- IV Function of Management -II

Organising: Concept, Importance, Principles, Foundation and Dimension of Organization, Structure, Span of Management.

Delegation and Departmentalisation: Meaning, Importance, Types and Principles of Delegation, Authority Responsibility and Accountability, Centralization vs Decentralization Principles and Basis of Departmentalisation.

UNIT- V Function of Management III

Manpower planning, Job, Analysis, Recruitment, Selection and Placement, Job, Evaluation, Induction and Training Performance Appraisal.

Directing :-Meaning, Features, Importance, Principles of Directing.

Control: Meaning, Types of control, Control Techniques- Budgetary Control Techniques, Non Budgetary Control Techniques.

Reference:

1. Principle of Management : T. Ramaswamy, (Himalaya Publishing House)
2. Management & Organizational Behaviour : Dr. P. Subhan Rao (HPH) (Text, Cases & Games)
3. Organisation Structure & design : PG Aquinas (Encel Books) (Application & Challenges)
4. Organization & Management : C R Basu (S. Chand & Co. Ltd)
5. Principles of Management: Pradeep Kumar (Kedar Nath Ram Nath & Co.)

## **PAPER 102: PRINCIPLES OF MARKETING**

**Marks: 100 [ Terms and Examination 70]  
[ internal Assessment -30]**

### **Objectives:**

Introduce the field of marketing and offering to explore and analyze various basic components of Marketing.

### **1. Introduction to Marketing:** Definition & Functions of Marketing.

Core concepts of marketing –

- a) Need, Want, Desire, Benefits, Demand, Value, Exchange,
- b) Goods – Services Continuum, Product, Market
- c) Customer Satisfaction, Customer Delight.
- d) Approaches to Marketing – Product – Production - Sales – Marketing – Societal – Relational. Concept of Marketing Myopia. Selling versus marketing.
- e) Holistic Marketing Orientation & Customer Value

### **2. Consumer Behaviour:** Concept, Characteristics of consumer and organizational markets, 5 step Buyer decision process.

**3. Marketing Environment:** Analyzing needs and trends Macro Environment - Political , Economic, Socio-cultural and Technical Environment – PEST analysis. Micro Environment – Industry & Competition. Concept of Market Potential & Market Share

### **4. Market segmentation:** Definition, Need & Benefits. Bases for market segmentation of

consumer goods, industrial goods and services. Segment, Niche & Local Marketing, Effective segmentation criteria, Evaluating & Selecting Target Markets, Concept of Target Market and Concept of positioning – Value Proposition & USP.

**5. Marketing Mix:** Definition of each of the Four P's. Components of each P. Extended 7Ps for services. Significance in the competitive environment.

**Marketing Planning:** Contents of a Marketing Plan - Developing a Marketing Plan for variety of goods and services.

**Market Evaluation and Controls:** Generic Process of Need and Significance of marketing control. Marketing Audit.

### **Books Recommended**

1. Principles of Marketing 12th Edition - Philip Kotler and Gary Armstrong
2. Fundamentals of Marketing - Stanton
3. Marketing Management – Rajan Saxena
4. Marketing Management - V.S.Ramaswamy and S.Namakumari
5. Analysis for Marketing Planning – Donald Lehmann & Russell Winer, 6th ed.
6. Case Studies in Marketing - Indian context - R.Srinivas

## **PAPER 103: BUSINESS ECONOMICS**

**Marks: 100 [ Terms and Examination 70]  
[ internal Assessment -30]**

### **Objectives:**

The course in Managerial Economics attempts to build a strong theoretical foundation for Management students. The course is mainly analytical in nature and focuses on clarifying fundamental concepts from microeconomic viewpoint. The students are expected to study and analyses the dynamics of managerial decision making through this course. Also wherever possible, students are expected to study, analyses and interpret empirical evidence and case studies available currently on various basic concepts.

1. Definition, Nature and Scope of Managerial Economics, Managerial Economics and Microeconomics and macroeconomics. Managerial Economics and decision-making. Uses and Significance of Managerial Economics.

2. Meaning and Determinants of Demand. Demand Function, Law of Demand Market Demand, Elasticity of Demand, Types and Measurement of Elasticity, Demand Forecasting. Meaning, Significance and Methods of Demand Forecasting.

3. Production Function. Law of Variable Proportions. Law of Supply. Elasticity of Supply. Measurement of Elasticity of Supply.

Costs of Production. Short run and long run costs. Economies of Scale. Cost estimation and cost forecasting. Breakeven analysis.

4. Pricing Under Various Market Forms; Perfect competition, Monopoly Monopolistic Competition. Oligopoly. Price Discrimination. Prevention and Control of Monopolies. System of Dual Prices.

5. Pricing Strategies and Methods. Cost plus Pricing. Marginal cost Pricing. Price Leadership. Transfer Pricing. Seasonal Pricing Seasonal Pricing. Cyclical Pricing.

#### **Recommended Books:**

1. *Managerial Economics* – Analysis, Problems and Cases, P.L.Mehta, Sultan Chand and Sons, New Delhi.
2. *Managerial Economics* - Varshney and Maheshwari, Sultan Chand and Sons, New Delhi.
3. *Managerial Economics* – D. Salvatore, McGraw Hill, New Delhi.
4. *Managerial Economics* – G.S. Gupta – T M H, New Delhi.
5. *Managerial Economics* - Mote, Paul and Gupta T M H, New Delhi.
6. *Managerial Economics* – H L Ahuja, S Chand & Co. New Delhi.

**PAPER 104: ( MARKETING RESEARCH ) Dissertation – 1**

**Marks: 100 [ Terms and Examination 70]**



## [ internal Assessment -30]

**UNIT: I**

**Introduction to Marketing Research:** - Importance, Nature and scope of marketing research ; Marketing systems and Marketing research ; Marketing research process and organisation.

Problem identification and Research Design: Problem Identification and definition; Developing a research proposal; Determining research type- exploratory , descriptive and conclusion research; Experimental designs.

**UNIT: II**

Data source : Secondary Data source and usage; online data sources' primary data collection methods- questioning techniques, online surveys, observation method; questionnaire preparation.

Aptitude measurement and scaling techniques- elementary introduction to measurement scales.

Sampling plan: Universe, Sample frame and sampling unit; Sampling techniques; Sample size determination.

**UNIT: III**

**Data Collection : Organisation of field work and survey errors- Sampling and non-sampling errors.**

**Data Analysis: Univariate , beivariate and multivariate data analysis Report preparation and presentation.**

**UNIT: IV :**

**Market Research Applications: Product research ; Advertising research; Sales and market research ; International marketing research ; Marketing research in India.**

**UNIT: V \_:**

Marketing Report writing : Importance , steps, Study of the Specimen business research Report.

Bibliography and References:

1. Research for Marketing decisions- Paul, Donald, Herald- Prentice Hall (India)
2. Zikmund: Exploring Marketing Research, 8e, Thomson 2006
3. Naresh K.Malhotra, Marketing Research, An applied Orientation, Pearson Education Asia
4. David J. Luck, Ronald S. Rubin, Marketing Research, Prentice Hall India Limited

## **PAPER 105 :MARKETING COMMUNICATION**

**Marks: 100 [ Terms and Examination 70]  
[ internal Assessment -30]**

**Objective:** - To make the students aware of importance of soft skills / Communication and develop communication of students.

### **1. Introduction to Communication skills:**

Importance of Communication, types of Communication-Verbal, non Verbal (Written and body language), Communication Process and Principles of Communication.

### **2.Verbal Communication:**

Public Speaking(Elocution/Extempore/Welcome speech/Vote of Thanks/Presentation-with and without use of Audio visual aids), Interview and Interview techniques/Personal Interview, Group Discussion and Debates

Types of verbal Communication (Grapevine, face to face, Telephonic, Negotiation, Formal and Informal etc.), Listening Skills, Barriers in verbal communication

### **3.Non Verbal-Body Language. Kinesics**

Physical Appearance,Postures,Gestures, Dress Code for Formal and Informal occasions.

(Postures and Gestures should include Hand and Legs movement, whole body movement-Sitting, standing, walking style, Facial expressions etc.), Para Linguistic, manners & etiquettes Barriers in non verbal communication.

### **4. Written Communication (35%)**

Letter Writing-types of Business Letter (internal & external business environment), types of formats ( British and American style), Resume writing formats and Job Applications

Other forms of Written Communication-Memo, Agenda, Minutes of the Meeting, Press releases, Handouts, Notice, circulars etc.)

Recent developments in modes of communication like internet, video conferencing etc.

### **5. New media:**

Meaning Characteristics, most common vehicle of new media- internet, DVD & CD ROM, digital camera, mobile phone, Tele conferencing and media convergence

1. Marketing Communication: Principles and Practice, Richard J. Varey, Routledge, 2002.
2. Marketing Communication: A Critical Introduction Hardcover – December 14, 2001 by Richard Varey (Author)

## **PAPER 201: ADVERTISING AND SALES MANAGEMENT**

**Marks: 100 [ Terms and Examination 70]  
[ internal Assessment -30]**

### **Course Objective**

This course aims to enable students to understand the scope, significance and practical aspects of advertising and sales promotion. It also exposes the students to the functional implications and the environmental influences on integrated marketing communication.

### **UNIT – I**

Concept and definition of advertisement – Social, Economic and Legal Implications of Advertisement – setting advertisement objectives – Advertising Agencies – Selection and remuneration – Advertisement campaign

### **UNIT – II**

Media plan – Type and choice criteria – Reach and frequency of advertisement – Cost of advertisement - related to sales – Media strategy and scheduling.

### **UNIT – III**

Message development – Types of advertisement – Layout – Design appeal – Copy structure – Advertisement production – Print – Radio - Television - Web advertisements – Media Research – Testing validity and Reliability of advertisements – Measuring the impact of advertisement

### **UNIT – IV**

Scope and role of sale promotion – Definition – Objectives of sales promotion - sales promotion techniques – Trade oriented and consumer oriented.

### **UNIT – V**

Sales promotion – Requirement identification – Designing of sales promotion campaign – Involvement of salesmen and dealers – Outsourcing sales promotion - National and international

promotion strategies – Integrated promotion – Coordination within the various promotion techniques – Online sales promotions

## **REFERENCES**

1. Betch E. and Michael, Advertising and Promotion, McGraw Hill, 2003.
2. George E Belch and Michel A Belch, Advertising & Promotion, McGraw Hill, Singapore, 1998.
3. Jaishri Jefhwaney, Advertising Management, Oxford, 2008.
4. Julian Cummings, Sales Promotion, Kogan Page, London 1998.
5. Kazmi S. H. H. and Satish K Batra, Advertising & Sales Promotion, Excel Books, New Delhi, 2001.
6. Kenneth Clow. Donald Baack, Integrated Advertisements, Promotion and Marketing communication, Prentice Hall of India, New Delhi, 2003.
7. Wells, Moriarty & Burnett, Advertising, Principles & Practice, Pearson Education, 7th Edition, 2007.

## **PAPER 202: CONSUMER BEHAVIOUR**

**Marks: 100 [ Terms and Examination 70]  
[ internal Assessment -30]**

### **Course Objective**

This course aims at enabling students to understand why and how consumers make consumption and buying decisions. This would enable them to make better strategic marketing decisions.

### **UNIT – I**

Concepts – Significance – Dimensions of Consumer Behaviour – Application of knowledge of Consumer Behaviour in marketing decisions.

### **UNIT – II**

Industrial and individual consumer behaviour models - Howard- Sheth, Engel – Kollat, Webstar and wind Consumer Behaviour Models – Implications of the models on marketing decisions.

### **UNIT – III**

Psychological Influences on consumer behaviour – motivation – perception – personality - Learning and Attitude- Self Image and Life styles – Consumer expectation and satisfaction.

### **UNIT – IV**

Socio-Cultural Influence, Cross Culture - Family group – Reference group – Communication – Influences on Consumer behaviour

### **UNIT – V**

High and low involvement - Pre-purchase and post-purchase behavior – Online purchase decision process – Diffusion of Innovation – Managing Dissonance - Emerging Issues – case studies.

## **REFERENCES**

1. Assel, Consumer Behavior - A Strategic Approach, Biztranza, 2008.
2. David L. Loudon and Albert J Della Bitta, Consumer Behavior, McGraw Hill, New Delhi 2002.
3. Frank R. Kardes, Consumer Behaviour and Managerial Decision Making, 2nd Edition.
4. Indian Edition, 7th Edition 2005.
5. Jay D. Lindquist and Joseph Sirgy, Shopper, Buyer and Consumer Behavior, Biztranza, 2008.
6. Leon G. Schiffman and Leslie Lasar Kanuk, Consumer Behavior, Pearson Education, India, 2002.
7. Paul Peter et al., Consumer Behavior and Marketing Strategy, Tata McGraw Hill,
8. Sheth Mittal, Consumer Behavior- A Managerial Perspective, Thomson Asia (P) Ltd., 2003.

## **PAPER 203: RURAL MARKETING**

**Marks: 100 [ Terms and Examination 70]  
[ internal Assessment -30]**

### **Course Objective**

The objective of this course is to enable students to understand the importance of rural market and rural customers. The students are exposed to the unique requirements of the rural market.

### **UNIT I**

Defining rural market – profile of rural market and rural consumers – characteristics specific to rural consumer – rural marketing opportunities and challenges.

### **UNIT II**

Rural market segmentation – bases of segmentation – selecting target market – product positioning in rural markets.

### **UNIT III**

Rural consumer behaviour – changing trends – rural consumer decision making process – influencing factors.

### **UNIT IV**

Products and services – designing innovative products and services to rural market – pricing methods – methods of distribution – role of cooperative sectors – public distribution system.

### **UNIT V**

Designing advertisement campaigns for rural markets – media choice – sales promotion techniques – personal selling and publicity – impact of information technology on rural communication.

## REFERENCES

1. Krishnamachariyula, Cases in Rural Marketing, Person Education, 2003.
2. Krishnamachariyula, Rural Marketing text of cases, Person Education, 2002.
3. Pradeeo Kashyap and Siddhartha raut, The Rural Marketing, Biztantra, New Delhi, 2004.
4. Ram Kishen, New Perspectives in Rural and Agricultural Marketing, Jaico Publishing House, Mumbai 2005

**Marks: 100 [ Terms and Examination 70]  
[ internal Assessment -30]**

## PAPER 204 : Computer Application in Marketing

**Marks: 100 [ Terms and Examination 70]  
[ internal Assessment -30]**

Objective: The purpose of this course is to develop understanding of Web- based Commerce and equip them to assess e-commerce requirements of a business and develop e-business plans and to interact with various IT professionals who may be developing e-commerce applications.

### Course Outline:

Unit-1: Introduction to Electronic Commerce: Meaning, nature and scope; Business application of e-commerce; Global trading environment and adopting of ecommerce, Evolution of World Wide Web. Future of Web.

Business Models of E-Commerce; B2B, B2C, B2G and other models of ecommerce; Applications of e-commerce to supply chain management

Unit-2: Electronic Payment System: Types of payment systems –e-cash and currency servers, e-cheques, credit cards, smart cards; electronic purses and debit cards; Operational, credit and legal risk of e-payment, Risk management options for epayment systems, Set standards.

Unit-3: Security Issues in E-Commerce: Risks of e-commerce –Types and sources of threats, Protecting electronic commerce assets and intellectual property; Firewalls; Client server network security; Data and message security; Security tools; Digital identity and electronic signature; Encryption and concepts of public and private key infrastructure; Risk management approach to e-commerce security.

International cyber laws – cyber laws – Aims and salient Provisions; Cyber laws in India and their limitations; Taxation and e-commerce, Ethical Issues in ecommerce.

### Unit-4: . MS-Word, Excel

**MS word – Introduction,** Creating, opening, closing, saving and editing a word Document; Insert header and footer in the document; Create a link between two files using Hyperlink. ; Create a mail-merge and add data of 5 recipients; Protect a document; Implement macro.  
**MS-EXCEL-** Introduction, Data entry; filter data; Sorting data in ascending and descending order; the use of goal seek; use of different functions.

### **Unit-5: Powerpoint, Introduction to tally**

**MS-POWERPOINT:** Introduction, Create slides in PowerPoint ; Make a master slide; Insert Animation; Insert a background in PowerPoint; Features of tally ; creation of company by tally ; preparation of balance sheets.

Suggested Readings:

1. Laudon, Kenneth C. and Carol Guercio Traver (2002) E-commerce: business, technology, society. (New Delhi : Pearson Education).
2. Awad, Elias M. (2007), Electronic Commerce: From Vision to Fulfillment (New Delhi : Pearson Education).
3. Kalakota, Ravi and Marcia Robinson (2001). Business 2.0: Roadmap for Success (new Delhi : Pearson Education).
4. Smith, P.R. and Dave Chaffey (2005), eMarketing eXcellence; The Heart of eBusiness (UK : Elsevier Ltd.)

### **PAPER 205: Dissertation 70 Marks , Viva-voce -30 Marks**

1. Viva-voce examination will be conducted in the Department and one external member from other department will be invited as external expert to conduct the Viva- Voce examination.
2. The average marks of two examiners- one of them is concerned supervisor and the other external examiner nominated by the HOD will be taken in to consideration. However, for Viva-Voce the average marks given by the concerned supervisor, HOD & external expert will counted.

# Post Graduate Diploma In Bioinformatics

## Assam University :: Silchar

### Detailed Course Structure and Syllabus

#### The Programme

The Post Graduate Diploma in Bioinformatics is of one year duration. The Programme has been organized in two semesters, First semester and second semester.

#### COURSE STRUCTURE

Sl. No.	Name of the modules	Total marks	Pass Marks
<b>Semester -I</b>			
a)	PGDBI-T1: Modern Biology and Basic Bioinformatics	70	30
b)	PGDBI-T2: Basic Computer Application and Fundamentals of Programming	70	30
c)	PGDBI-T3: Biostatistics and Basic Mathematics	70	30
d)	PGDBI-P1: Practical	30	10
Sub-Total (A)		240	100
<b>Semester-II</b>			
e)	PGDBI-T4: Introduction to Database and Programming	70	30
f)	PGDBI-T5: Genomics, Proteomics and Structural Biology	70	30
g)	PGDBI-P2: Practical	30	10
h)	PGDBI-Project: Project/Dissertation work	90	30
Sub-Total (B)		260	100
<b>TOTAL (A+B)</b>		<b>500</b>	<b>200</b>



**PGDBI-T1: Modern Biology and Basic Bioinformatics****Unit-1**

1. Basics of cell biology: Structure and Functions of Cellular Organelles, Cell Cycle, Chromosome Structure, Cellular Metabolic Pathways
2. Basics of Genetics: Mendel's works and experiments, chemical basis of heredity
3. Pathway of Carbohydrate, Lipid and Nitrogen metabolism

**Unit-2**

1. Molecular Biology: Structure of Nucleic acids, Structure of a Gene, Central Dogma, Concepts of Genetic code and ORF's, DNA Replication, Chromosomal Aberration
2. Mutation and its implications, Amino acid structure and properties, Different levels of protein structure, Concepts of pH and Buffer
3. Genome Sequencing Techniques, Polymerase Chain Reaction, Chromatographic Techniques, Gel Electrophoresis, Blotting Techniques

**Unit-3**

1. Introduction to Biological Databases: NCBI, EMBL, PIR, SWISS-Prot, PubChem Compound, KEGG-Pathway, ChEMBL, BindingDB. Analysis of Three Dimensional Structure of Proteins, RCSB-PDB
2. Computation of various parameters using proteomics tools at the ExPASy server and EMBOSS
3. Repositories for high throughput genomic sequences: EST, STS GSS, etc.; Genome Databases at NCBI, EBI, TIGR, SANGER.

**Unit-4**

1. Detection of ORF's, Outline of Sequence assembly, Mutation Matrices, Pair wise Sequence Alignments, BLAST and FASTA
2. Multiple Sequence Alignment and Phylogenetic Analysis.
3. Restriction Enzymes and rDNA Technology

**Suggested Readings:**

- a) David W Mount, Bioinformatics: Sequence And Genome Analysis, Cold Spring Harbor Press.
- b) Terence A Brown, Genomes 3. Oxford: Wiley-Liss
- c) Benjamin Cummings, Becker's World of the Cell by Jeff Hardin
- d) Attwood, Introduction to Bioinformatics

## PGDBI-T2: Basic Computer Application and Fundamentals of Programming

### Unit-1

1. Fundamentals of Computer, Basic Applications of Computer; Components of Computer System, Central Processing Unit (CPU), VDU, Keyboard and Mouse, Other input/output Devices, Computer Memory, Concepts of Hardware and Software; Concept of Computing, Data and Information
2. Basics of Operating System; Popular Operating Systems (Windows, Linux, DOS); Introduction to Internet, www, HTML and URL's
3. Understanding Word Processing: Word Processing Basics; Text creation and Manipulation; Formatting of text; Using Spread Sheet: Basics of Spreadsheet; Manipulation of cells; Formulas and Functions; Basics of presentation package and application

### Unit-2

1. Communication using the Internet: Basic of Computer networks; LAN, MAN, WAN; Concept of Internet; Applications of Internet; What is ISP; Knowing the Internet; Basics of internet connectivity (MODEM, ROUTER, SWITCH, wired connection etc.)
2. WWW and Web Browsers: World Wide Web; Web Browsing software, Search Engines; Understanding URL; Domain name; IP Address;
3. Communications and collaboration: Basics of electronic mail; Getting an email account;

### Unit-3

1. The C Language and its Advantages; The Structure of a C Program; Writing C Programs; Building an Executable Version of a C Program, Data Types, Operands, Operators, and Arithmetic Expressions
2. Input/Output Management, The getchar() and putchar() Functions and Single-character I/O, Formatted Input and the scanf() Function, The Control-flow Program Statements, Looping Statements, The Data-checking Process
3. Arrays, Command-line arguments, File Input and Output, Combining Command-line Arguments and File I/O

### Unit-4

1. Introduction to PERL; variables; Array; Initialization and manipulation
2. Arithmetic and logical operators; Conditional statement and Loops; Regular expressions; Function and subroutines
3. Application of PERL in Bioinformatics; concatenating DNA fragments; DNA to RNA; Reading protein Files; Finding motifs; ORFs; DNA to protein; Reading sequence from file; Converting PERL to executable file.

### Suggested Readings:

- a) P.K. Sinha, Fundamentals of computer
- b) Greg Johnson, Introduction to PERL
- c) Yashwant Kanetkar, Let us C

### PGDBI-T3: Biostatistics and Basic Mathematics

#### Unit-1

1. Measure of central tendency and dispersion.
2. Introduction: Nature of Statistics, Uses of Statistics, Statistics in relation to other disciplines, Abuses of Statistics.
3. Types of Data: Concepts of population and sample, quantitative and qualitative data, cross-sectional and time-series data, discrete and continuous data, different types of scales.

#### Unit-2

1. Bivariate data – scatter diagram, correlation coefficient and its properties, Correlation ratio, Correlation Index, Concept of Regression, Principles of least squares, Fitting of polynomial and exponential curves.
2. Rank correlation – Spearman's and Kendall's measures.
3. Sampling Distributions: Introduction: Concepts of Random Sampling, Statistics and Sampling

#### Unit-3

1. Elements of Hypothesis Testing : Null and Alternative hypotheses, Simple and Composite hypotheses, Critical Region, Type I and Type II Errors, Level of Significance and Size, p-value, Power
2. Distributions of Statistics: Illustrations using different distributions, reproductive properties of the distributions.
3. Sampling Distributions :  $\chi^2$  distribution, distributions of the mean and variance of a random sample from a normal population; t and F distributions; distributions of means, variances and correlation coefficient

#### Unit-4

1. Matrix; Determinants and their application;
2. Complex numbers; Binomial theorem; Coefficient
3. Bayes' theorem and probability

#### Suggested Readings:

- a) Zar, Biostatistics.
- b) Chakraborty, A class book of Mathematics, S Chand & Comp.

## PGDBI-T4: Introduction to Database and Programming

### Unit-1

1. Introduction; Characteristics of Database approach; Advantages of using DBMS approach; A brief history of database applications; Data models, schemas and instances; Three-schema architecture and data independence;
2. Database languages (DDL and DML) and interfaces; Database system environment; Centralized and client-server architectures; Classification of Database Management systems.
3. ENTITY-RELATIONSHIP MODEL: Entity Types, Entity Sets, Attributes and Keys; Relationship types, Relationship Sets, Refining the ER Design; ER Diagrams,

### Unit-2

1. SQL Data Definition and Data Types; Specifying basic constraints in SQL; Schema change statements in SQL; Basic queries in SQL; Insert, Delete and Update statements in SQL; Database programming issues and techniques;
2. Informal Design Guidelines for Relation Schemas; Functional Dependencies; Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms; Boyce-Codd Normal Form.
3. Update Operations, Transactions and dealing with constraint violations; Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational Operations : JOIN and DIVISION; Additional Relational Operations;

### Unit-3

1. Introduction to Php; How php better than other language; How php works with the web server; Php tags. Web architecture: MVC model, API, URL
2. Basic Development concepts: Php Syntax; Datatype; Operator; Variable; If else statement. Switch case.
3. Array: Array Structure; Type of array; Single and multi-dimensional array; Creating and deleting file; Reading and writing file; Creating and deleting folder.

### Unit-4

1. OOPs Concept; Class and object; Properties of object; Encapsulation and abstraction; Inheritance; Polymorphism; Abstract class.
2. Java: tokens and keywords; Data type; Declaring objects; garbage collection; Function overriding; Recursion; Try & Catch; Package & Interface
3. Java Thread Model; Thread priorities; JDBC, its type and application; basics of HTML.

### Suggested Readings:

- a) Korth, DBMS
- b) Balaguruswamy, Java Programming
- c) Gilmore, Beginning PHP and MySQL 5: From Novice to Professional

**PGDBI-T5: Genomics, Proteomics and Structural Biology****Unit-1**

1. Whole Genome Analysis, Comparative Genomics, Concepts of Pharmacogenomics
2. Human Genetic Disorders; Gene Expression study using Microarray, Customized Microarray design, Public Microarray data sources
3. Gene/Protein function prediction using Machine learning tools: supervised/unsupervised learning, Neural networks etc.

**Unit-2**

1. Basics of Protein Structure, Introduction to basic Proteomics Technology, Bioinformatics in Proteomics, Protein arrays,
2. Protein Structure and Ramachandran Plots, Protein Structure to Function Relationships.
3. Comparative Genome Analysis using Proteomics, Differential Expression on 2D-gel

**Unit-3**

1. Basic Principles of Amino Acid Sequencing, Protein Synthesis, Isolation, Purification, Characterization and Estimation
2. Classification and comparison of protein 3D structures: Purpose of 3-D structure comparison and concepts, RMSD, Z-score for structural comparison ;Proteomics tools at the ExPASy server and EMBOSS,
3. Prediction of secondary structure: PHD and PSI-PRED methods, Protein Structure Prediction and Homology Modeling; Protein as Drug target: Some Case Studies,

**Unit-4**

1. Molecular Interaction Fields and Docking, Concept of Active Site of Enzymes, Protein-Protein and Protein-Ligand Docking
2. Introduction to QSAR and Combinatorial Chemistry, In silico prediction ADMET properties for Drug Molecules
3. Chemo informatics and its application in Computer Aided Drug Designing

**Suggested Readings:**

- a) A. Malcolm Campbell, Laurie J. Heyer. Discovering Genomics, Proteomics and Bioinformatics.
- b) Branden and Tooze, Introduction to protein structure.
- c) Dunn & Pennington, Proteomics
- d) Palzkill, Proteomics

**PGDBI-P1: Practical**

Retrieval of DNA/RNA/protein sequences; Biological sequence editing and analysis; PCR primer designing; Plasmid vector designing; Retrieving, visualization and analysis of macromolecular structure.

Sequence alignment: database searches (BLAST, FASTA etc.), PSA and MSA; Draw and analysis of chemical structures; Submission of nucleotide sequence using BankIT; Gene finding and analyses of Genomes;

Basic C programming (use of operator and loops); Use of Array and structures.

**PGDBI-P2: Practical**

Webpage design using HTML; Database preparation in SQL; SQL commands; operating PHP, WAMP, LAMP etc;

Basic Java Programming; Creating and operating objects and classes

Basic PERL programming; Designing PERL program for analysis of nucleotide and protein sequences;

**PGDBI-Project: Project/Dissertation**

The students will be assigned with a practical project at the end of the first semester which they will have to complete by the end of second semester under the supervision of a teacher concerned to the following themes.

1. Computer Aided Drug Designing
2. Phylogenetic Analyses
3. Protein Structure prediction
4. Construction of databases
5. Developing Bioinformatics tools

The project report should be submitted to the centre and should comply with the guidelines given in the student corner of the webpage.

## Post Graduate Diploma in Information Technology

### Syllabus for One Year Post Graduate Diploma in Information Technology . First Semester Course Structure

Paper Code	Name of the Paper	Periods			Evaluation Scheme		Full Marks
		L	T	P	Sessional	End Sem. Exam.	
PGD - 101	Programming and Problem Solving	4	1	0	MM:25 QM:07	MM:75 QM:23	100
PGD - 102	Data Structure	4	1	0	MM:25 QM:07	MM:75 QM:23	100
PGD - 103	Digital Logic	4	1	0	MM:25 QM:07	MM:75 QM:23	100
PGD - 104	Information Technology	4	1	0	MM:25 QM:07	MM:75 QM:23	100
PGD - 105 (a)	IT Lab - I Programming and Problem Solving	0	0	4	12	MM:37 QM:13	50
PGD - 105(b)	Data Structure	0	0	4	12	MM:37 QM:13	50

### Second Semester Course Structure

Paper Code	Name of the Paper	Periods			Evaluation Scheme		Full Marks
		L	T	P	Sessional	End Sem. Exam.	
PGD - 201	System Analysis and Design	4	1	0	MM:25 QM:10	MM:75 QM:30	100
PGD - 202	Web Technology	4	1	0	MM:25 QM:10	MM:75 QM:30	100
PGD - 203	Elective	4	1	0	MM:25 QM:10	MM:75 QM:30	100
PGD - 204	Object Oriented Programming	4	1	0	MM:25 QM:10	MM:75 QM:30	100
PGD - 205(a)	IT Lab - II Object oriented Programming	0	0	4	12	MM:37 QM:13	50
PGD - 205(b)	Project	0	0	4	12	MM:37 QM:13	50

### Abbreviations

L- Lecture

T-Tutorial

P-Practical

C-Credit

MM- Maximum Marks

QM-Qualifying Marks

### ELECTIVE

a. Database Management System

b. Software Engineering

c. Operating System

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4 1 0

## **PGD 101 Programming and Problem Solving**

Full marks: 100

Pass Marks: 40

### **Unit 1:-**

Notion of an algorithm, tools for design and analysis of algorithms- Flow chart decision table, Pseudo code

### **Unit 2:-**

Major hardware and software components of a digital computer; concept of machine language and high level Language,

### **Unit3:-**

Expressions; data type; conditional statement, Iterative Statements; Array data type and use of arrays; character data type and text processing; functional and procedural abstraction.

### **Unit 4:-**

Pointer Data type and simple applications of pointers. Example algorithms: string processing, root finding, Matrix operations, record processing, searching & sorting.

### **Unit 5:-**

File Handling & Debugging.

### **Text Books:**

1. Programming in C – E. Balaguruswamy, TMH Publication
2. Programming with C- Gottfried B, TMH Publication.
3. Let us C- Y Kanitkar, BPH Publication

### **Reference Book:**

1. How to solve it by Computer- Drommy G, PHI (EEE), 1985
2. Karnigham and Ritchie: The programming Languages.



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## **PGD 102: Data Structure**

Full marks: 100

Pass Marks: 40

### **Unit 1:-**

Basic concepts: Data Structures, Algorithms, Complexity of algorithm.

### **Unit 2:-**

Basic data types, List, Stack, Queues. Trees: Definition & implementation ;  
Binary trees | Tree traversal, Postfix, Prefix notations.

### **Unit 3-**

Sets: Implementation; Dictionary, hash table, Priority queues; Advanced set representation method- Binary search tree, AVL Tree, Balanced Tree.

### **Unit 4:-**

Directed graph: Representation; Single source shortest path problem, all pair shortest path problem, Transitive Closure, Undirected Graph, Minimum Spanning tree.

### **Unit 5:-**

Sorting Algorithm: Quick Sort, Heap sort, selection Sort, Binary Sort. Memory Management, Garbage Collection.

### **Text Books:**

1. Data Structures & algorithm- Addison & Wesley.
2. Fundamentals of Algorithm-Horowitz & Sahni, Narosa Publishing House.
3. The Art of Computer programming-Knuth. D.Vol I & Vol II, Addison Wesley.

### **Reference Books:**

1. Data structure through C- Y. Kanitkar, BPH Publication

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## **PGD 103: Digital Logic**

Full marks: 100

Pass Marks: 40

### **Unit 1:-**

Representation of information: Number System: Binary, Octal, Hexadecimal; Positive & negative numbers; Fixed point & floating point quantities.

### **Unit 2:-**

Arithmetic operations: Addition, Subtraction. Character Codes: ASCII and EBCDIC, Redundant coding for error detection and correction: Concept of hamming distance, Parity codes, Hamming Codes.

### **Unit 3-**

Combinational Logic circuits: - AND, OR, NAND, NOR & NOT gates and tristate buffer; Implementation of Boolean functions using logic gates. Logic Design: Boolean Algebra, Boolean Variables and functions- Canonical & standard forms, Truth table & minimization of Boolean functions-Karnaugh map.

### **Unit 4:-**

Combinational circuits: Multiplexer, Decoder; encoder, Simple arithmetic and logic gate.

### **Unit 5:-**

Sequential Circuits- Flip flops, Shift registers and Counters- Synchronous and Asynchronous. Concept of bus and registrar transfer logic.

### **Text Books:**

1. Digital Logic and Computer design- Mano M.M, PHI (EEE) Publication
2. An introduction to Digital Computer and design-Rajaraman, V Radhakrishnan
3. Computer System & architecture- Mano M.M, PHI (EEE) Publication.

### **Reference Books:**

1. Computer organization- Hamacher, Vranesic, Zaky-McGraw Hill.

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## **PGD 104: Foundation of Information Technology.**

Full marks: 100

Pass Marks: 40

### **Unit 1:-**

Information: Concept of information and information processing; Information gathering, storage, processing, retrieval, and dissemination; Evaluation of information processing. Elements of modern information processing system.

### **Unit 2:-**

Hardware: Processor, input/ output devices, storage devices & media. Data communication equipment.

Software: System & Application.

L

### **Unit 3:-**

Machine Language, Assembly Language, High level language, Low level language, Generation of Computer language, Operating System, Major function, Task function.

### **Unit 4:-**

Data communication networks, Computer network LAN, MAN, WAN, Client Server Architecture, Network Structure, Communication service across network, Network Protocol(Telnet, HTTP,SOAP,POP), e-mail, internet, Communication device.

### **Unit 5:-**

Integrity definition, Enduring integrity, Computer and communication security, Concept of security, Preventive measures and treatment

### **Text and Reference Books:**

1. Rajaraman V, "Introduction to Computer"
2. Morris, "Computer organisation"
3. Kanter, "Managing Information System"
4. Hamacher, "Computer organisation"

**PGD 105 IT Lab-I**

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0 0 4

**a. Programming and Problem Solving (in C)**

- Writing an algorithm and drawing Flow chart of at least three programs;
- Writing programs for:  
    computing Expressions; declaration of data type;
- Writing programs using:  
    Conditional statement; Iterative Statements;
- Writing programs for:  
    Declaration of Arrays and use of arrays: one and two dimensions; character data type and text processing;
- Writing programs:  
    Declaration and use of functions
- Writing programs:  
    Declaration and use of pointers
- Writing programs for:  
    File Handling

L T P  
0 0 4

**b. Data Structure (in C)**

Write programs for declaration of data types and use of input-output statement:

Write programs for :

- List: Sequential; Linked
- Stack and Queues: Implementation, application
- Tree - Binary, AVL, Balanced .
- Search – Sequential, Binary, Hashing
- Sort - Quick Sort, Heap sort, selection Sort, Binary Sort
- Graph: Breadth First Search, Depth First Search;  
Implementation of Minimum Spanning tree.  
Shortest path problem: Single source, all pair  
Transitive Closure,

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4 1 0

## **PGD 201- System Analysis and Design**

Full marks: 100  
Pass Marks: 40

### **Unit-1**

Overview of systems analysis and design; Information systems concepts; Systems development life-cycle; Project selection, feasibility analysis, design, implementation, testing and evaluation.

### **Unit-2**

Project selection: Sources of project requests, managing project - review and selection; preliminary investigation.

Feasibility Study: Technical and economical feasibility; cost and benefit analysis.

### **Unit-3**

System requirement specification and analysis: Fact finding techniques; data flow diagrams; data dictionaries; process organization and interactions; Decision analysis- decision trees and tables.

Detailed design: Modularization, module specification; file design; systems development involving databases.

### **Unit-4**

System control and quality assurance: Design objectives; Reliability and maintenance; Software design and documentation tools; Top-down and bottom-up and variants; Units and integration testing; Testing practices and plans; System controls; Audit trails.

### **Unit-5**

System administration and training, conversion, and operation plans.

Hardware and software selection: Hardware acquisition - memory, processors, peripherals, benchmarking, vendor selection; Software selection- Operating system, languages; Performance and acceptance criteria.

### **Books/References:**

1. Senn J.A., Analysis and Design of Information Systems, McGraw Hill.
2. Awad, E.M, Systems Analysis and Design, Irwin series.
3. Lucas, H.C, The Analysis, Design and Implementation of Information Systems, McGraw Hill.

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**PGD 202- Web Technology**

Full marks: 100

Pass Marks: 40

**Unit-1**

Basics Of Internet

Client/Server Computing: What is C/S Computing, Middleware, Fat client VS Fat Servers, N-tiered Software Architecture.

**Unit-2**

Markup Languages And Their Grammers: SGML, DTD Resouce ; HTML, CSS;  
XML, XSL, Query Languages for XML W3schools xml validator script  
Web Browser: Browser Architecture, Configuration of Netscape and IE

**Unit-3**

Web Server Apache Architecture : Web Server Architecture, Server Features,  
Configuration of Apache and IIS .  
Protocols: HTTP, FTP, SMTP, POP; JAVASCRIPT CGI PROGRAMMING JAVA

**Unit-4**

Overview of Java, JAVA Applet, JAVA Servlet;  
ASP & JSP Search Engines; Web Database Connectivity;  
CGI interface to Datatabase, JDBC interface to Database .

**Unit-5**

Web Security: S-HTTP, Fire Walls, Proxy Servers.  
Distributed Object Models: CORBA, DCOM, EJB.

**Books/References:**

1. Shelly Powers et al., Dynamic Web Publishing , Techmedia, 1998.
2. Jamie Jaworski, Java 1.2 Unleashed , Techmedia, 1998.
3. Robert Niles et.al., CGI by Examples , Que, 1996.
4. Scot Johnson et.al., Using Active Server Pages , Que,, Information Technology.

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**PGD 203-a Database Management Systems**

Full marks: 100

Pass Marks: 40

**Unit-1**

Overview: Concept of database, data independence, redundancy Control; Database architecture - ANSI model.

**Unit-2**

Modeling of real world situation: Entity-relationship model; Data models: Network, Hierarchical, Relational. data model: DDL, DML: relational algebra and calculus; functional dependencies, normal forms, decomposition, integrity rules;

**Unit-3**

Query languages for relational systems: SQL, QBE, query optimization, embedded SQL.

**Unit-4**

Database transactions, concurrency control, recovery and security issues in databases. Brief treatment of: Client-server models, distributed databases,

**Unit-5**

Object-oriented databases, deductive databases, multimedia databases, active databases.

**Books/References:**

1. Silberschatz and Korth, Database system concepts, McGraw Hill.
2. Elmasri and Navathe, Fundamentals of database systems; Narosa Publishing Co.

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**PGD 203-b Software Engineering**

Full marks: 100

Pass Marks: 40

**Unit-1**

Introduction to SE, Software Development Life-cycle: Requirements analysis, software design, coding, testing, maintenance, etc.

**Unit-2**

SE models: Waterfall model, prototyping, interactive enhancement, spiral model. Role of Management in software development. Role of metrics and measurement, SRS: Problem analysis, requirement specification, validation, metrics, monitoring and control.

**Unit-3**

System Design: Problem partitioning, abstraction, top-down and bottom-up design, Structured approach, Functional versus object-oriented approach, design specification, Coding: Top-down and bottom-up

**Unit-4**

Testing: Levels of testing functional testing, structural testing, test plane, test cases specification, reliability assessment.

**Unit-5**

Software Project Management: Cost estimation, Project scheduling, Staffing, Software configuration management, Quality assurance, Project Monitoring, Risk management, etc.

**Text Books & References**

1. Jalote, Pankaj “Integrated Approach to Software Engineering”, Narosa, 1993.
2. Pressman, R. “Software Engineering A Practitioner’s Approach”, Fourth Edition, McGraw Hill 1997.
3. Rumbaugh, J. Blaha, M. Premeralani, W. Eddy F. and Lorensen, W. “Object- Oriented Modelling and Design”, Prentice Hall of India, 1991, (Reprinted 1997)



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## **PGD 203-c Operating System**

Full marks: 100

Pass Marks: 40

### **Unit-1**

Operating System objective and function. The Evaluation of Operating Systems. Batch, interactive, time-sharing and real time systems. Protection. System components, operating system service, System structure.

### **Unit-2**

Concurrent Processes: Process concept, Principles of concurrency. The Producer/consumer problem, The critical section problem. Semaphores, Classical problems in concurrency, Inter processes Communication, Process generation, Process Scheduling.

### **Unit-3**

CPU Scheduling: Scheduling concepts. Performance criteria. Scheduling algorithms. Multiprocessor scheduling, Dead locks: System model. Dead lock Prevention, avoidance and detection. Recovery from dead lock.

### **Unit-4**

Memory Management: Base machine, Resident Monitor, Multi programming with fixed partitions. Multiprogramming with variable partitions. Multiple Base Registers. Paging, segmentation. Paged segmentation, Virtual Memory concept, Demand Paging, Performance, Page Replacement algorithms, Allocation of frames, Thrashing, cache memory Organisation impact on performance.

### **Unit-5**

I/O management & Disk Scheduling: I/O Devices and the organisation of the I/O function. I/O Buffering, Disk I/O, Operating System Design issues.

File System: File concept- File organisation and Access mechanism. File Directories, File sharing. Implementation issues.

### **Text Books & References**

1. Milenkovic M.. “Operating System: Concept & Design”, McGraw Hill.
2. Tanenbaum. A.S. “Operating System Design & Implementation”. Practice Hall NJ.
3. Stalling. William “Operating Systems”, Maxwell McMillan International Editions, 1992.
4. Dietel, H.N. “An Introduction to Operating Systems”, Addison Wesley.

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4 1 0

## **PGD 204- Object Oriented Programming.**

Full marks: 100

Pass Marks: 40

### **Unit-1**

Part I : Object Oriented Programming

Structured Programming and Object Oriented Programming paradigms.

### **Unit-2**

Key Concepts :

Data Abstraction : Class, object, constructors, destructors, memory allocations for objects, member functions, friend functions, templates.

### **Unit-3**

Inheritance : Single & multiple inheritance, virtual base class.

Polymorphism : Compile time polymorphism : operator overloading, function overloading, static binding.

Run-time polymorphism : Virtual function, pure virtual function, abstract class, dynamic binding.

### **Unit-4**

Exception handling.

Part - II Object Oriented Design

Object Oriented Design Approaches: Object Model, Dynamic Model, and Functional Model. (Objet Diagram, State Diagram, and DFD).

### **Unit-5**

Phases of Object Oriented Development: Object Analysis, System Design, Object Design.

### **Books/References:**

1. Herbert Schild : The Complete Reference to C++, Osborne McGrawHill.
1. Rambaugh et al. : Object Oriented Modeling and Design, PHI(EEE).
2. Grady Booch: Object Oriented Analysis and Design, Pearson Education.
3. Bjarne Stroustrup: The C++ Programming Language, Addison Wesley

Full marks: 100  
Pass Marks: 40

## **PGD 205 IT Lab-II**

### **a. Object Oriented Programming (in C++)**

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**0 0 4**

- Writing an algorithm and drawing Flow chart of at least three programs;
- Writing programs for:  
    computing Expressions; declaration of data type; Input-Output Statements
- Writing programs using:  
    Class declarations and object
- Writing programs for:  
    Implementation of Constructor, Destructor, Member function, Friend Function
- Writing programs:  
    Implementation of Inheritance-single and multiple
- Writing programs:  
    Polymorphism: Operator overloading, function overloading

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### **b. PROJECT**

To be allotted by the Guide

## CERTIFICATE OF PROFICIENCY IN FRENCH

### CONCEPT PAGE

#### AIMS AND OBJECTIVES

The present programme is:

1. To provide a solid foundation in French grammar and vocabulary, enabling students to understand and use the language in a variety of contexts.
2. To equip the learner with more cultural, linguistic and communicative strategies, which will help them to communicate in varied situations.
3. To develop the learner's ability to identify and comprehend written and spoken texts, and to use them in a variety of contexts.
4. To develop the learner's ability to identify and comprehend written and spoken texts, and to use them in a variety of contexts.
5. To develop the learner's ability to identify and comprehend written and spoken texts, and to use them in a variety of contexts.

#### DURATION

The duration of the programme is 12 weeks. The first 6 weeks are devoted to the study of the grammar and vocabulary, and the last 6 weeks are devoted to the study of the cultural, linguistic and communicative strategies.

#### EXTRACURRICULAR ACTIVITIES

A minimum of 10 hours of study

## KESSELI UNIVERSITY - 30024

DEPARTMENT OF FRENCH  
DEPLUMA, COORDINATEUR/TECHNIC  
CULTURE, PARIS

## AIMS AND OBJECTIVES

The course aims at:

1. Introducing French to beginning and developing the following language skills:
  - (i) Listening: to understand and interpret language which has a clear structure of an intermediate level.
  - (ii) Speaking: to engage in simple conversations.
  - (iii) Reading: to read and understand intermediate level texts.
  - (iv) Writing: to write paragraphs and short essays.
2. Giving the learners the capacity of and ability to use the appropriate structures and lexical vocabulary items.
3. Exposing the learner to the culture(s) of French and Francophone Countries.

## DURATION

Two semesters (total of one academic year) About 110 hours of classroom instruction and 30 hours of self-study on the basis of home assignments and exercises. The classes will be held at the rate of two(2) hrs/3days/week and the course of interest.

## ENTRY QUALIFICATION

A minimum 100% pass rate (100% or equivalent level) is required from any recognized university/ institution.

## COURSE CONTENT

The course content of the Diploma Course will have three main aspects like the Certificate Course viz.: *Aspects de l'histoire-Culturelle, Sociale and Civilisationnelle Aspect.*

Aspects de langue (linguistique)

1<sup>er</sup> aspect: les scènes de la vie familiale, vocabulaire corporel, les programmes de la radio/télévision, introduction de la littérature française et francophone, conception de l'information, communication et médias différents, les autres pays francophones, les phénomènes naturels, le climat, agencier le dîner, comparaison et manifestation, vie quotidienne.

2<sup>nd</sup> aspect: situations dans le monde actuel, l'actualité vue sous différents aspects, les différents régions, le monde dans une perspective, l'ère de l'écologie, l'écologie totale, l'agriculture et l'économie.

### Administrative aspects

[illegible]

**Le premier** : *adjectif* = « se rapportant à un objet, une personne ou une chose, sans l'appeler nommément avec l'article, les termes relatifs, l'expression de la forme, les conditionnels - aspects propres, rapportant avec l'expression, propositions relatives, subordonnées et coordination ».

The Creative Classroom will be emphasized instead of rote learning practices to enable the students to utilize their inherent productivity as it is followed in the Certificate Course.

### Civilizational aspects

1<sup>er</sup> semestre : situations familiales et sociales, analyse des situations, aspects littéraires, agir et réagir dans les situations différentes selon les milieux et les lieux, les moyens de communication, la documentation – utilisation de la carte, les situations sociales, comparées, pages d'illustration, œuvres de la tradition française, les arts, les sciences, les nouvelles techniques, l'écriture.

2<sup>nd</sup> semestre : classes aux particularités et nuances, transports et l'habiter, descriptions des objets, les plans corporels et d'espace, les méthodes et aspects historiques, aspects militaires, révisions

PRODUCTS BOOK

Along with this book, certain titles of *Parvata2* (CLE), *Le Noveci Espere 2* (Bachetta), *ADON*(CLE), *Parvata2*(CLE), *Compas2*(CLE) etc. and the books of *Wen-Fengzhu* *Parvata* series will also be used as complementary reading.

Other than these, from time to time, various authority documents will also be introduced.

#### TECHNIQUES OF DISTRACTIONS

The communicative approach will be followed with the emphasis on cultural competence and creativity. An intercultural approach of tracking language and cultural/civilizational aspects which already the learners have experienced will be further strengthened. The modern equipments will be used as their help was taken in the CCE level classes.

## EVALUATION

The course will consist two papers:

Paper I: Language Comprehension

Paper II: Reading & Comprehension - Science and Phonological Comprehension

The internal marking will be 80% oral and 20% written. The oral marking will be 80% and the written marking will be 20%.

The 80% of the internal assessment marks will be of two equal parts - 40% mark for written and oral. This will be given on the basis of average of two hour of three internal oral written tests per semester.

## STUDENT STRENGTH

Maximum 20 per batch.

ASSAM UNIVERSITY: SILCHAR

DEPARTMENT OF FRENCH

The minutes of the 3<sup>rd</sup> BUGS meeting

The 3<sup>rd</sup> BUGS meeting was held on 09.04.08 at 12.30 pm with the following agenda items.

1. Confirmation of the last meeting.
2. Approval of the Syllabus for ADOP in french.
3. Review of COP and DOP Syllabus in french.
4. Miscellaneous.

The following members were present,

1. Prof D.K.Singh(BHU External Member)
2. Dr A.Karkun(JNU External Member)
3. Mr.Amalendu Chakraborty.( E O Chairman)
4. P.R.Chakraborty(French deptt)
5. Dr.Indranil Sanyal(French deptt)
6. Prof.Rama Bhattacharya(Bengali deptt)
7. Dr Dipendu Das(Eng deptt)
8. Ajit Kumar(Linguistic deptt)
9. Swapna Devi(Dean School of Languages)

After thread-bare discussions, the Board has taken the the following decisions:



1. The present system of the examination will continue for all the courses, i.e.
  - a) The 60% marks will remain for each paper of each course for the end-semester examination of which 40% will be for the written examination and 20% will be for the oral.
  - b) The rest 40% marks of each paper will be internal marks.
2. Along with the present COP and DOP courses, the Advance Diploma in French will be introduced from the session of 2008-09.
3. The entry qualification for the COP and DOP courses remain the same, i.e. 10+2 and 10+2+COP respectively. For the Advance Diploma Course, the qualification will be the DOP.
4. For the COP and the DOP courses, the present syllabi will remain the same; but some new orientations will be added on.
5. Henceforth all the courses will have two papers in all the semesters. The numbering of the papers will be papers I&II for the 1<sup>st</sup> semester and papers III& IV in the 2<sup>nd</sup> semester. The detailed descriptions of them will be given separately.
6. The name of the papers will be as follows:  
 The papers no's I and III of the COP and DOP courses will have the name as " Language Competence" and the papers no's II and IV will bear the the name "Society & Civilization".  
 The ADF course will have the names of its papers as follows:  
 Paper I— Initiation to Practical Translation  
 Paper II— Initiation to French Literature (Part-I)  
 Paper III— Commercial French & Tourism

#### Paper IV— Initiation to French Literature (Part-II)

7. The Advance Diploma Course will be introduced this year which be a one-year course divided into two semesters.
8. The Board strongly recommended to introduce the BA course in the university side by side the MA course also initiated in the current year (as a part of effort starting the Integrated Course in French as to popularize the subject among the students).
9. The prescribed text books in the COP & DOP courses will remain the same, i.e. NSF 1&2 respectively, of which the first two units will be assigned for the 1<sup>st</sup> semester and the last two units will generally assigned for the 2<sup>nd</sup> semester.
10. The ADF course will have NSF 3 as the main text books. In the paper-II, two books of novel and drama will be taught of the following list (if the Department thinks to teach a book in a particular year out the list they can do it as the list given only indicates just an idea of the great representative all-time great French literary works of which the students be taught to enable them to be fit for the higher studies of the same in the MA course, in this or another university) given below:
  - a) L'étranger (Albert Camus).
  - b) Le Petit Prince (A de Saint-Exupery).
  - c) Madame Bovary (G Flaubert).
  - d) Candide (Voltaire).
  - e) La leçon(Ionesco).
  - f) La Cantatrice Chauve(Ionesco).
  - g) Rhinocéros (Ionesco).
  - h) Don Juan (Molière).
  - i) Bourgeois Gentilhomme(Molière).
  - j) Le Cid (Corneille).
  - k) Phèdre (Racine).etc.

In the Paper -IV of the course. The Poetry/drama/ short stories / texts from media etc. Will be taught. A list of them is given hereby (the conditions stated of the above chart will be applicable)

- a) La poésie de Jaques Prévert.
- b) La poésie de Paul Eluard.
- c) La poésie de Raymond Queneau.
- d) Short stories of Maupassant.
- e) Short stories of Camus.
- f) Excerpts from the magazines and method books like NSF3, Campus 3, NSF4, Panorama3 etc.

11. In Papers-I & III of the ADF course, the students will be encouraged to do the translations French-English (and vice-versa) from media (print and electronic) etc.
12. The student strength of the COP and the DOP courses will be 30 each and that of the ADF Course will be 25.
13. There is no change in the class timings for all the courses (and also the total time of class per week and semester).
14. The detailed divisions of the different aspects (such as grammatical, civilizational etc.) remain same for the COP and DOP courses. The same for the ADF Course is placed separately.
15. The content apart from the literary aspects can be divided into the followings:
  - a) Grammatical aspects:
    - i) The notions about the tenses and aspects of the verbs.
    - ii) The different *passés* and their usages.
    - iii) The different *conditionnels* and the usages thereof.
    - iv) The different moods of the verbs and their usages.
    - v) The different *subjonctifs*.

- vi) The *structures emphatiques*.
- vii) The *subordinations* and the *co-ordinations*.
- viii) The analysis of the *phrases*.
- ix) The notion of different traditional parts of speech etc.

b) Civilizational aspects:

- i) The notion about the history and the geography of France.
- ii) The initiation to the notion of *Francophonie*.
- iii) The European Union.
- iv) The daily life and different media.
- v) Initiation to the different systems of the day to day life in France like that of Political system, educational system, the different *Républiques*, commerce, economy, foreign policy etc. and the recent developments thereof and comparison with those of India. Etc.
- vi) The initiation to the basic translation along with a touch of basic translational ideas(theories).
- vii) **The audiovisual materials** (such as audio materials, documentary and feature films, other authentic documents from both print and electronic media will be used.

c) Literary aspects: the students will be sensitized to the different genre of literature with the initiation to some basic literary theory. The detailed content of the course has already described above.

d) Prescribed texts: the NSF3 will be the main text for the course (apart from the literary texts). The NSF4, Campus3, Tempo3, Bienvenue en France, Mauger Bleu2 etc. will be used as helping texts.

**DEPARTMENT OF EARTH SCIENCE  
ASSAM UNIVERSITY: SILCHAR  
M.Sc. programme in Applied Geology**

**ES - 202: Sedimentology**

**Total Credit: 6**

**Contact hours:**

**Full Marks: 100 (Semester 70 + Sessional 30)**

**UNIT I:** Earth Surface System: liberation of flux of sediments. Sedimentary structures: classification, significance and field recording. Fluid flow mechanics and formation of sedimentary bedforms, Concept of Flow Regime.

**UNIT II:** Sedimentary Environments and Facies; Walther's law of facies succession, Processes and characteristics of fluvial, estuarine, deltaic, lagoonal, barrier beach, tidal flats and deep-sea environments.

**UNIT III:** Marine and continental evaporate. Shallow water carbonates. Volcanoclastic: on-land and marine. Palaeocurrent properties and indicators, Palaeocurrent analysis. Significance of ichnofossils in sedimentological studies, Cyclic sedimentation.

**UNIT IV:** Petro genesis of sandstones, Graywacke and graywacke problem; plate - tectonics and sandstones composition, Sedimentary basins in relation to Plate tectonics, Clastic petrofacies, Palaeoclimate indicators.

**UNIT V:** Diagenesis and fluid flow. Diagenesis of mudstones, sandstones and carbonate rocks: changes in mineralogy, fabric and chemistry. Heavy minerals and their uses in provenance studies.

**Books Recommended:**

Allen, J.R.L. 1985: Principles of Physical Sedimentation. George Allen & Unwin.

Allen, P. 1997: Earth Surface Processes. Blackwell.

Nichols, G. 1999: Sedimentology and Stratigraphy.

Blackwell. Reading, H.G. 1996: Sedimentary Environments.

Blackwell. Davis, R.A. Jr. 1992: Depositional Systems. Prentice Hall.

Einsele, G. 1992: Sedimentary Basins. Springer Verlag.

Prothero, D.R. and Schwab, F. 1996: Sedimentary Geology.

Freeman. Miall, A.D. 2000: Principles of Sedimentary Basin Analysis. Springer Verlag.

Pettijohn, F.J., Potter, P.E., and Siever, R. 1990: Sand and Sandstone. Springer Verlag.

Blatt, H., Murray, G.V., and Middleton, R.C. 1980: Origin of Sedimentary Rocks.

Bhattacharya, A. and Chakraborti, C. 2000: Analyses of Sedimentary Successions. Oxford -IBH. Boggs, Sam Jr. 1995: Principles of Sedimentology and Stratigraphy.

Prentice Hall. Sengupta, S. 1997: Introduction to Sedimentology. Oxford - IBH.

Reineck, H.E. and Singh, I.B. 1980: Depositional Sedimentary Environments. Springer Verlag.

Collins, J.D., and Thompson, D.B. (1982): Sedimentary Structures, George Allen and Unwin, London.

Lindholm, R.C. (1987) A Practical Approach to Sedimentology, Allen and Unwin, London.

Selley, R. C. (2000) Applied Sedimentology, Academic Press.

Tucker, M.E. (1981): Sedimentary Petrology: An Introduction, Wiley and Sons, New York.

Tucker, M.E. (1990): Carbonate Sedimentology, Blackwell Scientific Publication.

### **ES - 401: Ore Geology and Mining Geology**

**Total Credit: 6**

**Contact hours:**

**Full Marks: 100 (Semester 70 + Sessional 30)**

**UNIT I:** Concept of ore genesis; Spatial and temporal distribution of ore deposits; Metallogenic epochs and Metallogenic Provinces. Nature and morphology of principles types of ore deposits; Classification of ore deposits. Textures, paragenesis and zoning of ores and their significance

**UNIT II:** Concept of ore bearing fluids, their origin and migration. Wall rock alteration; Structural, physicochemical and stratigraphic controls of ore localization; Ore deposits in relation to Plate tectonics; Fluid inclusions in ore – principles and applications.

**UNIT III:** Mineralogy, classification and genesis of ore deposits associated with orthomagmatic ores of ultramafic-mafic rocks; Ores of felsic-silicic igneous rocks; Ores of sedimentary affiliation - biochemical, chemical and clastic sedimentation, placers and residual concentration deposits; Ores of metamorphic affiliations.

**UNIT IV:** Study of ore minerals related to the following metals with special reference to their mineralogy, genesis, specification (if any), uses and distribution in India: Fe, Mn, Cr, Cu, Pb, Zn, Al, Sn, and W.

**UNIT V:** Classification and description of mining methods. Planning, exploration and exploratory mining of surface and underground mineral deposits. Exploration for placer deposits; Ocean bottom mining; Mining hazards: mine inundation, fire and rock burst.

### **Books Recommended:**

Arrogyaswami, R.N.P. 1996: Courses in Mining Geology (IV ed). Oxford IBH.

Barnes, H.L. 1979: Geochemistry of Hydrothermal Ore Deposits. John Wiley.

Boyle, R.W. 1982: Geochemical Prospecting for Thorium and Uranium Deposits. Elsevier.

Clark, G.B. 1967: Elements of Mining (3rd ed). John Wiley.

Craig, J.M. and Vaughan, D.J. 1981: Ore Petrography and Mineralogy. John Wiley.

Dahlkamp, F.J. 1993: Uranium Ore Deposits. Springer Verlag.

Evans, A.M. 1993: Ore Geology and Industrial Minerals. Blackwell.

Guilbert, J.M. and Park, C.F. Jr. 1986: The Geology of Ore Deposits. Freeman.

Klemm, D.D. and Schneider, H.J. 1977: Time and Strata Bound Ore Deposits. Springer Verlag.

McKinstry, H.E. 1962: Mining Geology (2nd ed). Asia Publishing House.

Mookherjee, A. 2000: Ore Genesis A Holistic Approach. Allied Publishers.

Peters, W.C. 1978: Exploration and Mining Geology. John Willey and Sons. S

awkins, F.J. 1984: Metal deposits in Relation to Plate Tectonics. Springer Verlag.

Stanton, R.L. 1972: Ore Petrology. McGraw Hill.

Torling, D.H. 1981: Economic Geology and Geotectonics. Blackwell.

**DEPARTMENT OF LAW  
ASSAM UNIVERSITY**

**Syllabus**

**B.A. L.L.B (Hons.)**

<b>1<sup>st</sup> Semester</b>	
Course No.	Course name
<i>B.A.LL.B.(HC)-101</i>	<i>General English – I</i>
<i>B.A.LL.B.(HC)-102</i>	<i>Political Science-I</i>
<i>B.A.LL.B.(HC)-103</i>	<i>History – I (Age of Antiquity)</i>
<i>B.A.LL.B.(HC)-104</i>	<i>Sociology – I</i>
<i>B.A.LL.B.(HC)-105</i>	<i>Economics – I</i>
<i>B.A.LL.B.(HC)-106</i>	<i>Law of Torts &amp; Consumer Protection Laws</i>
<b>2nd Semester</b>	
Course No.	Course name
<i>B.A.LL.B.(HC)-201</i>	<i>General English – II</i>
<i>B.A.LL.B.(HC)-202</i>	<i>Political Science- II</i>
<i>B.A.LL.B.(HC)-203</i>	<i>History – II</i>
<i>B.A.LL.B.(HC)-204</i>	<i>Sociology – II</i>
<i>B.A.LL.B.(HC)-205</i>	<i>Economics – II</i>
<i>B.A.LL.B.(HC)-206</i>	<i>Law of Contract – I</i>
<b>3rd Semester</b>	
Course No.	Course name
<i>B.A.LL.B.(HC)-301</i>	<i>Political Science- III</i>
<i>B.A.LL.B.(HC)-302</i>	<i>History – III</i>
<i>B.A.LL.B.(HC)-303</i>	<i>Sociology – III</i>
<i>B.A.LL.B.(HC)-304</i>	<i>Constitutional Law - I</i>
<i>B.A.LL.B.(HC)-305</i>	<i>Law of Contract – II</i>
<i>B.A.LL.B.(HC)-306</i>	<i>History of Courts, Legislature and Legal Profession in India</i>
<b>4th Semester</b>	
Course No.	Course name
<i>B.A.LL.B.(HC)-401</i>	<i>Political Science- IV</i>
<i>B.A.LL.B.(HC)-402</i>	<i>Journalism And Mass Communication - I</i>
<i>B.A.LL.B.(HC)-403</i>	<i>Gender justice &amp; feminist approach</i>
<i>B.A.LL.B.(HC)-404</i>	<i>Constitutional Law-II</i>
<i>B.A.LL.B.(HC)-405</i>	<i>Family Law - I</i>
<i>B.A.LL.B.(HC)-406</i>	<i>Law of Crimes (IPC)</i>
<b>5th Semester</b>	
Course No.	Course name
<i>B.A.LL.B.(HC)-501</i>	<i>Political Science – V (Public Administration)</i>
<i>B.A.LL.B.(HC)-502</i>	<i>Law and Language</i>
<i>B.A.LL.B.(HC)-503</i>	<i>Journalism And Mass Communication – II</i>
<i>B.A.LL.B.(HC)-504</i>	<i>Family Law- II</i>



<i>B.A.LL.B.(HC)-505</i>	<i>Criminal Procedure Code</i>
<i>B.A.LL.B.(HC)-506</i>	<i>Jurisprudence</i>
<b>6th Semester</b>	
Course No.	Course name
<i>B.A.LL.B.(HC)-601</i>	<i>Political Science – VI(Public Administration)</i>
<i>B.A.LL.B.(HC)-602</i>	<i>Law of Evidence</i>
<i>B.A.LL.B.(HC)-603</i>	<i>Civil Procedure Code &amp; Limitation Act.</i>
<i>B.A.LL.B.(HC)-604</i>	<i>Administrative Law</i>
<i>B.A.LL.B.(HC)-605</i>	<i>Transfer of Property Act and Easement Law</i>
<i>B.A.LL.B.(HC)-606</i>	<i>Clinical Course – I</i>
<b>7th Semester</b>	
Course No.	Course name
<i>B.A.LL.B.(HC)-701</i>	<i>Arbitration, Conciliation and Alternate Dispute Resolution</i>
<i>B.A.LL.B.(HC)-702</i>	<i>Environmental Law</i>
<i>B.A.LL.B.(HC)-703</i>	<i>Insurance Law</i>
<i>B.A.LL.B.(HC)-704</i>	<i>Human Rights</i>
<i>B.A.LL.B.(HC)-705</i>	<i>Company Law</i>
<i>B.A.LL.B.(HC)-706</i>	<i>Clinical Course –II</i>
<b>8th Semester</b>	
Course No.	Course name
<i>B.A.LL.B.(HC)-801</i>	<i>Labour Law – I</i>
<i>B.A.LL.B.(HC)-802</i>	<i>Assam Land Laws</i>
<i>B.A.LL.B.(HC)-803</i>	<i>Law of Poverty and Development</i>
<i>B.A.LL.B.(HC)-804</i>	<i>Right to Information (RTI)</i>
<i>B.A.LL.B.(HC)-805</i>	<i>Interpretation of Statutes</i>
<i>B.A.LL.B.(HC)-806</i>	<i>Clinical Course–III</i>
<b>9th Semester</b>	
Course No.	Course name
<i>B.A.LL.B.(HC)-901</i>	<i>Banking Laws</i>
<i>B.A.LL.B.(HC)-902</i>	<i>Labour Law – II</i>
<i>B.A.LL.B.(HC)-903</i>	<i>Information technology (IT)</i>
<i>B.A.LL.B.(HC)-904</i>	<i>Law Relating to Women and Children</i>
<i>B.A.LL.B.(HC)-905</i>	<i>Corporate Governance</i>
<i>B.A.LL.B.(HC)-906</i>	<i>Clinical Course–IV</i>
<b>10th Semester</b>	
Course No.	Course name
<i>B.A.LL.B.(HC)-1001</i>	<i>Intellectual Property Rights (IPR)</i>
<i>B.A.LL.B.(HC)-1002</i>	<i>Criminology and Penology</i>
<i>B.A.LL.B.(HC)-1003</i>	<i>Law of Trust, Equity and Fiduciary Relations</i>
<i>B.A.LL.B.(HC)-1004</i>	<i>International Law</i>
<i>B.A.LL.B.(HC)-1005</i>	<i>Law of Taxation</i>
<i>B.A.LL.B.(HC)-1006</i>	<i>Prison Administration</i>

**B.A.LL.B.(HC)-606**  
**CLINICAL COURSE –I**  
**DRAFTING, PLEADING AND CONVEYANCING**

Parts	Marks	Pass marks
A – Internal Assessment	30	13
B – Written Examination	50	23
C – Viva Voce	20	9
Total	100	45

***Note:** This Course shall be divided in to three parts A,B & C. Under Part- A, there shall be an Internal Assessment test for 25 marks which shall be conducted by the course teacher during the semester. Under Part- B, there shall be a written examination for 50 marks, along with the end semester examination. (The candidates shall have to answer 5 questions out of 10) Under Part-C, there shall be a viva voce examination for 25 marks. The viva voce shall be conducted jointly by the course teacher as internal examiner and an external examiner to be appointed by the University.*

**UNIT-I**

**Civil Pleadings:** Complaint, Written Statement, Original Petition, Execution Petition, Civil Miscellaneous Application, Inter- Locutory Application, Revision Petition, Memorandum of Appeal and review etc.

**UNIT-II**

**Criminal Pleadings:** Complaints, Bail application, Criminal Miscellaneous Application, Memorandum of appeal, Revision Petition, Petition u/s 125 Cr.P.C, Statement of Accused u/s 164 Cr.P.C, Application u/s 457 Cr.P.C. etc.

**UNIT-III**

**Conveyancing:** General Requirements of Deed, Sale Deed, Mortgage Deed, Gift Deed, Will Deed, License Deed, Agreement to Sell, Rent Deed, Power of Attorney, etc.

**UNIT-IV**

**Drafting:** General Principles of Drafting, Notice, Notice u/s 138 of Negotiable Instrument Act, Notice u/s 80 of C.P.C, Notice by Landlord to his Tenant, Memorandum of Appearance, Affidavit (Statement of Truth), etc.

**UNIT-V**

**Constitutional Petition:** Individual Petitions under Article 32 & 226 of Constitution of India, Public Interest Litigation, Special Leave Petition, etc.

**Suggested Readings:**

1. Banerjee & Awasthi - Guide to Drafting.
2. Sir Jailal - Conveyancing.
3. G.C.Mogha - Pleading.
4. Michael Haeword - Conveyancing.
5. K.K.Srivastava - Law Relating to Pleading, Drafting & Conveyancing.
6. William M. Ross - Pleading.
7. M.L.Singhal, G.C.Mogha - Pleading in India.

**B.A.LL.B.(HC)-706**  
**CLINICAL COURSE –II**

**PUBLIC INTEREST LITIGATION, LEGAL AID-PARA LEGAL SERVICES AND TRAINING FOR ADVOCACY SKILL**

Parts	Marks	Pass marks
A – Internal Assessment	30	13
B – Written Examination	50	23
C – Viva Voce	20	9
Total	100	45

*Note: The course would be taught partly through class room instructions including simulation exercises and partly through practical method (learning by doing and observing). In this paper, 100 marks are split up in this way: 25 marks for the written (internal) examination on the prescribed subjects taught through classroom instructions, 50 marks for (evaluation of the record prepared from) court visit. (The record shall be evaluated jointly by the internal and external examiner at the time of viva voce examination.) Viva-voce for 25 marks shall be conducted separately by one internal examiner (subject teacher) and an external examiner to be appointed by the University.*

**A- Classroom Instructions & internal assessment:**

(i) Origin, Development, Scope, Procedure and Application of Public Interest Litigation in Different Fields.

(ii) Legal Services Authorities Act, 1987: Constitutional Background of Legal Aid and Some leading cases-Madhav Hayawadanrao Hoskot vs. State of Maharashtra AIR 1978 SC 1548 and Hussainara Khatoon vs. Home Secretary, State of Bihar AIR 1979 SC 1369, Types of Legal Services-Legal Aid etc, Legal Aid Clinic, Para-Legal Services, Lok Adalat, Legal Services Authorities, etc.

**B- Court Visit & Write-Up**

- (i) Visit To Consumer Dispute Redressal Forum
- (ii) Visit To Family Court
- (iii) Visit To Legal Aid Camp/Legal Literacy Programme
- (iv) Visit To Lok Adalat/Permanent Lok Adalat.
- (v) Visit To Motor Vehicle Accident Claim Tribunal
- (vi) Visit to Civil and Criminal Courts

**Write-Up:** The students are required to collect all the relevant materials or documents regarding any pending case or decided case and arrange them systematically step by step. They also have to analyze preferably the evidences (which are on record) and ascertain the facts and finding of facts independently along with the criticism of the judgment of the decided case or giving a thoughtful opinion about the tentative decision of the pending case. The students are also required to learn and write down the technical and procedural matters which come after the filing of the case and shall submit the report of the proceedings.

**C- Viva-Voce:**

Viva-voce will be jointly conducted by one internal examiner (subject teacher) and an external examiner to be appointed by the University.

**B.A.LL.B.(HC)-806**

**CLINICAL COURSE –III**

**MOOT COURT, PRE-TRIAL PREPARATIONS AND PARTICIPATION IN TRIAL PROCEEDINGS**

Parts	Marks	Pass marks
A – Moot Court (internal Assessment)	30	13
B+C Observance of Trial Interviewing techniques and Pre-trial preparations	50	23

(Writeup)		
D – Viva Voce	20	9
Total	100	45

**Note:** In this paper, there shall be 30 marks for Moot-Court, 25 marks for Observance of Trial, 25 marks for Interviewing Technique & Pre-Trial Preparations. The students will prepare write-ups on Observance of Trial and Interviewing techniques under the supervision of the course teacher and submit at the time of viva voce examination.

A-Moot Court:

Every student will do at least three rounds of Moot Court presentations during the semester on assigned moot problems in which the students are required to submit 'written submissions' i.e. Moot Court Memorials.

**B-Observance of trial in two cases, one civil and one criminal:** Students may opt for observation/participation in trial proceedings in any one of criminal courts and one civil court from the following:

**Criminal Proceedings:** Court of Session Judge/Additional Session Judge/Assistant Session Judge, Chief Judicial Magistrate, Judicial Magistrate First Class.

**Civil Proceedings:** Consumer Forum, Income Tax Tribunal, Administrative Tribunal, Family Court, Accident Claims Tribunals, Court of Civil Judge Junior Division, Court of Civil Judge Senior Division, Court of District Judge.

#### **C-Interviewing techniques and pre-trial preparations**

Each student will observe two interviewing sessions of clients at the Lawyer's Office / Legal Aid Office and record the proceeding in a diary. Each student will further observe the preparation of documents and court papers by the advocate and the procedure for the filing of suit petition.

#### **Viva-Voce**

The viva-voce examination shall be conducted on all the above three aspects. The evaluation of the write-ups and Viva-Voce will be conducted by one internal and an external examiner to be appointed by the University.

### **B.A.LL.B.(HC)-906**

#### **CLINICAL COURSE –IV**

#### **PROFESSIONAL ETHICS, ACCOUNTANCY FOR LAWYERS AND BAR BENCH RELATIONS**

Parts	Marks	Pass marks
A – Internal Assessment	30	13
B – End Semester Examination	50	23
C – Viva Voce	20	9
Total	100	45

**Note:** This Course shall be divided in to three parts. 1st Part shall be for Internal Assessment of 25 marks which will be conducted by the course teacher during the semester. In the 2nd Part there shall be a written examination along with the end semester examination for 50 marks.(The candidates shall have to answer 5 questions out of 10) The 3rd Part shall be a viva voce examination for 25 marks. The viva voce shall be conducted jointly by the course teacher as internal examiner and an external examiner to be appointed by the University.

Historical background of Advocate Act 1961

Law prior to Advocate Act

Object and Reasons of passing the Act.

Definitions, Nature and scope of Advocate Act

Bar Council of India – Constitution, functions, powers and jurisdiction.

State Bar Council – Constitution, functions, powers and jurisdiction

Enrolment of Advocates, designation of senior Advocate, Rights of Advocates to practice

Duties and Responsibilities of Advocates, Punishment of Advocates for misconduct, disciplinary powers of B.C.I, disposal of disciplinary proceedings, Appeal to B.C.I., Appeal to Supreme Court, Stay Order, Review of Order by Disciplinary Committee & Revision

Procedure for maintaining accounts of fee by the Advocate. Norms of fee and law relating to the fee of Advocate – Part II of Advocate Rules, Rule – 26 to 31, Enrollments of Advocates

Court of Record and Contempt Jurisdiction, Contempt of Court Act, Bar and Bench Relationship

#### **Cases:**

Rajendra V.Pai Vs. Alex Fernandes, AIR 2002, S.C.1808.

In Re: An Advocate AIR 196 2SC 1337.

P.J.Ratnam Vs. D.Kanikaran, AIR 1964 SC 224.

L.D.Jatsmgham Vs. Naraindas N.Punjabi. (1976). ISCC 354

John D'Souza Vs. Edward Ani (1994) 2SCC 64.

In Re Vinay Chandra Mishra, AIR 1995 SC 234Q.

Supreme Court Bar Association Vs. Union of India, AIR 1998 SC 1895, (1998) 4SCC409.

Rafiq Vs. Munshilal, AIR 1981 SC1400.

Viva-Voce shall be conducted by one internal and one external examiner to be appointed by the University.

#### **Suggested Readings:**

Professional Ethics – Published by B.C.I. New Delhi.

## **DEPARTMENT OF LAW ASSAM UNIVERSITY**

### **Syllabus**

#### **MASTER OF LAWS (LL.M.)**

Total number of Courses in four semesters = 20

Number of **Core Courses** in four semesters = **16**

*(Theory = 11 + Project = 01 + Practical = 02 + Dissertation=02)*

Number of **Open Courses** = **02**

Number of **Elective Courses** = **02**

Contact hours for each course = 50

Credit for each course = 5

Marks for each course = 100

*[Internal Assessment = Marks-30 (Written Research Paper 20 + Seminar 10) + Written examination 70]*

Marks in each semester=500

Total Marks= 2000

Duration of End Semester Examination = 03 hours [a student must write 5 questions of 14 marks each]

Both the **open courses** are in semester II under Course No.203 and 204 from courses offered by any of the allied disciplines of this University.

Out of the two elective courses one is under semester-III (Course No.304) and the other is in semester-IV (Course No.404)

Abbreviations:

LL.M. (C) – LL.M. CORE

LL.M. (O) -- LL.M. OPEN

LL.M. (E)-- LL.M. ELECTIVE

#### SUBJECTS' DETAILS

Each subject has an identification code which reflects the Semester and the paper. The first digit refers to the semester and the last two digits refer to the course number.

The syllabus of each subject is only suggestive. Students are expected to do exhaustive self study.

The course being advance course in law and very dynamic in nature, the students are expected to remain up to date with latest developments and case laws and contemporary social, political and economic developments.

**Fullmarks-70+30=100**

**Minimum Pass marks-28+12=40**

**Credits-5**

**Total no. of Lectures / Course=50**

1 <sup>st</sup> Semester	
Course No.	Course name
LL.M.(C) 101	JURISPRUDENCE – I
LL.M.(C) 102	CONSTITUTIONAL LAW – I
LL.M.(C) 103	LAW AND SOCIAL TRANSFORMATION
LL.M.(C) 104	RESEARCH METHODOLOGY
LL.M.(C) 105	PROJECT WRITING AND SEMINAR
2 <sup>nd</sup> Semester	
Course No.	Course name
LL.M.(C) 201	JURISPRUDENCE – II
LL.M.(C) 202	CONSTITUTIONAL LAW – II
LL.M.(O) 203 (Open)	INTELLECTUAL PROPERTY LAW
LL.M.(O) 204 (Open)	ENVIRONMENTAL LAW
LL.M.(C) 205	TERM PAPER AND LEGAL EDUCATION- PRACTICAL-I

3 <sup>rd</sup> Semester	
Course No.	Course name
LL.M.(C) 301	ADMINISTRATIVE LAW
LL.M.(C) 302	SOCIO ECONOMIC OFFENCES
LL.M.(O) 303	INTERPRETATION OF STATUTES
LL.M.(E) - I 304	CORPORATE LAW-I
LL.M.(E) – II 304	CRIMINAL LAW- I
LL.M.(C) 205	TERM PAPER AND LEGAL EDUCATION- PRACTICAL-II

4th Semester	
Course No.	Course name
LL.M.(C) 301	HUMAN RIGHTS
LL.M.(C) 302	LAW OF INTERNATIONAL TRADE
LL.M.(C) 303	DISSERTATION [Thesis-140 Viva voce-60]
LL.M.(E) - I 304	CORPORATE LAW-II
LL.M.(E) – II 304	CRIMINAL LAW- II

\* Elective/Optional papers one out of the two courses (Course no. 304, 404)

\* \* Choice based courses/open course (203,204)

# Course 403 (Dissertation work)

### **LL.M. (C) 305 TERM PAPER & LEGAL EDUCATION (Practical)**

**Part-A:** Term Paper(30) marks

**Part-B:** Legal Education (Practical) (70) marks

#### **Object of this Course**

To train the students on the development of Legal Education & teaching and to develop their teaching skills through lecture deliberation.

#### **Guidelines for this course.**

The students will be divided into small groups looking to the student teacher ratio in the batch. Each such group shall be supervised by a permanent teacher of the department which will be decided through the departmental committee.

#### **Part-A**

For this part, each of the students shall have to write a term paper on different aspects of legal education, which will be evaluated for 30 marks by the course teacher.

#### **Part-B**

For this part, a student shall have to deliver at least three lectures to the students of B.A.LL.B.(Hons.) in the department, which shall be evaluated for 75marks, (25 marks for first two lectures and 20 for the 3rd lecture) at least by two teachers, jointly, to be decided by the course teacher.

For conducting the practical in this paper each of the teachers will be assigned at least one period per week in the time table.

The supervising teacher shall conduct the course and submit the marks and attendance of the students, to the Head of the Department, for compilation and onward transmission.

### **Fourth Semester**

**LL.M.(C)403**

**DISSERTATION [Thesis-140 Viva voce-60]**

#### **(i) MODALITIES FOR THIS PAPER:**

(a) A candidate shall select a topic for his/her dissertation work and submit to the Head of the department with a synopsis, through a permanent teacher of the department as the supervisor, for approval of the departmental affairs committee.

(b) The candidate shall be required to submit the Dissertation (Three Copies) at least two weeks before the commencement of Fourth Semester Examination, to the Head of the Department who shall forward the same to the Controller of Examinations for evaluation.

- (c) The candidate shall be required to secure at least 50% marks in the Dissertation to pass the Examination.
- (d) The Examiner shall either-
- (i) Award at least 50% marks, or
  - (ii) Return the Dissertation for revision, or
  - (iii) Reject the Dissertation.
- (e) The candidate who's Dissertation is returned for revision may revise the dissertation and re-submit it within a period of two months. Failure to submit in time shall result in a declaration that the candidate has failed at the relevant LL.M. Examination.
- (f) A Dissertation can be revised only once. If the candidate fails to secure pass marks in the revised Dissertation he shall be declared failed in the LL.M. Examination.
- (g) The candidate whose Dissertation is rejected, may with the approval of the Faculty of Law write a Dissertation on another topic and submit it within a period of six months. And if he fails to secure pass marks in respect of this Dissertation also, he shall be declared failed at LL.M. Degree Examination.
- (h) A Dissertation shall be examined by a Board of two examiners at least one of them shall necessarily be an external examiner.
- (i) The evaluation of the two examiners shall be coordinated as hereunder:
  - (j) Each examiner shall award marks out of 140.
  - (k) If the marks awarded by two examiners vary by 30 marks or more, the Dissertation shall be examined by the third examiner, whose decision shall be final.
  - (l) If one of the examiners return the Dissertation for revision or rejects the Dissertation, his decision shall prevail provided that if one of the examiners has rejected the Dissertation and another examiner has returned it for revision, the Dissertation shall be deemed to be rejected.

**(ii) Viva Voce Examination:**

- (a) The Viva Voce Examination shall be conducted by a Board of Examiners.
- (b) The Board shall consist of **three members**; at least one of them shall be an external member.
- (c) The Viva-voce Examination shall carry 60 marks.
- (d) The candidate shall be required to obtain a minimum of 30 marks to pass the Viva Voce Examination.

**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

**ASSAM UNIVERSITY: SILCHAR**

**CSEEL 14: Cloud Computing 5:0:0 [5]**

**8 Hours**

**UNIT I:**

Cloud Computing definition, private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public vs private clouds, role of virtualization in enabling the cloud; Business Agility: Benefits and challenges to Cloud architecture. Application availability, performance, security and disaster recovery; next generation Cloud Applications.

Technologies and the processes required when deploying web services; Deploying a web service from inside and outside a cloud architecture, advantages and disadvantages

**UNIT II:**

**8 Hours**

Management of Cloud services: Reliability, availability and security of services deployed from the cloud. Performance and scalability of services, tools and technologies used to manage cloud services deployment; Cloud Economics : Cloud Computing infrastructures available for implementing cloud based services. Economics of choosing a Cloud platform for an organization, based on application requirements, economic constraints and business needs Abstraction and Virtualization: Virtualization



Technologies, Load balancing and virtualization, Understanding Hypervisors, SOA, SOA Communications, Managing SOA, Relating SOA and Cloud Computing.

### **UNIT III:**

**8 Hours**

Abstraction and Virtualization: Virtualization Technologies, Load balancing and virtualization, Understanding Hypervisors, SOA, SOA Communications, Managing SOA, Relating SOA and Cloud Computing.

Cloud Computing Risk Issues: The CIA, Privacy and Compliance risk, Common Threats and vulnerabilities, Cloud Access Control Issues, Cloud Service Provider risk.

### **UNIT IV:**

**8 Hours**

Information Storage Security & Design and Optimization: Storage strategy and governance; security and regulations. Designing secure solutions; the considerations and implementations involved. Securing storage in virtualized and cloud environments. Monitoring and management; security auditing and SIEM.

Global storage management locations, scalability, operational efficiency. Global storage distribution; terabytes to petabytes and greater. Policy based information management; metadata attributes; file systems or object storage.

### **UNIT V:**

**8 Hours**

Confidentiality, privacy, integrity, authentication, non-repudiation, availability, access control, defence in depth, least privilege, how these concepts apply in the cloud, what these concepts mean and their importance in PaaS, IaaS and SaaS. e.g. User authentication in the cloud; Cryptographic Systems- Symmetric cryptography, stream ciphers, block ciphers, modes of operation, public-key cryptography, hashing, digital signatures, public-key infrastructures, key management, X.509 certificates, OpenSSL. Incident Response, Layered security and IDS, Encryption and Key Management.

## **CSEEL 16: Script Programming 5:0:0 [5]**

### **UNIT I:**

**8 Hours**

Introduction to Programming Languages: What is program and programming paradigms, Programming languages-their classification and characteristics, language translators and language translation activities, Use of Algorithms/Flow Charts for problem solving Introduction to Python Programming: Features, basic syntax, Writing and executing simple program, Basic Data Types such as numbers, strings, etc. Declaring variables, Performing assignments, arithmetic operations, Simple input-output

### **UNIT II:**

**8 Hours**

Sequence Control – Precedence of operators, Type conversion Conditional Statements: if, if-else, nested if –else Looping: for, while, nested loops Control statements: Terminating loops, skipping specific conditions String Manipulation: declaring strings, string functions Manipulating Collections Lists, Tuples, Sets Dictionaries – Concept of dictionary, techniques to create, updates & delete dictionary items. OOP Using PYTHON- Class, Object, self, init() function.

### **UNIT III: 8 Hours**

Functions: Defining a function, calling a function, Advantages of functions, types of functions, function parameters, Formal parameters, Actual parameters, anonymous functions, global and local variables Modules: Importing module, Creating & exploring modules, Math module, Random module, Time module Python File Input-Output: Opening and closing file, Various types of file modes, reading and writing to files, manipulating directories Exception Handling – What is exception, Various keywords to handle exception such try, catch, except, else, finally, raise Regular Expressions – Concept of regular expression, various types of regular expressions, using match function

### **UNIT IV:**

**8 Hours**

Linux Usage Basics Starting X from the Console- Changing your Password- The root User- Elevating your Privileges, Running Commands and Getting Help- Reading Usage Summaries- man, info, & whatis Commands

Filesystem- Linux File Hierarchy Concepts- Current Working Directory Files & Directory Name- Absolute and Relative Pathnames- Create, remove, change, list, copy, move Files & Directories- Determining File Content, Viewing Files- Partitions, Filesystem and checking free space  
- cp, mv, rm, & inodes- Symbolic Links and Hard Links

Standard I/O & Pipes- Standard Input and Output, Pipes to connect Processes- Overwriting vs Appending

- Redirecting both standard Output and Error

#### **UNIT V:**

**8 Hours**

Shells, Types of Unix Shells, Advantages of Shell Scripts, Initialization Files, Login Shells, Non Login Shells, Aliases, Variables, Working with Variables, Important Internal Bash Variables, Command History, Input and Output Channels, Redirection to Files, The here Operator, Feeding Output to Another Process, Duplicating the Output with tee, Types of Commands, Quoting, Substitution and Expansion, Variable Substitution

#### **Text books:**

1. Paul Gries , Jennifer Campbell, Jason Montojo, *Practical Programming: An Introduction to Computer Science Using Python 3*, Pragmatic Bookshelf, 2/E 2014.

2. James Payne , *Beginning Python: Using Python 2.6 and Python 3*, Wiley India, 2010.

3. Behrouz A. Forouzan, Richard F. Gilbery, “Unix and shell Programming” (1<sup>st</sup> Ed.), Cengage Learning India, 2003.

#### **Reference Books:**

1. Lukaszewski, *MySQL for Python: Database Access Made Easy*, Pact Publisher, 2010 .

2. Sumitabha Das, “Unix Concepts And Applications”( 4th Ed.) TMH, 2006.

### **CSEEL 25: Advanced Java Programming**

**7 Hours**

#### **5:0:0 [5] UNIT I:**

Introduction: Client & server side programming. Enterprise architecture styles: Single tier , 2-tier , 3-tier, n-tier; Relative comparison of the different layers of architectures.

MVC Architecture: Explanation, Need, Drawbacks, J2EE WEB SERVICES, Different components & Containers.

Servlet: Introduction, Advantages over CGI, How it works?, Servlet life cycle, Servlet API (Different interfaces & classes of generic servlet & HTTP servlet), Accessing user information by means of Request & Response, Servlet session management techniques and relative comparison.

#### **UNIT II:**

**7 Hours**

JSP: Introduction, Comparison between JSP & servlet., Architecture/Life cycle, Different types of JSP architectures and relative comparison.; JSP tags ,Directives, Scripting elements, Actions; JSP Implicit objects, Accessing user information using implicit objects. Beans- useBeans, setProperty, getProperty, Session Tracking, User Passing Control and Data Between Pages, Sharing Session and application data.

#### **UNIT III:**

**8 Hours**

JDBC: Introduction, Database driver ,Different approaches to connect an application to a database server, Establishing a database connection and executing SQL statements, JDBC prepared statements, JDBC data sources.

#### **UNIT IV:**

**9 Hours**

Hibernate: Introduction, Installing Hibernate, writing POJO classes, Creating Table, Hibernate application- writing, compiling and running, Annotations, Object life cycle, Hibernate Query languages, Using native SQL Query, Named queries, Generating DDL, Syntax of O/R Mapping File, Generator Class, Hibernate Tools.

#### **UNIT V:**

**9 Hours**

Introduction: J2EE, JavaBeans- Bean Builder, advantages, Design Patterns, Properties- Simple, Bound, Constrained, BeanInfo interface, Persistence, Customizer, JavaBean API, EJB- Architecture, Usage, Benefits, Beans- Sessions, Stateless, Statefull, Entity and Message driven, Introduction to Struts-Basic Idea.

**CSECC 24: Web Technology 4:0:0[4]****UNIT I:****8 Hours**

Internet basics: History and basic idea of Internet; Internet services: telnet, e-mail, ftp, WWW.

Web page design: Designing web pages with HTML- use of tags, hyperlinks, URLs, tables, text formatting, graphics & multimedia, imagemap, frames and forms in web pages. Use of Cascading Style Sheet in web pages.

Dynamic Web Pages: Creating interactive and dynamic web pages with JavaScript- JavaScript overview; constants, variables, operators, expressions & statements; user-defined & built-in functions; client-side form validation; using properties and methods of built-in objects.

**UNIT II:****8 Hours**

Markup language basics: Standard Generalized Markup Language (SGML)- structures, elements, Content models, DTD, attributes, entities.

Extensible Markup Language (XML)- Introduction: using user-defined tags in web pages; displaying XML contents using HTML and JavaScript; XML Document Type Definitions; Extensible Stylesheet Language (XSL) and its use to display XML contents; XSL and basic database queries; brief introduction to other markup languages: VML, MathML, VRML, RELML, HRMML, VoxML, etc.

**UNIT III:****8 Hours**

Java environments for Web Technology

**UNIT IV:****8 Hours**

Introduction to Client/Server Computing: client-server computing basics

Web Browsers: functions and working principle of web browsers; plug-ins & helper applications; conceptual architecture of typical web browsers (like Mozilla).

Web Servers: Web services and web server functionality; web server composition; registration; HTTP, IP address, DNS & ports; conceptual architecture of a typical web server (like Apache).

**UNIT V:****8 Hours**

Introduction to Advanced web technologies.

Web Security: Firewalls- definition and uses, network layer firewalls and application layer firewalls; Proxy servers.

**Textbooks:**

1. Godbole A. S. & Kahate A. "Web Technologies", (3rd Ed.) Tata McGraw Hill Education Pvt Ltd, 2013.

2. Xavier C. "Web Technology & Design", New Age Publication, 2007.

3. Kogent Learning Solution Inc. "Java Server Programming, Java EE7 (Black Book)", (J2EE 1.7 Ed.) Dreamtech Press, 2014.

**References:**

1. Dick Oliver, "SAMS Teach Yourself Html and CSS in 24 Hours", (9th Ed.), Sams Publishing, 2013.

2. Brad Dayley, "SAMS Teach Yourself JavaScript in 24 Hours", Sams Publishing, 2013

**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**  
**ASSAM UNIVERSITY: SILCHAR**

**CSEEL 14: Cloud Computing 5:0:0 [5]**

**8 Hours**

**UNIT I:**

Cloud Computing definition, private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public vs private clouds, role of virtualization in enabling the cloud; Business Agility: Benefits and challenges to Cloud architecture. Application availability, performance, security and disaster recovery; next generation Cloud Applications.

Technologies and the processes required when deploying web services; Deploying a web service from inside and outside a cloud architecture, advantages and disadvantages

**UNIT II:**

**8 Hours**

Management of Cloud services: Reliability, availability and security of services deployed from the cloud. Performance and scalability of services, tools and technologies used to manage cloud services deployment; Cloud Economics : Cloud Computing infrastructures available for implementing cloud based services. Economics of choosing a Cloud platform for an organization, based on application requirements, economic constraints and business needs Abstraction and Virtualization: Virtualization Technologies, Load balancing and virtualization, Understanding Hypervisors, SOA, SOA Communications, Managing SOA, Relating SOA and Cloud Computing.

**UNIT III:**

**8 Hours**

Abstraction and Virtualization: Virtualization Technologies, Load balancing and virtualization, Understanding Hypervisors, SOA, SOA Communications, Managing SOA, Relating SOA and Cloud Computing.

Cloud Computing Risk Issues: The CIA, Privacy and Compliance risk, Common Threats and vulnerabilities, Cloud Access Control Issues, Cloud Service Provider risk.

**UNIT IV:**

**8 Hours**

Information Storage Security & Design and Optimization: Storage strategy and governance; security and regulations. Designing secure solutions; the considerations and implementations involved. Securing storage in virtualized and cloud environments. Monitoring and management; security auditing and SIEM.

Global storage management locations, scalability, operational efficiency. Global storage distribution; terabytes to petabytes and greater. Policy based information management; metadata attributes; file systems or object storage.

**UNIT V:**

**8 Hours**

Confidentiality, privacy, integrity, authentication, non-repudiation, availability, access control, defence in depth, least privilege, how these concepts apply in the cloud, what these concepts mean and their importance in PaaS, IaaS and SaaS. e.g. User authentication in the cloud; Cryptographic Systems- Symmetric cryptography, stream ciphers, block ciphers, modes of operation, public-key cryptography, hashing, digital signatures, public-key infrastructures, key management, X.509 certificates, OpenSSL. Incident Response, Layered security and IDS, Encryption and Key Management.

**CSEEL 16: Script Programming 5:0:0 [5]**

**UNIT I:**

**8 Hours**

Introduction to Programming Languages: What is program and programming paradigms, Programming languages-their classification and characteristics, language translators and language translation activities, Use of Algorithms/Flow Charts for problem solving Introduction to Python Programming: Features, basic syntax, Writing and executing simple program, Basic Data Types such as numbers, strings, etc. Declaring variables, Performing assignments, arithmetic operations, Simple input-output

**UNIT II:**

**8 Hours**

Sequence Control – Precedence of operators, Type conversion Conditional Statements: if, if-else, nested if –else Looping: for, while, nested loops Control statements: Terminating loops, skipping specific conditions String Manipulation: declaring strings, string functions Manipulating Collections Lists, Tuples, Sets Dictionaries – Concept of dictionary, techniques to create, updates & delete

dictionary items. OOP Using PYTHON- Class, Object, self, init() function.

### **UNIT III: 8 Hours**

Functions: Defining a function, calling a function, Advantages of functions, types of functions, function parameters, Formal parameters, Actual parameters, anonymous functions, global and local variables  
Modules: Importing module, Creating & exploring modules, Math module, Random module, Time module  
Python File Input-Output: Opening and closing file, Various types of file modes, reading and writing to files, manipulating directories  
Exception Handling – What is exception, Various keywords to handle exception such try, catch, except, else, finally, raise  
Regular Expressions – Concept of regular expression, various types of regular expressions, using match function

### **UNIT IV:**

**8 Hours**

Linux Usage Basics Starting X from the Console- Changing your Password- The root User- Elevating your Privileges, Running Commands and Getting Help- Reading Usage Summaries- man, info, & whatis Commands

Filesystem- Linux File Hierachy Concepts- Current Working Directory Files & Directory Name- Absolute and Relative Pathnames- Create, remove, change, list, copy, move Files & Directories- Determining File Content, Viewing Files- Partitions, Filesystem and checking free space

- cp, mv, rm, & inodes- Symbolic Links and Hard Links

Standard I/O & Pipes- Standard Input and Output, Pipes to connect Processes- Overwriting vs Appending

- Redirecting both standard Output and Error

### **UNIT V:**

**8 Hours**

Shells, Types of Unix Shells, Advantages of Shell Scripts, Initialization Files, Login Shells, Non Login Shells, Aliases, Variables, Working with Variables, Important Internal Bash Variables, Command History, Input and Output Channels, Redirection to Files, The here Operator, Feeding Output to Another Process, Duplicating the Output with tee, Types of Commands, Quoting, Substitution and Expansion, Variable Substitution

### **Text books:**

1. Paul Gries , Jennifer Campbell, Jason Montojo, *Practical Programming: An Introduction to Computer Science Using Python 3*, Pragmatic Bookshelf, 2/E 2014.
2. James Payne , *Beginning Python: Using Python 2.6 and Python 3*, Wiley India, 2010.
3. Behrouz A. Forouzan, Richard F. Gilbery, “Unix and shell Programming” (1<sup>st</sup> Ed.), Cengage Learning India, 2003.

### **Reference Books:**

1. Lukaszewski, *MySQL for Python: Database Access Made Easy*, Pact Publisher, 2010 .
2. Sumitabha Das, “Unix Concepts And Applications”( 4th Ed.) TMH, 2006.

## **CSEEL 25: Advanced Java Programming**

**7 Hours**

### **5:0:0 [5] UNIT I:**

Introduction: Client & server side programming. Enterprise architecture styles: Single tier , 2-tier , 3-tier, n-tier; Relative comparison of the different layers of architectures.

MVC Architecture: Explanation, Need, Drawbacks, J2EE WEB SERVICES, Different components & Containers.

Servlet: Introduction, Advantages over CGI, How it works?, Servlet life cycle, Servlet API (Different interfaces & classes of generic servlet & HTTP servlet), Accessing user information by means of Request & Response, Servlet session management techniques and relative comparison.

### **UNIT II:**

**7 Hours**

JSP: Introduction, Comparison between JSP & servlet., Architecture/Life cycle, Different types of JSP architectures and relative comparison.; JSP tags ,Directives, Scripting elements, Actions; JSP

Implicit objects, Accessing user information using implicit objects. Beans- useBeans, setProperty, getProperty, Session Tracking, User Passing Control and Data Between Pages, Shareing Session and

application data.

### **UNIT III:**

**8 Hours**

JDBC: Introduction, Database driver ,Different approaches to connect an application to a database server, Establishing a database connection and executing SQL statements, JDBC prepared statements, JDBC data sources.

### **UNIT IV:**

**9 Hours**

Hibernate: Introduction, Installing Hibernate, writing POJO classes, Creating Table, Hibernate application- writing, compiling and running, Annotations, Object life cycle, Hibernate Query languages, Using native SQL Query, Named queries, Generating DDL, Syntax of O/R Mapping File, Generator Class, Hibernate Tools.

### **UNIT V:**

**9 Hours**

Introduction: J2EE, JavaBeans- Bean Builder, advantages, Design Patterns, Properties- Simple, Bound, Constrained, BeanInfo interface, Persistence, Customizer, JavaBean API, EJB- Architecture, Usage, Benefits, Beans- Sessions, Stateless, Statefull, Entity and Message driven, Introduction to Struts-Basic Idea.

## **CSECC 24: Web Technology 4:0:0[4]**

### **UNIT I:**

**8 Hours**

Internet basics: History and basic idea of Internet; Internet services: telnet, e-mail, ftp, WWW.

Web page design: Designing web pages with HTML- use of tags, hyperlinks, URLs, tables, text formatting, graphics & multimedia, imagemap, frames and forms in web pages. Use of Cascading Style Sheet in web pages.

Dynamic Web Pages: Creating interactive and dynamic web pages with JavaScript- JavaScript overview; constants, variables, operators, expressions & statements; user-defined & built-in functions; client-side form validation; using properties and methods of built-in objects.

### **UNIT II:**

**8 Hours**

Markup language basics: Standard Generalized Markup Language (SGML)- structures, elements, Content models, DTD, attributes, entities.

Extensible Markup Language (XML)- Introduction: using user-defined tags in web pages; displaying XML contents using HTML and JavaScript; XML Document Type Definitions; Extensible Stylesheet Language (XSL) and its use to display XML contents; XSL and basic database queries; brief introduction to other markup languages: VML, MathML, VRML, RELML, HRMML, VoxML, etc.

### **UNIT III:**

**8 Hours**

Java environments for Web Technology

### **UNIT IV:**

**8 Hours**

Introduction to Client/Server Computing: client-server computing basics

Web Browsers: functions and working principle of web browsers; plug-ins & helper applications; conceptual architecture of typical web browsers (like Mozilla).

Web Servers: Web services and web server functionality; web server composition; registration; HTTP, IP address, DNS & ports; conceptual architecture of a typical web server (like Apache).

### **UNIT V:**

**8 Hours**

Introduction to Advanced web technologies.

Web Security: Firewalls- definition and uses, network layer firewalls and application layer firewalls; Proxy servers.

### **Textbooks:**

1. Godbole A. S. & Kahate A.”Web Technologies”,(3rd Ed.) Tata McGraw Hill Education Pvt Ltd,2013.

2. Xavier C. “Web Technology & Design”, New Age Publication,2007.

3. Kogent Learning Solution Inc.”Java Server Programming,Java EE7(Black Book)”, (J2EE 1.7 Ed.) Dreamtech Press,2014.

**References:**

1. Dick Oliver, "SAMS Teach Yourself Html and CSS in 24 Hours", (9<sup>th</sup> Ed.), Sams Publishing, 2013.
2. Brad Dayley, "SAMS Teach Yourself JavaScript in 24 Hours", Sams Publishing, 2013

# Matlab

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<b>Course Code</b>	
<b>Course Name</b>	Matlab
<b>Credits</b>	3L: 0T: 0P
<b>Pre-Requisites</b>	Basic Programming Knowledge
<b>Comments</b>	Open

## Course Objectives:

- Understand the Matlab Desktop, Command window and the Graph Window.
- Be able to do simple and complex calculation using Matlab.
- Be able to carry out numerical computations and analyses.
- Understand the mathematical concepts upon which numerical methods rely.
- Ensure you can competently use the Matlab programming environment.
- Understand the tools that are essential in solving engineering problems.

## Syllabus

UNIT I	Hours=40
<b>Introduction to Matlab</b> Matlab Interactive Sessions, Computing with Matlab, Variables, Arrays, Functions and Files.	6
UNIT II	
<b>Programming Techniques</b> Program Design and Development, Relational Operators and Logical Variables, Logical Operators and Functions, Conditional Statements, Loops, The Switch Structure, Debugging Mat Lab Programs.	8
UNIT III	
<b>Plotting</b> XY- plotting functions, Subplots and Overlay plots, Special Plot types, Interactive plotting, Function Discovery, Regression, 3-D plots.	8
UNIT IV	
<b>Probability and Statistics</b> Interpolation, Statistics, Histogram and probability, The Normal Distribution, Random number Generation.	10
UNIT V	
<b>Symbolic Processing With Matlab</b> Symbolic Expressions and Algebra, Algebraic and Transcendental Equations, Calculus, Symbolic Linear Algebra.	8



**Text Books:**

1. *Introduction to Matlab 7 for Engineers*, by William J. Palm III, McGraw Hill 2005.

**Reference Books:**

1. S. J. Chapman. *MATLAB Programming for Engineers*. Thomson, 2004
2. J. Cooper. *A MATLAB Companion for Multivariable Calculus*. Academic Press, 2001.

**Course Outcomes:**

**After completion of course, students would be able to:**

- Able to use Matlab for interactive computations.
- Familiar with memory and file management in Matlab.
- Able to generate plots and export this for use in reports and presentations.
- Able to use basic flow controls.

**DEPARTMENT OF BIOTECHNOLOGY**  
**ASSAM UNIVERSITY**

**Syllabus**

**COURSE STRUCTURE**

Paper No.	Name of the paper	Total Marks	Credit Point
<b>Theory SEMESTER I</b>			
BT 101	Biological Chemistry	100	6.0
BT 102	Cell Biology	100	6.0
BT 103	Genetics & Quantitative Methods	100	6.0
BT 104	Microbiology and Virology	100	6.0
<b>Practical</b>			
BT 105	Biological Chemistry and Cell Biology	100	3.0
BT 106	Quantitative Methods	100	3.0
<b>Theory SEMESTER II</b>			
BT 201	Immunology	100	6.0
BT 202	Molecular Biology	100	6.0
BT 203	Fundamentals of Biotechnology (CBCS)	100	6.0
BT 204	Bioinformatics	100	6.0
<b>Practical</b>			
BT 205	Molecular Biology and Genetics	100	3.0
BT 206	Microbiology & Immunology	100	3.0
<b>Theory SEMESTER III</b>			
BT 301	Tissue Culture (Plant and Animal)	100	6.0
BT 302	Fundamentals of Genetic Engineering	100	6.0
BT 303	Biochemical Engineering and Cell Technologies	100	6.0
BT 304	Biodiversity, IPR, Patents and Biosafety	100	6.0
<b>Practical</b>			
BT 305	Tissue Culture and Cell Technology	100	3.0
BT 306	Genetic Engineering and Bioinformatics	100	3.0
<b>Theory SEMESTER IV</b>			
BT 401	Advanced Techniques in Biological Chemistry, Molecular Biology, Genomics and Proteomics	100	6.0
BT 402	Plant Biotechnology, Animal Biotechnology & Applications of Genetic Engineering	100	6.0
BT 403	Industrial Biotechnology, Molecular Immunology & Immunotechnology	100	6.0

**Practical**

\*BT 404 Project Work & Review 200 12.0

**NOTE:** TOTAL MARKS in all FOUR Semester: 2300 (600+600+600+500)

Internal assessment: Theory - 30, Pass Mark- 12; Practical – 30, Pass Mark – 12

End Semester Exam: Theory – 70, Pass Mark – 28; Practical – 70, Pass Mark – 28

\*BT 404 no internal marks

<b>Breakup for Internal Assessment: Test – 15: Assignment – 10: Attendance - 05</b>
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## Fourth Semester

### **BT 401 ADVANCED TECHNIQUES IN BIOLOGICAL CHEMISTRY , MOLECULAR BIOLOGY, GENOMICS AND PROTEOMICS**

#### **BT 401.1 Techniques in Biological Chemistry**

Chromatography: gel permeation, adsorption (ion exchange, affinity), partition, HPLC, protein purification; 2-D analysis and MALDI-TOF in Proteomics, Centrifugation techniques

#### **BT 401.2 Techniques in Molecular Biology**

Nucleic acids techniques: Agarose gel electrophoresis, various blotting techniques, PFGE, RNA interference and gene silencing (si-RNA, mi-RNA) technology, Radioactivity: Applications of radioisotopes for analysis of biological samples; General principles of using radiotracers, Detection and measurement of radioactivity; Neutron Activation Analysis, Isotope dilution analysis, Radio-immunoassay; Interaction of radiation with matter: Interaction of charge particles and gamma rays; Interaction with biological cells, Somatic and genetic affects of radiations.

#### **BT 401.3 Techniques for Macromolecular Structure**

Techniques: IR, NMR, CD, Fluorescence, STM, Small angle scattering, Crystallization of biomolecules, Introduction to X-ray crystallography; Sequencing of proteins and nucleic acids; Structure of Biomolecules: Proteins; Sequencing of RNA (RNA Seq)

#### **BT- 401.4 Genomics**

Introduction to genomics and Proteomics; Sequencing strategies for whole genome analysis, sequence data analysis; Comparative Genomics: protein evolution from exon shuffling, protein structural genomics, gene function by sequence comparison; Global expression profiling: whole genome analysis of mRNA and protein expression; Toxicogenomics; Pharmacogenomics; Metagenomics, Metabolic engineering

#### **BT 401.5 Proteomics**

Importance of proteomics; Strategies in proteomics: Mapping of protein interactions: Two hybrid, phage display etc; Proteomics applications: understanding the mechanism of pathogenesis, Drug discovery; Disease diagnosis, identification and characterization of novel proteins.

**DEPARTMENT OF CHEMISTRY  
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**M. Sc. Chemistry New (CBCS) Syllabus**

**Course Structure**

Course Number	Course Name	Total Marks				Total	L*	T*	C*
		Internal		External					
		MM*	PM*	MM	PM				
Semester – I									
CH - 101	Inorganic Chemistry – I	30	12	70	28	100	4	2	6
CH - 102	Organic Chemistry – I	30	12	70	28	100	4	2	6
CH - 103	Physical Chemistry-I	30	12	70	28	100	4	2	6
CH - 104	Physical Chemistry-II	30	12	70	28	100	4	2	6
CH - 105	Laboratory Course in Inorganic Chemistry	30	12	70	28	100			8
Total		150		350		500	16	8	32
Semester – II									
CH - 201	Inorganic Chemistry – II	30	12	70	28	100	4	2	6
CH - 202	Organic Chemistry – II	30	12	70	28	100	4	2	6
CH - 203	General Chemistry (Open-I)	30	12	70	28	100	4	2	6
CH - 204	Quantum Chemistry and Molecular spectroscopy (Open-II)	30	12	70	28	100	4	2	6
CH - 205	Laboratory Course in Organic Chemistry	30	12	70	28	100			8
Total		150		350		500	16	8	32
Semester - III									
CH - 301	Inorganic Chemistry – III	30	12	70	28	100	4	2	6
CH - 302	Organic Chemistry – III	30	12	70	28	100	4	2	6
CH - 303	Physical Chemistry - III	30	12	70	28	100	4	2	6
CH - 304	Applications of Spectroscopic Methods	30	12	70	28	100	4	2	6
CH - 305	Laboratory Course in Physical Chemistry	30	12	70	28	100			8
Total		150		350		500	16	8	32
Semester - IV									
CH - 401	Analytical and Computational Chemistry	30	12	70	28	100	4	2	6

CH - 402	Chemistry of Advanced Materials	30	12	70	28	100	4	2	6
CH – 403A/	Inorganic Chemistry-IV	30	12	70	28	100	4	2	6
CH – 403 B/	Organic Chemistry – IV								
CH – 403C/	Physical chemistry-IV								
CH-404 A/B/C	Project Work Inorganic/Organic/ Physical	60	24	140	56	200			16
Total		150		350		500	16	8	34

### First Semester

#### CHEMISTRY – 105 : LABORATORY COURSE IN INORGANIC CHEMISTRY

**Max. Marks: 100, External: 70, Pass Marks: 28, Sessional:30, Pass Marks:12**

##### 1. Semimicro qualitative analysis ;

Complete systematic analysis of Inorganic mixtures containing six ions including two of the following elements: W, Mo, Au, Pt, Pd, Se, Te, V, Ti, Zr, U, Th and Ce and the interfering anion (arsenates/phosphate/borate/fluoride).

2. **Quantitative estimation** (involving volumetric-redox and complexometry, gravimetric and Spectrophotometric methods) of constituents in two and three component mixtures and alloys.

3. **Preparation of the following compounds** : related complementary work and physical studies (at least 8 preparations are to be completed by turn)

- Reinecke Salt.
- Potassium tris-oxalato chromate (III) trihydrate
- Potassium tris-oxalato ferrate (III) trihydrate.
- Tris (acetylacetonato) iron (III).
- Tris (acetylacetonato) chromium (III).
- Chloro pentaamino cobalt (III) chloride.
- Mercury tetrathiocyanatocobaltate(II).
- Linkage isomers of Nitro and Nitrito-pentammine cobalt (III) chloride.
- Cis, trans –dichloro bis(ethylenediammine) cobalt (III) chloride.
- N, N' disalicylaethylene – diammine nickel (II).
- Bis(N, N' disalicylaethylene-diamine)-μ- aquadnicobalt(II)

4. Physical studies includes magnetic susceptibility conductance measurements, infrared, UV-Visible Spectroscopy and cyclic voltammetry.

##### Essential readings ;

- A.I. Vogel, Macro and Semicro qualitative Inorganic Analysis, Orient Longman, 1969.

2. J. Basset, R.C. Denney, G.H. Jeffery and J. Memdham, Vogel's Text Book of quantitative Inorganic Analysis, ELBS, 4th Edn., 1978.
3. H. H. Willard, L. L. Merrit and J.A. Dean, Instrumental methods of analysis, East-West Press, 4th Edn, 1974.
4. G.W. Parshall (Ed. In chief), Inorganic Synthesis, Vol 15, McGraw Hill, P. 48, 1974.
5. D. D. Sood, S. B. Mohaharand, A. V. R. Reddy, Experiments in Radiochemistry Theory and Practice, IANCAS Publications, 1994.
6. W.L. Jolly : Synthesis and characterization of inorganic compounds Prentice Hall Inc.

### Second Semester

#### CHEMISTRY – 205: LABORATORY COURSE IN ORGANIC CHEMISTRY

**Max. Marks: 100, External: 70, Pass Marks: 28, Sessional:30, Pass Marks:12**

##### 1. Qualitative Analysis:

Separation, purification and identification of compounds of binary mixture (one liquid and one solid, two solids) using TLC and column chromatography, chemical tests (Semi micro/Spot test/Capillary method), UV and IR Spectra to be used for functional group identification.

2. **Chromatography:** TLC and column chromatography (CC). Separation and identification of mixture of two or three compounds by chromatography, determination of RF values.

##### 3. Organic Synthesis: (Any four)

**Acetylation :** Acetylation of cholesterol and separation of cholesteryl acetate by column chromatography. **Oxidation:** Adipic acid by chromic acid oxidation of cyclohexanol.

**Grignard reaction:** Synthesis of triphenylmethanol from benzoic acid. **Aldol condensation:** Dibenzal acetone from benzaldehyde. **Sandmeyer reaction :** p-Chlorotoluene from p-toluidine. Acetoacetic ester condensation synthesis of ethyl-n-butylacetoacetate by A.E.E. condensation. **Cannizzaro reaction:** 4-Chlorobenzaldehyde as substrate. **Friedel Crafts Reaction:**  $\beta$ -Benzoyl propionic acid from succinic anhydride and benzene. **Aromatic electrophilic substitutions :** Synthesis of p-nitroaniline and p-bromoaniline. **Benzilic acid rearrangement:** Benzilic acid from benzoin, Benzoin—Benzil—Benzilic acid. **Synthesis of heterocyclic compounds - Skraup synthesis:** Preparation of quinoline from aniline, **Fisher – Indole synthesis:** Preparation of 2-phenylindole from phenylhydrazine. **Enzymatic Synthesis:Enzymatic reduction:** reduction of ethyl acetoacetate using Bakers' yeast to yield enantiomeric excess of S(+) ethyl-3-hydroxybutanoate and determine its optical purity. Biosynthesis of ethanol from sucrose. Synthesis using microwaves. Alkylation of diethyl malonate with benzyl chloride. Synthesis using phase transfer catalyst. Alkylation of diethyl malonate or ethyl acetoacetate with an alkyl halide.

##### 4.Extraction of Organic compounds from Natural sources : (Any two)

Isolation of caffeine from tea leaves. Isolation of nicotine dipicrate from tobacco. Isolation of cinchonine from cinchona bark. Isolation of piperine from black pepper. Isolation of lycopene from tomatoes. Isolation of  $\beta$ -carotene from carrots. Isolation of oleic acid from olive oil involving the preparation of complex with urea and separation of linoleic acid). Isolation of eugenol from cloves. Isolation of (+) limonine from citrus rinds

##### 5. Quantitative Analysis: (any two )

Determination of the percentage or number of hydroxyl groups in an organic compound by acetylation method. Estimation of amines/phenols using bromate bromide solution or acetylation method. Determination of Iodine and Saponification values of an oil sample. Determination of DO, COD and BOD of water sample.

6. **Estimations:** Ascorbic acid, Aspirin, Caffeine.

7. **Use of Computer in organic chemistry:** Simple operations like Drawing of structures, Optimization etc.

**ESSENTIAL READINGS :**

1. F. Brians, J. H. Antony, P. W. G. Smith and R. T. Austin, Vogel's text book of practical organic chemistry, ELBS, 5th Edn. 1991.
2. R. K. Bansal, Laboratory manual of organic chemistry, 3rd Edn. Wiley Eastern Limited, 1994.
3. D. H. Williams and Ian Fleming, Spectroscopic methods in organic chemistry, TMH Edition, 1988.
4. A. Buzarbarua, A Text Book of Practical Plant Chemistry, S. Chand and Company Ltd., 2000.
5. S. Sadasivam and A. Manikam, Biochemical Methods, Wiley Eastern, 1992.
6. D. L. Pavia, G. M. Lampman and G. S. Kriz, Introduction to Spectroscopy, 3rd Edn. Harcourt College Publishers, 2007.

**ADDITIONAL READINGS:**

1. A.Y. Sathi, A first courses in food analysis: New Age International (P) Ltd. Publishers, New Delhi, 1999.
2. M. R. Silverstein, C. G. Bassler, C. Horril, Spectroscopic Identification of Organic compounds, John Wiley and Sons, 1991.
3. P. S. Kalsi, Spectroscopy of Organic Compounds, New Age International Publishers Ltd., 1995.
4. I. L. Finar, Organic Chemistry Vol. 2, ELBS with Longman, 1975.
5. H. T. Clarke, A Hand book of Organic analysis Edward Arnold Ltd 1960.

**Third Semester****CHEMISTRY – 305 : LABORATORY COURSE IN PHYSICAL CHEMISTRY**

**Max. Marks: 100, External: 70, Pass Marks: 28, Sessional:30, Pass Marks:12**

1. Determination of equilibrium constant of the reaction  $KI + I_2$ .
2. Determination of energy of activation for hydrolysis of an ester, using an acid catalyst.
3. Study of the reaction between acetone and iodine in the presence of an acid.
4. Determination of the partial molal volume of a solute in solution.
5. Determination of molecular weight of a non-electrolyte\electrolyte by cryoscopy.
6. Determination of dissociation constant of a weak electrolyte conductometrically and verification of Ostwald's dilution law.
7. Determination of specific rotation of source and rate constant of its hydrolysis, using a polarimeter.
8. Solubility curve for a ternary system of liquids (water acetic acid chloroform).
9. To obtain the phase diagram for a two component system forming a congruent compound (benzophenone-diphenylamine).
10. Determination of transport number of ions by Hittorf's method.
11. Determination of strengths of strong and weak acids in a given mixture, using the pH meter.
12. Determination of a) cell constant b) strengths of strong and weak acids in a given mixture, conductometrically.
13. Determination of the order of saponification for the reaction of ethyl acetate with sodium hydroxide, conductometrically.
14. Determination of the order of saponification for the reaction of ethyl acetate with sodium hydroxide, conductometrically.
15. Determination of the equivalent conductivity of strong electrolytes at different dilutions (HCl, NaCl,
16.  $CH_3COONa$ ) and hence to determine the equivalent conductivity of a weak electrolyte ( $CH_3COOH$ ) at infinite dilution.
17. Determination of solubility and solubility product of sparingly soluble salts ( $PbSO_4$  and  $BaSO_4$ ), conductometrically.

18. Determination of strengths of halides in a mixture, potentiometrically.
19. Determination of the valency of mercurous ions, potentiometrically.
20. Determination of the hydrolysis constant of ammonium chloride and the dissociation constant of ammonium hydroxide potentiometrically.
21. Determination of the dipole moment of a polar molecule using the dipole meter.
22. Determination of phase transition temperature through differential thermal analysis.
23. Determination of glass transition temperature of a given salt, conductometrically.
24. Determination of the PK of an indicator spectrophotometrically.
25. Determination of the PK of the indicator in micelle medium spectrophotometrically.
26. Determination of the rate constant for the oxidation of iodide ions by hydrogen peroxide. Studying the kinetics as an iodine-clock reactions.
27. Determination of the composition and the stability constant of a complex, spectrophotometrically.

**Suggested reading:**

1. Experiments in Physical Chemistry J.C.Ghosh Bharati Bhavan 1974, New Delhi
2. Advanced experimental chemistry (Physical) J.N.Gurtu, & NR Kapoor, S.C. Company 1980
3. Laboratory manual in Physical chemistry WJ Popiel, ELBS 1970
4. Advanced Practical in Physical Chemistry JB Yadav, Pragati prakasan Meerut
5. Practical Physical Chemistry, A. M. James and F. E. Prichard, Longman.

**Additional reading**

6. Findley's practical Physical Chemistry, B. P. Levitt, Longman.
7. Experimental Physical Chemistry, R. C. Das and B. Behera, Tata McGraw Hill.

## Fourth Semester

### Chemistry CH – 402: CHEMISTRY OF ADVANCED MATERIALS

**Max. Marks: 100, External: 70, Pass Marks: 28, Sessional:30, Pass Marks:12**

#### **Unit- I: Introduction to Nanomaterials:**

Introduction - definition of nanoscience, nanochemistry -classification of the nanomaterials, Synthesis of Nanomaterials: Top-Down and Bottom-up approaches. Characterization Techniques: Electron Microscopy, Spectroscopy, XRD. Properties of nanomaterials:Size-effect: melting point, electrical properties, optical properties, magnetic properties, catalytic properties. Few selective examples of recent emerging applications: Solar cell, green- and environmental-nanotechnology, nanotoxicology.

#### **Unit- II: Photosensitizers in Photodynamic Therapy:**

Modified Jablonski Diagram, Type I and Type-II mechanism for generation of ROS, Porphyrin analogues, Nanomaterials in PDT. First, second and third generation Photosensitizers and their development.

#### **Unit -III: Mesogens and Supramolecules:**

Introduction - Difference between liquid crystal, solid and liquid. Order parameters, Classification of liquid crystals. Thermotropic liquid crystals, shape anisotropy, nematic, cholesteric and smectic mesophases. Important applications of liquid crystals.



Applications of Supramolecule: Molecular sensors- Electrochemical and optical sensors, Switches and molecular machinery, Photochemical devices, MRI contrast, Anti cancer agents, Cosmetics and food industries.

#### **Unit- IV: Pharmaceutical Chemistry**

Concept and definition of Pharmacophore, Drug Discovery, Design and Development. Structure-activity relationships: Strategies in drug design. QSAR and combinatorial synthesis. Optimization of drug-target interactions and access to drug targets. ADMET of drugs. Pro-drugs and drug delivery systems. Elementary ideas on Biomimicking systems: Cyclodextrins as enzyme mimics, ion channel mimics.

#### **Unit- V: Hazards and Peaceful use of Chemistry**

Historical background, types of weapons of mass destruction (WMD) – Nuclear, Radiological, Chemical and Biological. Chemical warfare agents: Classes, Designation, persistency. Hazards and peaceful uses. Chemical Weapon Convention (CWC).

#### **Essential Readings:**

1. Introduction to Nanoscale science and Technology, (Ed) Massimiliano Di Ventra, Kluwer Academic.
2. Nanomaterials CNR Rao, Wiley-VCH
3. M.J.O.Connell, Carbon Nanotubes: Properties and Application, CRC Press, 2006
4. Nanostructures and Nanomaterials, Synthesis, Properties Applications, by G.Cao, Imperial College Press, 57 Shelton Street, Covent Garden, London WC2H 9HE, 2004
5. C.N.R.Rao, A.Muller, A.K.Cheetham, Nanomaterial Chemistry: Recent developments and new directions, Wiley, 2007.
6. T. Pradeep, Nano: The Essentials, Tata McGraw-Hill, New Delhi, 2007.
7. Nanoparticle Technology Handbook, Masuo Hosokawa, Kiyoshi Nogi, Makio Naito, Toyokazu Yokoyama, Elsevier 2007
8. Yury Gogotsi, Nanomaterials Handbook, CRC press, 2008

#### **Additional reading:**

1. J.W.steed, D.R.Turner, K.Wallace, Core Concept in Supramolecular Chemistry and Nanochemistry, Wiley, 2007
2. H.S. Nalwa, Handbook of Nanostructured Materials and Nanotechnology, Academic Press, 2000.
3. M.S. Dresselhaus, G. Dresselhaus, P.C. Eklund, Science of Fullerenes and Carbon Nanotubes, Academic Press, San Diego, USA, 1996.
4. M.S. Dresselhaus, G. Dresselhaus, P. Avouris, Carbon Nanotubes: Synthesis, Structure, Properties and Application, Springer, Berlin, Germany, 2001.
5. P. J. Bruke, Nanotubes and Nanowires, Spring, 2004
6. Advanced semiconductor and organic nano technique part I, II, III Hadis Morkoc, Elsevier.

#### **Chemistry CH – 404: Project Work**

**Max. Marks: 200, External: 140, Pass Marks: 56, Sessional:60, Pass Marks:24**

Project Work: A/B/C

A = Inorganic

B = Organic

C = Physical

#### **Syllabus for IPP Course Work to be effective from 2017 Session**

##### **DEPARTMENT OF CHEMISTRY**

##### **ASSAM UNIVERSITY: SILCHAR**

#### **Course Structure**

Course Number	Course Name	Nature	Max. Credit	Max. Marks
Paper-I	Research Methodology	School Level	4	100

Paper-II	Essentials in Chemical Science Research	Department Level	4	100
Paper-III(A)	Materials Chemistry	Department Level	4	100
Paper-III(B)	Advanced Organic Chemistry	Department Level	4	100
Paper-III(C)	Topics in Advanced Chemistry	Department Level	4	100
Paper-IV	Term Paper	Department Level	4	100
<b>Total</b>		<b>16</b>	<b>16</b>	<b>400</b>

The one paper for Paper-III has been replaced with three optional papers as follows: Paper-III(A): Materials Chemistry Paper-III(B): Advanced Organic Chemistry Paper-III(C): Topics in Advanced Chemistry

(The candidate has to choose any one from these three optional papers)

New syllabus has been prepared for each of these papers

**Paper-III (A) Materials Chemistry**  
**Max. Marks: 100**  
**Credit: 4**

**UNIT-I: Liquid Crystals**

Plastic Crystals and Liquid Crystals, Classification, General synthetic strategies of thermotropic liquid crystals, Order parameters for cholesteric, nematic and smectic phase and their experimental determination, Optical properties and defects in liquid crystals, Diffraction of X-rays by liquid crystals, Information obtained from X-ray studies on liquid crystalline materials. Electrical and Magnetic properties of liquid crystals, Theory of dielectric anisotropy, Freedericksz effect, application of liquid crystals.

**UNIT-II: Metallomesogens**

Definition, examples, strategies for synthesis of metallomesogens, functionalisation of multidentate ligands (salen, salphen type etc.). Metallomesogens involving copper, vanadium, nickel, palladium, platinum, lanthanides etc. Study of their properties, like NLO, photoluminescence etc.

**UNIT-III: Properties and Applications of Nanoscale Materials**

Nanoscale Materials: Definition – Size effect Synthesis – Some Typical Chemical approaches Properties – Optical, Electronic, Catalytic and Magnetic, Applications in Solar Cell, Catalysis, and Photodynamic Therapy.

**UNIT-IV: Carbon Nanomaterials**

Carbon Nanotubes: Definition, Different Types-Single and Multi-Walled, Synthesis-Some Typical Examples, Properties and Applications. Environmental Impacts and Health Hazards

**Suggested Readings**

1. Introduction to Nanoscale Science and Technology, (Ed) M.D.VentraS.Evoy and J.R.Heflen Kluwer Academic Publisher, Boston. , (2004).

2. Nanomaterials Chemistry: Recent Developments and New Directions” C.N.R. Rao, A.Muller and A.K.Cheetham, Wiley VCH (2007).
3. Chemistry of Nanomaterials”, C.N.R Rao, A.Muller and A.K.Cheetham (Eds) WileyVCH, Weinheim, 2004, Reprinted 2006.
4. Liquid Crystals: Fundamentals, David A. Dunmur and Shri Singh, World Scientific Publishing Co Pte Ltd, 2000
5. Nanoscience with Liquid Crystals, Quan Li (Editor)Springer; 2014 edition

**Paper-III (B) Advanced Organic Chemistry**

**Max. Marks: 100**

**Credit: 4**

**UNIT-I: Application of Computer in Chemical Science Research**

Application of computational methods for prediction of chemical Potential, Electronegativity, Hardness and Softness of molecules. DFT Formulation of Reactivity—The Fukui Function. Electronic structure and thermochemical properties, geometry optimization, study of reaction mechanism, transition-state optimizations.

**UNIT-II: Carbohydrates**

Carbohydrates: Structure of Monosaccharide. Importance of carbohydrates (Carbohydrates as antibiotics, Vaccines, Tumor metastasis etc.) Structural features of Polysaccharides, Glycoprotein, Proteoglycans. Synthesis : Glycosyl Donor, Glycosyl Acceptor, Techniques of oligosaccharides synthesis. Synthesis and Applications of Carbohydrate-Derived Macrocyclic Compounds

**UNIT-III: Organic Photosensitizers**

Biomedical Organic Photosensitizers: Porphyrin analogues, nucleic acid analogues, functionalization of carbon nanomaterials with organic molecules in the development of photosensitizers. Photodynamic therapy and applications, Photo thermal therapy, Hyperthermia

**UNIT-IV: Organic Reaction Methodology**

Designing organic synthesis, Multi-component reactions for the synthesis of heterocyclic and biologically active molecules, Ugi Reaction, Passerini Reaction, Organocatalysis.

**Suggested Readings**

1. Organic Synthesis with Carbohydrates, Geert-Jan Boons, Continuum International Publishing Group - Sheffie
2. Carbohydrate Chemistry, Geert-Jan Boons, Springer
3. Computational Chemistry, D Jolly, Ivy Publishing House

4. Computational Chemistry : Intro To The Theory & Applications Of Molecular & Quantum Mechanics, Errol Lewars, Springer
5. Computational Chemistry (Oxford Chemistry Primers), Guy H. Grant, OUP Oxford
6. Computational Chemistry: A Practical Guide for Applying Techniques to Real World Problems, David Young, Wiley-Blackwell
7. Photosensitizers in Medicine, Environment, and Security, T. Nyokong (Editor), Vefa Ahsen (Editor), Springer
8. Towards Dual and Targeted Cancer Therapy with Novel Phthalocyanine-based Photosensitizers, Janet T F Lau, Springer
9. Designing Organic Synthesis, Sharma, Pragati Prakashan
10. Designing Organic Syntheses: A Programmed Introduction to the Synthon Approach, Stuart Warren, Wiley-Blackwell
11. Multicomponent Reactions: Concepts and Applications for Design and Synthesis, Raquel P. Herrera, Eugenia Marqués, Wiley-VCH, Weinheim, 2015

**Paper-III (C): Topics in Advanced Chemistry**

**Max. Marks: 100**

**Credit: 4**

**UNIT-I: Application of Transition Metal Complexes**

Binding of transition metal complexes with DNA and Nucleic Acid, Anticancer activity of Platinum Group Complexes: different type of active complexes, Antimicrobial activity of metal chelates. Alkaline phosphatase: structure and reactivity; Insulin: structure and reactivity.

**UNIT-II: Catalysis**

General Principles, Energetics, Catalytic cycles, Catalytic efficiency and lifetime, Selectivity, Homogeneous catalysis: Alkene metathesis, Asymmetric oxidation, Palladium- catalyzed C-C bond forming reactions, Methanol carbonylation, Heterogeneous catalysis: Surface area and porosity, Surface acidic and basic sites, Surface metal sites, Chemisorption and desorption, Hydrogenation catalysts, Sulfur dioxide oxidation, Electrocatalysis, Hybrid catalysis: Tethered catalysts, Biphasic systems

**UNIT-III: Application of Fluorescence**

Types of Photophysical Pathways, Fluorophores, Quenching of Fluorescence, Energy Transfer and Protein Fluorescence.

**UNIT-IV: Chemical and Electrochemical Kinetics and Environment Related Chemistry**

Electrochemistry Fuel cells; Solar cells (photochemical, photovoltaic); Batteries (solid-state & conventional)-single electrode and complete cell studies; Production of H<sub>2</sub> and important chemicals of high energy; Corrosion & waste removal techniques

**Suggested Readings**

1. Shriver& Atkins' Inorganic Chemistry, P. Atkins, T. Overton, J. Rourke, M. Weller, F. Armstrong, Fifth Edition, Oxford University Press.
2. Protein Fluorescence, Joseph R. Lacowicz, Springer
3. Single-Molecule Fluorescence Spectroscopy of the Folding of a Repeat Protein, Sharona Cohen, Springer.



**DEPARTMENT OF AGRICULTURAL ENGINEERING  
ASSAM UNIVERSITY: SILCHAR**

**Curriculum  
Of  
Undergraduate Degree Course  
In  
Agricultural Engineering**

**General, Course structure & Theme & Semester-wise credit distribution**

**A. Definition of Credit:**

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
1 Hr. Practical (P) per week	0.5 credit
2 Hours Practical(Lab)/week	1 credit

**B. Range of credits** - A range of credits from 150 to 160 for a student to be eligible to get Under Graduate degree in Engineering. A student will be eligible to get Under Graduate degree with Honours or additional Minor Engineering, if he/she completes an additional 20 credits. These could be acquired through MOOCs.

**C. Structure of Undergraduate Engineering program:**

Sl. No.	Category	Credit Breakup
1	Humanities and Social Sciences including Management courses	13
2	Basic Science courses	22
3	Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc.	24
4	Professional core courses	56
5	Professional Elective courses relevant to chosen specialization/branch	18
6	Open subjects – Electives from other technical and /or emerging subjects	12
7	Project work, seminar and internship in industry or elsewhere	15
8	Mandatory Courses [Environmental Sciences, Induction Program, Indian Constitution, Essence of Indian Knowledge Tradition]	(non-credit)
	<b>Total</b>	<b>160</b>

**D. Credit distribution in the First year of Undergraduate Engineering program:**

	Lecture	Tutorial	Laboratory/Practical	Total credits
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Chemistry-I	3	1	4	6
Physics	3	1	4	6
Mathematics-I	3	1	0	4
Mathematics -II	3	1	0	4
Programming for Problem solving	3	0	4	5
English	2	0	4	4
Engineering Graphics & Design	1	0	4	3
Workshop/Manufacturing Practices	1	0	4	3
Basic Electrical Engineering	3	1	2	5
*Basic Electronics Engineering	3	1	0	4
*Engineering Mechanics	3	1	0	4
*Mathematics -III	2	0	0	2

*\*These courses are offered in the 3<sup>rd</sup> semester & onwards.*

#### E. Course code and definition:

Course code	Definitions
BSC	Basic Science Courses
ESC	Engineering Science Courses
HSMC	Humanities and Social Sciences including Management courses
PCC-AE	Professional core courses
PEC -AE	Professional Elective courses
OEC-AE	Open Elective courses
LC	Laboratory course
MC	Mandatory courses
SI	Summer Industry Internship
PROJ-AE	Project

#### HUMANITIES AND SOCIAL SCIENCES INCLUDING MANAGEMENT COURSES [HSMC]

Sl.	Code No.	Course Title	Hours per week	Total	Semester
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No.			Lecture	Tutorial	Practical	Credits	
1	HSMC 101	English-I	1	0	2	2	1
2	HSMC 201	English-II	1	0	2	2	2
3	HSMC 301	Humanities-1 (Effective Technical Communication)	3	0	0	3	3
4	HSMC 401	Management-I (Organizational Behaviour)	3	0	0	3	4
5	HSMC 501	Operations Research and Industrial Management	3	0	0	3	5
<b>Total Credits:</b>						<b>13</b>	

**BASIC SCIENCE COURSES [BSC]**

Sl. No.	Code No.	Course Title	Hours per week			Total Credits	Semester
			Lecture	Tutorial	Practical		
1	BSC101	Engineering Physics	3	1	4	6	1
2	BSC 102	Mathematics-I	3	1	0	4	1
3	BSC 201	Mathematics-II (Probability and Statistics)	3	1	0	4	2
4	BSC 202	Chemistry-I	3	1	4	6	2
5	BSC 301	Mathematics-III (Ordinary Differential Equation and Complex Variable)	2	0	0	2	3
<b>Total Credits:</b>						<b>22</b>	

**ENGINEERING SCIENCE COURSES [ESC]**

Sl. No.	Code No.	Course Title	Hours per week			Total Credits	Semester
			Lecture	Tutorial	Practical		
1	ESC 101	Engineering Graphics & Design	1	0	4	3	1
2	ESC 102	Workshop/Manufacturing Practices	1	0	4	3	2
3	ESC 201	Programming for Problem Solving	3	0	4	5	2
4	ESC 202	Basic Electrical Engineering	3	1	2	5	1
5	ESC 301	Basic Electronics Engineering	3	1	0	4	2
6	ESC 302	Engineering Mechanics	3	1	0	4	2
<b>Total Credits:</b>						<b>24</b>	

**PROFESSIONAL CORE COURSES [PCC]**

Sl. No.	Code No.	Course Title	Hours per week			Total Credits	Semester
			Lecture	Tutorial	Practical		

1	AE301	Fluid Mechanics	2	0	2	3	3
2	AE302	Thermodynamics	2	1	0	3	3
3	AE303	Advanced Workshop Technology	0	0	4	2	3
4	AE401	Strength of Materials	2	1	0	3	4
5	AE402	Surveying and Leveling	2	0	2	3	4
6	AE403	Soil Science and Soil Mechanics	2	0	2	3	4
7	AE404	Farm Power	2	0	2	3	4
8	AE405	Post Harvest Operations	2	0	2	3	4
9	AE501	Kinematics and Theory of Machines	2	1	0	3	5
10	AE502	Watershed Hydrology	2	0	2	3	5
11	AE503	Farm Machinery	2	0	2	3	5
12	AE504	Mechanical Operation in Food Processing	2	0	2	3	5
13	AE 505	Renewable Energy Technologies	2	0	2	3	5
14	AE 601	Thermal Operation in Food Processing	2	0	2	3	6
15	AE 602	Machine Design and drawing	2	0	2	3	6
16	AE 603	Soil & Water Conservation Engg.	2	0	2	3	6
17	AE 604	Irrigation & Drainage Engineering	2	0	2	3	6
18	AE 701	Land and Water Resource Management	3	0	0	3	7
19	AE 702	Fruits and Vegetable Processing	3	0	0	3	7
<b>Total Credits:</b>						<b>56</b>	

#### PROFESSIONAL ELECTIVE COURSES [PEC]

Sl. No.	Code No.	Course Title	Hours per week			Total Credits	Semester
			Lecture	Tutorial	Practical		

1	AEZXX	Elective - I	3	0	0	3	5
2	AEZXX	Elective – II	3	0	0	3	6
3	AEZXX	Elective - III	3	0	0	3	6
4	AEZXX	Elective – IV	3	0	0	3	7
5	AEZXX	Elective – V	3	0	0	3	7
6	AEZXX	Elective - VI	3	0	0	3	8
<b>Total Credits:</b>						<b>18</b>	

### PROFESSIONAL ELECTIVE COURSE TRACKS- AGRICULTURAL ENGINEERING [PEC-AE]

The students will have options of selecting the electives from the different tracks/threads depending on the specialization one wishes to acquire. The following Five Professional Specialized Tracks offer electives in the respective Tracks:

Track / Threads	Professional Specialized Tracks	Professional Elective Courses (PEC-AE)	
A	Water Resources development and Management	A01 A02 A03	Watershed Planning and Management Environmental Engineering Fundamentals Environmental Microbiological Principles
B	Food Process Engineering	B01 B02 B03 B04	Food Chemistry and Microbiology Refrigeration & Air Conditioning Tea Technology Dairy Food Technology
C	Farm Machinery and Power Engineering	C01 C02 C03 C04 C05 C06	Testing & Evaluation of Tractors & Machines Advanced Farm Power Instrumentation and Control Earth Moving Machinery Ergonomics and Safety Hydraulic Drives and Controls
D	Aquacultural Engineering	D01	Aquacultural Engineering
E	Allied Engineering Applications	E01 E02 E03	Agricultural Business Management Building Materials & Structural Design Statistical Methods in Agriculture

### OPEN ELECTIVE COURSES [OEC]

Sl. No.	Code No.	Course Title	Hours per week			Total Credits	Semester
			Lecture	Tutorial	Practical		

1	OEC ASH 27	Open Elective – I (Humanities) Understanding Culture and Society through Literature	3	0	0	3	6
2	OEC	Open Elective – II	3	0	0	3	7
3	OEC	Open Elective - III	3	0	0	3	8
4	OEC	Open Elective – IV	3	0	0	3	8
<b>Total Credits:</b>						<b>12</b>	

### OPEN ELECTIVE COURSES [OEC]

Soft Skills and Interpersonal Communication

ICT for Development

Human Resource Development and Organizational Behavior

Cyber Law and Ethics

Introduction to Philosophical Thoughts

Comparative Study of Literature

Indian Music System

History of Science & Engineering

Introduction to Art and Aesthetics

Economic Policies in India

**Note :** There should be at least two electives from the Open Elective Course choices (OEC). The rest two can be taken from the other threads, if intended.

### PROJECT WORK, SEMINAR AND INTERNSHIP IN INDUSTRY OR ELSEWHERE

Sl. No.	Code No.	Course Title	Hours per week			Total Credits	Semester
			Lecture	Tutorial	Practical		
1	AE 510	Summer Industry Internship - I	-	-	-	2	5
2	AE 703	Summer Industry Internship - II	-	-	-	2	7
3	AE 704	Project- I	0	0	10	5	7
4	AE 801	Project- II	0	0	12	6	8
<b>Total Credits:</b>						<b>15</b>	

### MANDATORY COURSES

Sl. No.	Code No.	Course Title	Hours per week			Total Credits	Semester
			Lecture	Tutorial	Practical		
1	MC -1	Environmental Sciences	2	0	0	-	4
2	MC-2	Constitution of India/ Essence of Indian Knowledge Tradition	2	0	0	-	5

**4 year Curriculum structure**  
**Undergraduate Degree in Engineering & Technology**

**Branch / course: Agricultural Engineering**  
**Total credits (4 year course) 160**

**I. Induction Program**(Please refer Appendix-A of Model Curriculum for Undergraduate Degree Courses in Engineering & Technology January 2018 Volume - I published by AICTE for guidelines)

<b>Induction program (mandatory)</b>	3 weeks duration (Please refer Appendix-A for guidelines & also details available in the curriculum of Mandatory courses)
Induction program for students to be offered right at the start of the first year.	<ul style="list-style-type: none"> <li>• Physical activity</li> <li>• Creative Arts</li> <li>• Universal Human Values</li> <li>• Literary</li> <li>• Proficiency Modules</li> <li>• Lectures by Eminent People</li> <li>• Visits to local Areas</li> <li>• Familiarization to Dept./ Branch &amp; Innovations</li> </ul>

**II. Semester-wise structure of curriculum**

[L= Lecture, T = Tutorials, P = Practicals & C = Credits]

**Semester I [First year]**  
**Branch/Course : Agricultural Engineering**

Sl. No.	Course Code	Course Title	Hours per week			Total Contact hours	Credits
			Lecture	Tutorial	Practical		
1	ASH 101	Engineering Physics	3	1	4	8	6
2	ASH 102	Mathematics-I	3	1	0	4	4
3	ASH 104	English-I	1	0	2	3	2
4	ASH 105	Workshop / Manufacturing Practices	1	0	4	5	3
5	ASH 106	Engineering Graphics	1	0	4	5	3
<b>Total Credits:</b>							<b>18</b>

**Semester II [First year]**  
**Branch/Course : Agricultural Engineering**

Sl. No.	Course Code	Course Title	Hours per week			Total Contact hours	Credits
			Lecture	Tutorial	Practical		
1	ASH 201	Mathematics-II (Probability and Statistics)	3	1	0	4	4
2	ASH 202	Chemistry-I	3	1	4	8	6
3	ASH 203	Programming for Problem Solving	3	0	4	7	5
4	ASH 204	Basic Electrical Engineering	3	1	2	6	5
5	ASH 205	English-II	1	0	2	3	2
<b>Total Credits:</b>							<b>22</b>

**Semester III [Second year]**  
**Branch/Course : Agricultural Engineering**

Sl. No.	Course Code	Course Title	Hours per week			Total Contact hours	Credits
			Lecture	Tutorial	Practical		
1	ASH 301	Mathematics-III (Ordinary Differential Equation and Complex Variable)	2	0	0	2	2
2	ASH 302	Basic Electronics Engineering	3	1	0	4	4
3	ASH 303	Engineering Mechanics	3	1	0	4	4
4	ASH 304	Humanities-1 (Effective Technical Communication)	3	0	0	3	3
5	AE 301	Fluid Mechanics	2	0	0	2	2
6	AE 302	Thermodynamics	2	1	0	3	3
7	AE 303	Fluid Mechanics Lab.	0	0	2	2	1
8	AE 304	Advanced Workshop Technology	0	0	4	4	2
<b>Total Credits:</b>							<b>21</b>

**Semester IV [Second year]**  
**Branch/Course : Agricultural Engineering**

Sl. No.	Course Code	Course Title	Hours per week			Total Contact hours	Credits
			Lecture	Tutorial	Practical		
1	ASH 401	Management-I (Organizational Behaviour)	3	0	0	3	3
2	AE 401	Strength of Materials	2	1	0	3	3
3	AE 402	Surveying and Leveling	2	0	0	2	2
4	AE 403	Soil Science and Soil Mechanics	2	0	0	2	2
5	AE 404	Farm Power	2	0	0	2	2
6	AE 405	Post Harvest Operations	2	0	0	2	2
7	AE 406	Surveying and Leveling Lab.	0	0	2	2	1
8	AE 407	Soil Science and Soil Mechanics Lab.	0	0	2	2	1
9	AE 408	Farm Power Lab.	0	0	2	2	1
10	AE 409	Post Harvest Operations Lab.	0	0	2	2	1
11	MC -1	Environmental Sciences	2	0	0	2	0
<b>Total Credits:</b>							<b>18</b>

**Semester V [Third year]**  
**Branch/Course : Agricultural Engineering**

Sl. No.	Course Code	Course Title	Hours per week			Total Contact hours	Credits
			Lecture	Tutorial	Practical		
1	ASH 501	Operations Research and Industrial Management	3	0	0	3	3
2	AE 501	Kinematics and Theory of Machines	2	1	0	3	3
3	AE 502	Watershed Hydrology	2	0	0	2	2
4	AE 503	Farm Machinery	2	0	2	2	2
5	AE 504	Mechanical Operation in Food Processing	2	0	0	2	2
6	AE 505	Renewable Energy Technologies	2	0	2	2	2
7	AE ZXX	Elective - I	3	0	0	3	3
8	AE 506	Watershed Hydrology Lab.	0	0	2	2	1
9	AE 507	Farm Machinery Lab.	0	0	2	2	1
10	AE 508	Mechanical Operation in Food Processing Lab.	0	0	2	2	1
11	AE 509	Renewable Energy Technologies Lab.	0	0	2	2	1
12	AE 510	Summer Industry Internship - I	-	-	-	-	2
13	MC-2	Constitution of India	-	-	-	-	0
Total Credits:							23

**Semester VI [Third year]**  
**Branch/Course : Agricultural Engineering**

Sl. No.	Course Code	Course Title	Hours per week			Total Contact hours	Credits
			Lecture	Tutorial	Practical		
1	AE 601	Thermal Operation in Food Processing	2	0	0	2	2
2	AE 602	Machine Design and drawing	2	0	0	2	2
3	AE 603	Soil & Water Conservation Engg.	2	0	0	2	2
4	AE 604	Irrigation & Drainage Engineering	2	0	2	2	2
5	AE ZXX	Elective - II	3	0	0	3	3
6	AE ZXX	Elective - III	3	0	0	3	3
7	OEC 27	Open Elective – I (Humanities)	3	0	0	3	3
8	AE 605	Thermal Operation in Food Processing Lab.	0	0	2	2	1
9	AE 606	Machine Design and drawing Lab.	0	0	2	2	1
10	AE 607	Soil & Water Conservation Engg. Lab.	0	0	2	2	1
11	AE 608	Irrigation & Drainage Engineering Lab.	0	0	2	2	1
Total Credits:							21

**Semester VII [Fourth year]**  
**Branch/Course : Agricultural Engineering**



Sl. No.	Course Code	Course Title	Hours per week			Total Contact hours	Credits
			Lecture	Tutorial	Practical		
1	AE 701	Land and Water Resource Management	3	0	0	3	3
2	AE 702	Fruits and Vegetable Processing	2	1	0	3	3
3	AE ZXX	Elective - IV	3	0	0	3	3
4	AE ZXX	Elective -V	3	0	0	3	3
5	OEC	Open Elective – II	3	0	0	3	3
6	AE 703	Summer Industry Internship - II	-	-	-	-	2
7	AE 704	Project- I	0	0	10	10	5
						<b>Total Credits:</b>	<b>22</b>

**Semester VIII [Fourth year]**  
**Branch/Course : Agricultural Engineering**

Sl. No.	Course Code	Course Title	Hours per week			Total Contact hours	Credits
			Lecture	Tutorial	Practical		
1	AE ZXX	Elective - VI	3	0	0	3	3
2	OEC	Open Elective – III	3	0	0	3	3
3	OEC	Open Elective – IV	3	0	0	3	3
4	AE 801	Project- II	0	0	12	12	6
						<b>Total Credits:</b>	<b>15</b>

**DETAILED 4-YEAR CURRICULUM CONTENTS**  
**Undergraduate Degree in Engineering & Technology**

**Branch/Course: AGRICULTURAL ENGINEERING**

**HUMANITIES AND SOCIAL SCIENCES INCLUDING MANAGEMENT COURSES  
[HSMC]**

<b>HSMC 101</b>	<b>English</b>	<b>1L:0T:2P</b>	<b>2 Credits</b>
<b>HSMC 201</b>	<b>English</b>	<b>1L:0T:2P</b>	<b>2 Credits</b>

**Teaching Scheme :** Lectures - 1 hours/week; Laboratory –2 hours/week

**Syllabus Contents**

**Unit 1: Vocabulary Building**

- 1.1 The concept of Word Formation
- 1.2 Root words from foreign languages and their use in English
- 1.3 Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives.
- 1.4 Synonyms, antonyms, and standard abbreviations.

**Unit 2: Basic Writing Skills**

- 2.1 Sentence Structures
- 2.2 Use of phrases and clauses in sentences
- 2.3 Importance of proper punctuation
- 2.4 Creating coherence
- 2.5 Organizing principles of paragraphs in documents
- 2.6 Techniques for writing precisely

**Unit 3: Identifying Common Errors in Writing**

- 3.1 Subject-verb agreement
- 3.2 Noun-pronoun agreement
- 3.3 Misplaced modifiers
- 3.4 Articles
- 3.5 Prepositions
- 3.6 Redundancies
- 3.7 Clichés

**Unit 4: Nature and Style of sensible Writing**

- 4.1 Describing
- 4.2 Defining
- 4.3 Classifying
- 4.4 Providing examples or evidence
- 4.5 Writing introduction and conclusion

**Unit 5: Writing Practices**

- 5.1 Comprehension
- 5.2 Précis Writing
- 5.3 Essay Writing

**Unit 6: Oral Communication**

(This unit involves interactive practice sessions in Language Lab)

- Listening Comprehension
- Pronunciation, Intonation, Stress and Rhythm
- Common Everyday Situations: Conversations and Dialogues

- Communication at Workplace
- Interviews
- Formal Presentations

### Course Outcomes

The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

### Suggested Readings

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Remedial English Grammar. F.T. Wood. Macmillan. 2007
3. On Writing Well. William Zinsser. Harper Resource Book. 2001
4. Study Writing. Liz Hamp-Lyons and Ben Heasley. Cambridge University Press. 2006
5. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
6. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press.

<b>HSMC 301</b>	<b>Humanities-1 (Effective Technical Communication)</b>	<b>3L:0T:0P</b>	<b>3 Credits</b>
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**Teaching Scheme :** Lectures - 3 hours/week

### Syllabus Contents

**Module 1:** Information Design and Development- Different kinds of technical documents, Information development life cycle, Organization structures, factors affecting information and document design, Strategies for organization, Information design and writing for print and for online media.

**Module 2:** Technical Writing, Grammar and Editing- Technical writing process, forms of discourse, Writing drafts and revising, Collaborative writing, creating indexes, technical writing style and language. Basics of grammar, study of advanced grammar, editing strategies to achieve appropriate technical style. Introduction to advanced technical communication, Usability, Human factors, Managing technical communication projects, time estimation, Single sourcing, Localization.

**Module 3:** Self Development and Assessment- Self assessment, Awareness, Perception and Attitudes, Values and belief, Personal goal setting, career planning, Self-esteem. Managing Time; Personal memory, Rapid reading, Taking notes; Complex problem solving; Creativity

**Module 4:** Communication and Technical Writing- Public speaking, Group discussion, Oral; presentation, Interviews, Graphic presentation, Presentation aids, Personality Development. Writing reports, project proposals, brochures, newsletters, technical articles, manuals, official notes, business letters, memos, progress reports, minutes of meetings, event report.

**Module 5:** Ethics- Business ethics, Etiquettes in social and office settings, Email etiquettes, Telephone Etiquettes, Engineering ethics, Managing time, Role and responsibility of engineer, Work culture in jobs, Personal memory, Rapid reading, Taking notes, Complex problem solving, Creativity.

### References

1. David F. Beer and David McMurrey, Guide to writing as an Engineer, John Willey. New York, 2004
2. Diane Hacker, Pocket Style Manual, Bedford Publication, New York, 2003. (ISBN 0312406843)
3. Shiv Khera, You Can Win, Macmillan Books, New York, 2003.
4. Raman Sharma, Technical Communications, Oxford Publication, London, 2004.
5. Dale Jungk, Applied Writing for Technicians, McGraw Hill, New York, 2004. (ISBN:

07828357-4)

6. Sharma, R. and Mohan, K. Business Correspondence and Report Writing, TMH New Delhi 2002.

7. Xebec, Presentation Book, TMH New Delhi, 2000. (ISBN 0402213)

<b>HSMC 401</b>	<b>Management-I: (Organizational Behaviour)</b>	<b>3L:0T:0P</b>	<b>3 Credits</b>
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**Teaching Scheme :** Lectures - 3 hours/week

### **Objectives**

To understand the various facets of individual, group and organisational behaviour which have an impact on personal and organisational effectiveness.

### **Syllabus Contents**

**Unit 1 :Behavioural Concepts:** Nature and Concepts of OB, Models of Organizational Behaviour, Relationship with Other Fields, Contemporary challenges. Learning: Nature and Significance of Learning, Process of Learning, Theories of Learning

**Unit 2 :Motivation Concepts:** Nature of Motivation, Classification of Motives, Motivation Process, Theories of Motivation: Early Theories: Hierarchy of Needs, Two-Factor Theory, McClelland's Theory of Needs; Contemporary Theories: Goal Setting Theories, Reinforcement Theory, Equity Theory, Expectancy Theory Attitudes: Nature & Dimensions of Attitude, Components of Attitude, Types of Attitude, Cognitive Dissonance Theory.

**Unit 3 : Perception:** Perceptual Process Model, Social Identity Theory, Attribution Theory: Attribution Errors, Perceptual Errors in Organizational Setting, Improving Perceptions Personality: Meaning of Personality, Determinants of Personality, Five-Factor Model of Personality, Myers-Briggs Type Indicator (MBTI); Theories of Personality: Freudian Theory (Psychoanalytic Theory of Personality), Erik Erikson Stages of Personality Development, Trait Theory, Jungian Theory given by Carl Jung .

**Unit 4 : Group Dynamics:** Nature of Group Dynamics, Types, Stages of Group Formation: The Five Stage Model; Group Structure: Group Tasks, Team Development: Nature, Significance, Comparing Work Groups and Work Teams, Types of Work-Teams, Team-Effectiveness Model, Team Process, Contemporary Issues in Managing Teams, Concept of Conflict.

**Unit 5 : Organizational Change:** Meaning and approaches to managing organizational change, creating a culture for change implementing the change Kurt Lewin Model of change.

**Unit 6 : Leadership:** Nature, Components, Leadership Styles, Traits of Effective Leader, Myths, Models and Theories of Leadership, Leadership Skills.

### **References**

1. Luthans Fred, "Organizational Behaviour", Tata McGraw Hill.
2. Rao V S P., "Organizational Behaviour", Excel Books.
3. Robbins Stephen P & Judge and Sanghi, "Organizational Behaviour", Pearson Education.
4. Aswathapa K., "Organisational Behaviour", Himalaya Publishing House.
5. Prasad L.M., "Organisational Behaviour", Sultan Chand & Sons.

<b>HSMC 501</b>	<b>Operations Research and Industrial Management</b>	<b>3L:0T:0P</b>	<b>3 Credits</b>
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**Teaching Scheme :** Lectures - 3 hours/week

### **Course Outcomes**

At the end of this course, students will be able to

- Apply the dynamic programming to solve problems of discrete and continuous variables.
- Apply the concept of non-linear programming.

- Carry out sensitivity analysis.
- Model the real world problem and simulate it.

### **Syllabus Contents**

**Unit 1:** Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models

**Unit 2:** Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming

**Unit 3:** Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT

**Unit 4:** Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

**Unit 5:** Competitive Models, Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation.

### **References**

1. H.A. Taha, Operations Research, An Introduction, PHI, 2008
2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
3. J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008
4. Hitler Libermann Operations Research: McGraw Hill Pub., 2009
5. Pannerselvam, Operations Research: Prentice Hall of India, 2010
6. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India, 2010

<b>BSC 101</b>	<b>Physics (Mechanics &amp; Mechanics of Solids)</b>	<b>3L:1T:4P</b>	<b>6 Credits</b>
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**Teaching Scheme :** Lectures - 3 hours/week; Tutorial – 1 hour/week; Laboratory – 4 hours/week

### **Syllabus Contents**

#### **Module 1: Vector mechanics of particles(6 lectures)**

Transformation of scalars and vectors under Rotation transformation; Forces in Nature; Newton's laws and its completeness in describing particle motion; Form invariance of Newton's Second Law; Solving Newton's equations of motion in polar coordinates; Problems including constraints and friction; Extension to cylindrical and spherical coordinates; Potential energy function;  $F = - \text{Grad } V$ ; Conservative and non-conservative forces; Central forces; Conservation of Angular Momentum

#### **Module 2: Planar rigid body mechanics (4 lectures)**

Definition and motion of a rigid body in the plane; Rotation in the plane; Kinematics in a coordinate system rotating and translating in the plane; Angular momentum about a point of a rigid body in planar motion; Euler's laws of motion, their independence from Newton's laws, and their necessity in describing rigid body motion; Examples.

#### **Module 3: Statics (10 lectures)**

Free body diagrams with examples on modelling of typical supports and joints; Condition for equilibrium in three- and two- dimensions; Friction: limiting and non-limiting cases; Force displacement relationship; Geometric compatibility for small deformations; Illustrations through simple problems on axially loaded members like trusses.

#### **Module 4: Mechanics of solids (10 lectures)**

Concept of stress at a point; Planet stress: transformation of stresses at a point, principal stresses and Mohr's circle; Concepts of elasticity, plasticity, strain hardening, failure (fracture / yielding); Idealization of one-dimensional stress-strain curve; Generalized Hooke's law with and without thermal strains for isotropic materials; Complete equations of elasticity; Force analysis — axial force, shear force. Torsion of circular shafts and thin-walled tubes (plastic analysis and rectangular shafts not to be discussed); Bending stress; Shear stress; Cases of combined stresses; Concept of strain energy

#### **References**

1. Engineering Mechanics, 2nd ed. — MK Harbola
2. Introduction to Mechanics — MK Verma
3. An Introduction to Mechanics — D Kleppner & R Kolenkow
4. Principles of Mechanics — JL Synge & BA Griffiths
5. Mechanics — JP Den Hartog
6. Engineering Mechanics — Dynamics, 7th ed. - JL Meriam
7. Mechanical Vibrations — JP Den Hartog
8. Theory of Vibrations with Applications — WT Thomson
9. An Introduction to the Mechanics of Solids, 2nd ed. with SI Units — SH Crandall, NC Dahl & TJ Lardner
10. Engineering Mechanics: Statics, 7th ed. — JL Meriam
11. Engineering Mechanics of Solids — EP Popov

<b>BSC 102</b>	<b>Mathematics-I (Calculus &amp; Linear Algebra)</b>	<b>3L:1T:0P</b>	<b>4 Credits</b>
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**Teaching Scheme :** Lectures - 3 hours/week; Tutorial – 1 hour/week

## Syllabus Contents

### Module 1: Calculus (4 lectures)

Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

### Module 2: Calculus: (4 lectures)

Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule; Maxima and minima.

### Module 3: Sequences and series: (8 lectures)

Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

### Module 4: Multivariable Calculus (Differentiation): (6 lectures)

Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.

### Module 5: Matrices (8 lectures)

Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skewsymmetric and orthogonal matrices; Determinants; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, and Orthogonal transformation.

## References

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9<sup>th</sup> Edition, Pearson, Reprint, 2002.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9<sup>th</sup> Edition, John Wiley & Sons, 2006.
3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11<sup>th</sup> Reprint, 2010.
5. D. Poole, Linear Algebra: A Modern Introduction, 2<sup>nd</sup> Edition, Brooks/Cole, 2005.
6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
7. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36<sup>th</sup> Edition, 2010.

<b>BSC 201</b>	<b>Mathematics-II (Probability and Statistics)</b>	<b>3L:1T:0P</b>	<b>4 Credits</b>
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**Teaching Scheme :** Lectures - 3 hours/week; Tutorial – 1 hour/week

## Syllabus Contents

### Module 1: Basic Probability (12 hours)

Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality.

### Module 2: Continuous Probability Distributions (4 hours)

Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities.

### Module 3: Bivariate Distributions (4 hours)

Bivariate distributions and their properties, distribution of sums and quotients, conditional

densities, Bayes' rule.

#### **Module 4: Basic Statistics (8 hours)**

Measures of Central tendency: Moments, skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation.

#### **Module 5: Applied Statistics (8 hours)**

Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.

#### **Module 6: Small samples (4 hours)**

Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.

#### **References**

1. E. Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, 2006.
2. P. G. Hoel, S. C. Port and C. J. Stone, "Introduction to Probability Theory", Universal Book Stall, 2003.
3. S. Ross, "A First Course in Probability", Pearson Education India, 2002.
4. W. Feller, "An Introduction to Probability Theory and its Applications", Vol. 1, Wiley, 1968.
5. N.P. Bali and M. Goyal, "A text book of Engineering Mathematics", Laxmi Publications, 2010.
6. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 2000.
7. T. Veerarajan, "Engineering Mathematics", Tata McGraw-Hill, New Delhi, 2010.

<b>BSC 202</b>	<b>Chemistry-I</b>	<b>3L:1T:4P</b>	<b>6 Credits</b>
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**Teaching Scheme :** Lectures - 3 hours/week; Tutorial – 1 hour/week; Laboratory –4 hours/week

#### **Syllabus Contents**

##### **Unit 1: Atomic and molecular structure (12 lectures)**

Schrodinger equation. Particle in a box solutions and their applications for conjugated molecules and nanoparticles. Forms of the hydrogen atom wave functions and the plots of these functions to explore their spatial variations. Molecular orbitals of diatomic molecules and plots of the multicenter orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomics. Pimolecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

##### **Unit 2: Spectroscopic techniques and applications (8 lectures)**

Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterization techniques. Diffraction and scattering.

##### **Unit 3: Intermolecular forces and potential energy surfaces (4 lectures)**

Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces of H<sub>3</sub>, H<sub>2</sub>F and HCN and trajectories on these surfaces.

##### **Unit 4: Use of free energy in chemical equilibria (6 lectures)**

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Waterchemistry. Corrosion. Use of free energy



considerations in metallurgy through Ellingham diagrams.

#### **Unit 5: Periodic properties (4 Lectures)**

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries

#### **Unit 6: Stereochemistry (4 lectures)**

Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds

#### **Unit 7: Organic reactions and synthesis of a drug molecule (4 lectures)**

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule.

#### **Laboratory**

Choice of 10-12 experiments from the following

- Determination of surface tension and viscosity
- Thin layer chromatography
- Ion exchange column for removal of hardness of water
- Determination of chloride content of water
- Colligative properties using freezing point depression
- Determination of the rate constant of a reaction
- Determination of cell constant and conductance of solutions
- Potentiometry - determination of redox potentials and emfs
- Synthesis of a polymer/drug
- Saponification/acid value of an oil
- Chemical analysis of a salt
- Lattice structures and packing of spheres
- Models of potential energy surfaces
- Chemical oscillations- Iodine clock reaction
- Determination of the partition coefficient of a substance between two immiscible liquids
- Adsorption of acetic acid by charcoal
- Use of the capillary viscosimeters to demonstrate the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg

#### **Course Outcomes**

The concepts developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications. Quantum theory is more than 100 years old and to understand phenomena at nanometer levels, one has to base the description of all chemical processes at molecular levels. The course will enable the student to:

- Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
- Rationalise bulk properties and processes using thermodynamic considerations.
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
- Rationalise periodic properties such as ionization potential, electronegativity, oxidation states

and electronegativity.

- List major chemical reactions that are used in the synthesis of molecules.

### Laboratory Outcomes

The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering. The students will learn to:

- Estimate rate constants of reactions from concentration of reactants/products as a function of time
- Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc
- Synthesize a small drug molecule and analyse a salt sample

### References

1. University chemistry, by B. H. Mahan
2. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
3. Fundamentals of Molecular Spectroscopy, by C. N. Banwell
4. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
5. Physical Chemistry, by P. W. Atkins
6. Organic Chemistry: Structure and Function by K. P. C. Vollhardt and N. E. Schore, 5<sup>th</sup> Edition  
<http://bcs.whfreeman.com/vollhardtschore5e/default.asp>

<b>BSC 301</b>	<b>Mathematics-III (Ordinary Differential Equation and Complex Variable)</b>	<b>2L:0T:0P</b>	<b>2 Credits</b>
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**Teaching Scheme :** Lectures - 2 hours/week

### Syllabus Contents

#### Module 1: First order ordinary differential equations (6 lectures)

Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

#### Module 2: Ordinary differential equations of higher orders (8 lectures)

Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

#### Module 3: Complex Variable – Differentiation and Integration (6 lectures)

Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties; Contour integrals, Taylor's series, zeros of analytic functions, singularities, Evaluation of definite integral involving sine and cosine.

### Course Outcomes

The objective of this course is to familiarize the prospective engineers with techniques in ordinary and partial differential equations and complex variables. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines.

The students will learn:

- The effective mathematical tools for the solutions of differential equations that model physical processes.
- The tools of differentiation and integration of functions of a complex variable that are used in

various techniques dealing engineering problems.

### **References**

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9<sup>th</sup> Edition, Pearson, Reprint, 2002.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9<sup>th</sup> Edition, John Wiley & Sons, 2006.
3. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9<sup>th</sup>Edn., Wiley India, 2009.
4. S. L. Ross, Differential Equations, 3<sup>rd</sup> Ed., Wiley India, 1984.
5. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
6. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
7. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7<sup>th</sup> Ed., Mc-Graw Hill, 2004.
8. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
9. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36<sup>th</sup> Edition, 2010.

<b>ESC 101</b>	<b>Programming for Problem Solving</b>	<b>3L:0T:4P</b>	<b>5 Credits</b>
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**Teaching Scheme :** Lectures - 3 hours/week; Laboratory – 4 hour/week

**Unit 1: Introduction to Programming (4 lectures)**

Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.). (1 lecture).

Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart / Pseudocode with examples. (1 lecture)

From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code. (2 lectures)

**Unit 2: Arithmetic expressions and precedence (12 lectures)**

Conditional Branching and Loops (6 lectures)

Writing and evaluation of conditionals and consequent branching (3 lectures)

Iteration and loops (3 lectures)

**Unit 3: Arrays (6 lectures)**

Arrays (1-D, 2-D), Character arrays and Strings

**Unit 4: Basic Algorithms (6 lectures)**

Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

**Unit 5: Function (5 lectures)**

Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference

**Unit 6: Recursion (4 -5 lectures)**

Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

**Unit 7: Structure (4 lectures)**

Structures, Defining structures and Array of Structures

**Unit 8: Pointers (2 lectures)**

Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)

**Unit 9:** File handling (only if time is available, otherwise should be done as part of the lab)

**Laboratory** - The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given.

**Tutorial 1:** Problem solving using computers.

**Lab1:** Familiarization with programming environment

**Tutorial 2:** Variable types and type conversions:

**Lab 2:** Simple computational problems using arithmetic expressions.

**Tutorial 3:** Branching and logical expressions.

**Lab 3:** Problems involving if-then-else structures.

**Tutorial 4:** Loops, while and for loops.

**Lab 4:** Iterative problems e.g., sum of series.

**Tutorial 5:** 1D Arrays: searching, sorting

**Lab 5:** 1D Array manipulation.

**Tutorial 6:** 2D arrays and Strings.

**Lab 6:** Matrix problems, String operations.

**Tutorial 7:** Functions, call by value.

**Lab 7:** Simple functions.

**Tutorial 8 & 9:** Numerical methods (Root finding, numerical differentiation, numerical integration).

**Lab 8 and 9:** Programming for solving Numerical methods problems.

**Tutorial 10:** Recursion, structure of recursive calls.

**Lab 10:** Recursive functions.

**Tutorial 11:** Pointers, structures and dynamic memory allocation.

**Lab 11:** Pointers and structures.

**Tutorial 12:** File handling.

**Lab 12:** File operations.

### **Course Outcomes**

The student will learn

- To formulate simple algorithms for arithmetic and logical problems.
- To translate the algorithms to programs (in C language).
- To test and execute the programs and correct syntax and logical errors.
- To implement conditional branching, iteration and recursion.
- To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
- To use arrays, pointers and structures to formulate algorithms and programs.
- To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.
- To apply programming to solve simple numerical method problems, namely root finding of function, differentiation of function and simple integration.

### **Laboratory Outcomes**

- To formulate the algorithms for simple problems
- To translate given algorithms to a working and correct program
- To be able to correct syntax errors as reported by the compilers
- To be able to identify and correct logical errors encountered at run time
- To be able to write iterative as well as recursive programs
- To be able to represent data in arrays, strings and structures and manipulate them through a program
- To be able to declare pointers of different types and use them in defining self-referential structures.
- To be able to create, read and write to and from simple text files.

### **References**

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
3. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

<b>ESC 102</b>	<b>Engineering Graphics &amp; Design</b>	<b>1L:0T:4P</b>	<b>3 Credits</b>
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**Teaching Scheme :** Lectures - 1 hours/week; Laboratory – 4 hour/week

### **Syllabus Contents**

#### **Traditional Engineering Graphics:**

Principles of Engineering Graphics; Orthographic Projection; Descriptive Geometry; Drawing

Principles; Isometric Projection; Surface Development; Perspective; Reading a Drawing; Sectional Views; Dimensioning & Tolerances; True Length, Angle; intersection, Shortest Distance.

**Computer Graphics:**

Engineering Graphics Software; -Spatial Transformations; Orthographic Projections; Model Viewing; Co-ordinate Systems; Multi-view Projection; Exploded Assembly; Model Viewing; Animation; Spatial Manipulation; Surface Modelling; Solid Modelling; Introduction to Building Information Modelling (BIM)

*(Except the basic essential concepts, most of the teaching part can happen concurrently in the laboratory)*

**Module 1: Introduction to Engineering Drawing**

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales.

**Module 2: Orthographic Projections**

Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes.

**Module 3: Projections of Regular Solids**

Solids inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc.

**Module 4: Sections and Sectional Views of Right Angular Solids**

Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)

**Module 5: Isometric Projections**

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions

**Module 6: Overview of Computer Graphics**

Listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects; Isometric Views of lines, Planes, Simple and compound Solids].

**Module 7: Customization & CAD Drawing**

Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles.

**Module 8: Annotations, layering & other Functions**

Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right

regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modeling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, multiview, auxiliary, and section views. Spatial visualization exercises. Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling.

### **Module 9: Demonstration of a Simple Team Design Project**

Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid-modeling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).

### **Course Outcomes**

All phases of manufacturing or construction require the conversion of new ideas and design concepts into the basic line language of graphics. Therefore, there are many areas (civil, mechanical, electrical, architectural and industrial) in which the skills of the CAD technicians play major roles in the design and development of new products or construction. Students prepare for actual work situations through practical training in a new state-of-the-art computer designed CAD laboratory using engineering software. This course is designed to address:

- to prepare you to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- to prepare you to communicate effectively
- to prepare you to use the techniques, skills, and modern engineering tools necessary for engineering practice

The student will learn :

- Introduction to engineering design and its place in society
- Exposure to the visual aspects of engineering design
- Exposure to engineering graphics standards
- Exposure to solid modelling
- Exposure to computer-aided geometric design
- Exposure to creating working drawings
- Exposure to engineering communication

### **References**

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4. Narayana, K.L. & P Kanniah (2008), Text book on Engineering Drawing, Scitech Publishers
5. (Corresponding set of) CAD Software Theory and User Manuals

<b>ESC 201</b>	<b>Basic Electrical Engineering</b>	<b>3L:1T:2P</b>	<b>5 Credits</b>
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**Teaching Scheme :** Lectures - 3 hours/week; Tutorial – 1 hour/week; Laboratory –2 hours/week

## Syllabus Contents

### Module 1 : DC Circuits (8 hours)

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

### Module 2: AC Circuits (8 hours)

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three-phase balanced circuits, voltage and current relations in star and delta connections.

### Module 3: Transformers (6 hours)

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

### Module 4: Electrical Machines (8 hours)

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.

### Module 5: Power Converters (6 hours)

DC-DC buck and boost converters, duty ratio control. Single-phase and three-phase voltage source inverters; sinusoidal modulation.

### Module 6: Electrical Installations (6 hours)

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

### Laboratory

List of experiments/demonstrations

- Basic safety precautions. Introduction and use of measuring instruments–voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
- Measuring the steady-state and transient time-response of R-L, R-C, and R-L-C circuits to a step change in voltage (transient may be observed on a storage oscilloscope). Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification. Observation of phase differences between current and voltage. Resonance in R-L-C circuits.
- Transformers: Observation of the no-load current waveform on an oscilloscope (nonsinusoidal wave-shape due to B-H curve nonlinearity should be shown along with a discussion about harmonics). Loading of a transformer: measurement of primary and secondary voltages and currents, and power.
- Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line-line voltage, phase-to-neutral voltage, line and phase currents). Phase-shifts between the primary and secondary side. Cumulative three-phase power in balanced three-phase circuits.
- Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winding - slip ring arrangement) and single-phase induction machine.
- Torque Speed Characteristic of separately excited dc motor.



- Synchronous speed of two and four-pole, three-phase induction motors. Direction reversal by change of phase-sequence of connections. Torque-Slip Characteristic of an induction motor. Generator operation of an induction machine driven at super-synchronous speed.
- Synchronous Machine operating as a generator: stand-alone operation with a load. Control of voltage through field excitation.
- Demonstration of (a) dc-dc converters (b) dc-ac converters – PWM waveform (c) the use of dc-ac converter for speed control of an induction motor and (d) Components of LT switchgear.

#### **Course Outcomes**

- To understand and analyze basic electric and magnetic circuits
- To study the working principles of electrical machines and power converters.
- To introduce the components of low voltage electrical installations

#### **Laboratory Outcomes**

- Get an exposure to common electrical components and their ratings.
- Make electrical connections by wires of appropriate ratings.
- Understand the usage of common electrical measuring instruments.
- Understand the basic characteristics of transformers and electrical machines.
- Get an exposure to the working of power electronic converters

#### **References**

1. D.P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.
2. D.C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.
3. L.S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.
4. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
5. V.D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989.

<b>ESC 202</b>	<b>Workshop/Manufacturing Practices</b>	<b>1L:0T:4P</b>	<b>3 Credits</b>
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**Teaching Scheme :** Lectures - 1 hours/week; Laboratory –4 hours/week

Manufacturing is fundamental to the development of any engineering product. The course on Engineering Workshop Practice is intended to expose engineering students to different types of manufacturing/ fabrication processes, dealing with different materials such as metals, ceramics, plastics, wood, glass etc. While the actual practice of fabrication techniques is given more weightage, some lectures and video clips available on different methods of manufacturing are also included.

#### **Course Outcomes:**

At the end of this course, students will demonstrate the ability to

- Understanding different manufacturing techniques and their relative advantages/ disadvantages with respect to different applications.
- Selection of a suitable technique for meeting a specific fabrication need.
- Acquire a minimum practical skill with respect to the different manufacturing methods and develop the confidence to design & fabricate small components for their project work and also to participate in various national and international technical competitions.
- Introduction to different manufacturing methods in different fields of engineering
- Practical exposure to different fabrication techniques.
- Creation of simple components using different materials.
- Exposure to some of the advanced and latest manufacturing techniques being employed in the

industry.

### Syllabus Contents

#### Lectures & videos: (10 hours)

1. Manufacturing Methods-casting, forming, machining, joining, advanced manufacturing methods (3 lectures)
2. CNC machining, Additive manufacturing (1 lecture)
3. Fitting operations & power tools (1 lecture)
4. Electrical & Electronics (1 lecture)
5. Carpentry (1 lecture)
6. Plastic moulding, glass cutting (1 lecture)
7. Metal casting (1 lecture)
8. Welding (arc welding & gas welding), brazing (1 lecture)

#### Workshop Practice: (60 hours)

1. Machine shop - 10 hours
2. Fitting shop - 8 hours
3. Carpentry - 6 hours
4. Electrical & Electronics - 8 hours
5. Welding shop - 8 hours (Arc welding 4 hours + gas welding 4 hours)
6. Casting - 8 hours
7. Smithy - 6 hours
8. Plastic moulding & Glass Cutting - 6 hours

Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

### References

1. HajraChoudhury S.K., HajraChoudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.
3. Gowri P. Hariharan and A. Suresh Babu, "Manufacturing Technology – I" Pearson Education, 2008.
4. Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India
5. 1998.
6. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House, 2017.

<b>ESC 301</b>	<b>Basic Electronics Engineering</b>	<b>3L:1T:0P</b>	<b>4 Credits</b>
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**Teaching Scheme :** Lectures - 3 hours/week; Tutorial – 1 hour/week

### Objectives

To provide an overview of electronic device components to Mechanical engineering students

### Syllabus Contents

**Semiconductor Devices and Applications:** Introduction to P-N junction Diode and V-I characteristics, Half wave and Full-wave rectifiers, capacitor filter. Zener diode and its characteristics, Zener diode as voltage regulator. Regulated power supply IC based on 78XX and 79XX series, Introduction to BJT, its input-output and transfer characteristics, BJT as a single stage CE amplifier, frequency response and bandwidth.

**Operational amplifier and its applications:** Introduction to operational amplifiers, Op-amp input modes and parameters, Op-amp in open loop configuration, op-amp with negative feedback, study of practical op-amp IC 741, inverting and non-inverting amplifier applications: summing and difference amplifier, unity gain buffer, comparator, integrator and differentiator.

**Timing Circuits and Oscillators:** RC-timing circuits, IC 555 and its applications as astable and mono-stable multi-vibrators, positive feedback, Barkhausen's criteria for oscillation, R-C phase shift and Wein bridge oscillator.

**Digital Electronics Fundamentals :** Difference between analog and digital signals, Boolean algebra, Basic and Universal Gates, Symbols, Truth tables, logic expressions, Logic simplification using Kmap, Logic ICs, half and full adder/subtractor, multiplexers, de-multiplexers, flip-flops, shift registers, counters, Block diagram of microprocessor/microcontroller and their applications.

**Electronic Communication Systems:** The elements of communication system, IEEE frequency spectrum, Transmission media: wired and wireless, need of modulation, AM and FM modulation schemes, Mobile communication systems: cellular concept and block diagram of GSM system.

### Course Outcomes

At the end of this course students will demonstrate the ability to

- Understand the principles of semiconductor devices and their applications.
- Design an application using Operational amplifier.
- Understand the working of timing circuits and oscillators.
- Understand logic gates, flip flop as a building block of digital systems.
- Learn the basics of Electronic communication system.

### References

1. Floyd ,” Electronic Devices” Pearson Education 9<sup>th</sup> edition, 2012.
2. R.P. Jain, “Modern Digital Electronics”, Tata McGraw Hill, 3<sup>rd</sup> Edition, 2007.
3. Frenzel, “Communication Electronics: Principles and Applications”, Tata McGraw Hill, 3<sup>rd</sup> Edition, 2001.

<b>ESC 302</b>	<b>Engineering Mechanics</b>	<b>3L:1T:0P</b>	<b>4 Credits</b>
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**Teaching Scheme :** Lectures - 3 hours/week; Tutorial – 1 hour/week

### Objectives

The objective of this Course is to provide an introductory treatment of Engineering Mechanics to all the students of engineering, with a view to prepare a good foundation for taking up advanced courses in the area in the subsequent semesters. A working knowledge of statics with emphasis on force equilibrium and free body diagrams. Provides an understanding of the kinds of stress and deformation and how to determine them in a wide range of simple, practical structural problems, and an understanding of the mechanical behavior of materials under various load conditions. Lab should be taken concurrently.

What Will I Learn?

- a) Confidently tackle equilibrium equations, moments and inertia problems
- b) Master calculator/computing basic skills to use to advantage in solving mechanics problems.
- c) Gain a firm foundation in Engineering Mechanics for furthering the career in Engineering

### Syllabus Contents

**Module 1:** *Introduction to Engineering Mechanics covering*, Force Systems Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application;

Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static Indeterminacy.

**Module 2:***Friction covering*, Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack.

**Module 3:***Basic Structural Analysis covering*, Equilibrium in three dimensions; Method of Sections; Method of Joints; How to determine if a member is in tension or compression; Simple Trusses; Zero force members; Beams & types of beams; Frames & Machines.

**Module 4:***Centroid and Centre of Gravity covering*, Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications; Area moment of inertia- Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Mass moment inertia of circular plate, Cylinder, Cone, Sphere, Hook.

**Module 5:***Virtual Work and Energy Method-* Virtual displacements, principle of virtual work for particle and ideal system of rigid bodies, degrees of freedom. Active force diagram, systems with friction, mechanical efficiency. Conservative forces and potential energy (elastic and gravitational), energy equation for equilibrium. Applications of energy method for equilibrium. Stability of equilibrium.

**Module 6:***Review of particle dynamics-* Rectilinear motion; Plane curvilinear motion (rectangular, path, and polar coordinates). 3-D curvilinear motion; Relative and constrained motion; Newton's 2<sup>nd</sup> law (rectangular, path, and polar coordinates). Work-kinetic energy, power, potential energy. Impulse-momentum (linear, angular); Impact (Direct and oblique).

**Module 7:***Introduction to Kinetics of Rigid Bodies covering*, Basic terms, general principles in dynamics; Types of motion, Instantaneous centre of rotation in plane motion and simple problems; D'Alembert's principle and its applications in plane motion and connected bodies; Work energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation.

**Module 8:***Mechanical Vibrations covering*, Basic terminology, free and forced vibrations, resonance and its effects; Degree of freedom; Derivation for frequency and amplitude of free vibrations without damping and single degree of freedom system, simple problems, types of pendulum, use of simple, compound and torsion pendulums;

**Tutorials from the above modules covering**, To find the various forces and angles including resultants in various parts of wall crane, roof truss, pipes, etc.; To verify the line of polygon on various forces; To find coefficient of friction between various materials on inclined plane; Free body diagrams various systems including block-pulley; To verify the principle of moment in the disc apparatus; Helical block; To draw a load efficiency curve for a screw jack.

### **Course Outcomes**

Upon successful completion of the course, student should be able to:

- Use scalar and vector analytical techniques for analysing forces in statically determinate structures
- Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems
- Apply basic knowledge of maths and physics to solve real-world problems
- Understand measurement error, and propagation of error in processed data
- Understand basic kinematics concepts – displacement, velocity and acceleration (and their angular counterparts);
- Understand basic dynamics concepts – force, momentum, work and energy;

- Understand and be able to apply Newton's laws of motion;
- Understand and be able to apply other basic dynamics concepts - the Work-Energy principle, Impulse-Momentum principle and the coefficient of restitution;
- Extend all of concepts of linear kinetics to systems in general plane motion (applying Euler's Equation and considering energy of a system in general plane motion, and the work of couples and moments of forces)
- Learn to solve dynamics problems. Appraise given information and determine which concepts apply, and choose an appropriate solution strategy; and
- Attain an introduction to basic machine parts such as pulleys and mass-spring systems.

#### **References**

1. Irving H. Shames (2006), Engineering Mechanics, 4<sup>th</sup> Edition, Prentice Hall
2. F. P. Beer and E. R. Johnston (2011), Vector Mechanics for Engineers, Vol I - Statics, Vol II, –Dynamics, 9<sup>th</sup> Ed, Tata McGraw Hill
3. R.C. Hibbler (2006), Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press.
4. Andy Ruina and RudraPratap (2011), Introduction to Statics and Dynamics, Oxford University Press
5. Shames and Rao (2006), Engineering Mechanics, Pearson Education,
6. Hibler and Gupta (2010), Engineering Mechanics (Statics, Dynamics) by Pearson Education
7. Reddy Vijaykumar K. and K. Suresh Kumar (2010), Singer's Engineering Mechanics
8. Bansal R.K.(2010), A Text Book of Engineering Mechanics, Laxmi Publications
9. Khurmi R.S. (2010), Engineering Mechanics, S. Chand & Co.
10. Tayal A.K. (2010), Engineering Mechanics, Umesh Publications

<b>AE 301</b>	<b>Fluid Mechanics</b>	<b>2L:0T:0P</b>	<b>2 Credits</b>
<b>AE 303</b>	<b>Fluid Mechanics Lab.</b>	<b>0L:0T:2P</b>	<b>1 Credit</b>

**Teaching Scheme :** Lectures - 2 hours/week; Laboratory – 2 hours/week

### Objectives

The objective of this course is to introduce the concepts of fluid mechanics useful in Agricultural Engineering applications. The course provides a first level exposure to the students to fluid statics, kinematics and dynamics. Measurement of pressure, computations of hydrostatic forces on structural components and the concepts of Buoyancy all find useful applications in many engineering problems. A training to analyse engineering problems involving fluids – such as those dealing with pipe flow, open channel flow, jets, turbines and pumps, dams and spillways, culverts, river and groundwater flow - with a mechanistic perspective is essential for the civil engineering students. The topics included in this course are aimed to prepare a student to build a good fundamental background useful in the application-intensive courses covering hydraulics, hydraulic machinery and hydrology in later semesters.

### Syllabus Contents

**Module 1:** Basic Concepts and Definitions – Distinction between a fluid and a solid; Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation of viscosity with temperature, Newton law of viscosity; vapour pressure, boiling point, cavitation; surface tension, capillarity, Bulk modulus of elasticity, compressibility.

**Module 2:** Fluid Statics - Fluid Pressure: Pressure at a point, Pascals law, pressure variation with temperature, density and altitude. Piezometer, U-Tube Manometer, Single Column Manometer, U Tube Differential Manometer, Micromanometers. pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodies.

**Module 3:** Fluid Kinematics-Classification of fluid flow : steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one, two and three dimensional flows; Stream line, path line, streak line and stream tube; stream function, velocity potential function. One-, two- and three -dimensional continuity equations in Cartesian coordinates

**Module 4:** Fluid Dynamics- Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation – derivation; Energy Principle; Practical applications of Bernoulli's equation : venturimeter, orifice meter and pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend; Vortex Flow – Free and Forced; Dimensional Analysis and Dynamic Similitude – Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number; Buckingham's  $\pi$ -Theorem.

### Lab Experiments

- Measurement of viscosity
- Study of Pressure Measuring Devices
- Stability of Floating Body
- Hydrostatics Force on Flat Surfaces/Curved Surfaces
- Verification of Bernoulli's Theorem
- Venturimeter
- Orifice meter
- Impacts of jets
- Flow Visualisation -Ideal Flow
- Length of establishment of flow
- Velocity distribution in pipes

- Laminar Flow

### Course Outcomes

At the end of the course, the student will be able to:

- Understand the broad principles of fluid statics, kinematics and dynamics
- Understand definitions of the basic terms used in fluid mechanics
- Understand classifications of fluid flow
- Be able to apply the continuity, momentum and energy principles
- Be able to apply dimensional analysis

### References

1. Fluid Mechanics and Machinery, C.S.P.Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 2010.
2. Hydraulics and Fluid Mechanics, P M Modi and S M Seth, Standard Book House
3. Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill
4. Fluid Mechanics with Engineering Applications, R.L. Daugherty, J.B. Franzini and E.J. Finnemore, International Student Edition, McGraw Hill.

<b>AE 302</b>	<b>Thermodynamics</b>	<b>2L:1T:0P</b>	<b>3 Credits</b>
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**Teaching Scheme :** Lectures - 2 hours/week; Tutorial – 1 hour/week

### Objectives

- To learn about work and heat interactions, and balance of energy between system and its surroundings
- To learn about application of I law to various energy conversion devices
- To evaluate the changes in properties of substances in various processes
- To understand the difference between high grade and low grade energies and 2<sup>nd</sup> law limitations on energy conversion

### Syllabus Contents

Fundamentals - System & Control volume; Property, State & Process; Exact & Inexact differentials; Work-Thermodynamic definition of work; examples; Displacement work; Path dependence of displacement work and illustrations for simple processes; electrical, magnetic, gravitational, spring and shaft work. (5 lectures)

Temperature, Definition of thermal equilibrium and Zeroth law; Temperature scales; Various Thermometers- Definition of heat; examples of heat/work interaction in systems- First Law for Cyclic & Non-cyclic processes; Concept of total energy E ; Demonstration that E is a property; Various modes of energy, Internal energy and Enthalpy. (5 lectures)

Definition of Pure substance, Ideal Gases and ideal gas mixtures, Real gases and real gas mixtures, Compressibility charts- Properties of two phase systems - Const. temperature and Const. pressure heating of water; Definitions of saturated states; P-v-T surface; Use of steam tables and R134a tables; Saturation tables; Superheated tables; Identification of states & determination of properties, Mollier's chart. (8 lectures)

First Law for Flow Processes - Derivation of general energy equation for a control volume; Steady state steady flow processes including throttling; Examples of steady flow devices; Unsteady processes; examples of steady and unsteady I law applications for system and control volume. (5 lectures)

Second law - Definitions of direct and reverse heat engines; Definitions of thermal efficiency and COP; Kelvin-Planck and Clausius statements; Definition of reversible process; Internal and external irreversibility; Carnot cycle; Absolute temperature scale. (5 lectures)

Clausius inequality; Definition of entropy  $S$  ; Demonstration that entropy  $S$  is a property; Evaluation of  $S$  for solids, liquids, ideal gases and ideal gas mixtures undergoing various processes; Determination of  $s$  from steam tables- Principle of increase of entropy; Illustration of processes in  $Ts$  coordinates; Definition of Isentropic efficiency for compressors, turbines and nozzles- Irreversibility and Availability, Availability function for systems and Control volumes undergoing different processes, Lost work. Second law analysis for a control volume. Exergy balance equation and Exergy analysis. (8 lectures)

Thermodynamic cycles - Basic Rankine cycle; Basic Brayton cycle; Basic vapor compression cycle and comparison with Carnot cycle. (4 lectures)

### Course Outcomes

1. After completing this course, the students will be able to apply energy balance to systems and control volumes, in situations involving heat and work interactions
2. Students can evaluate changes in thermodynamic properties of substances
3. The students will be able to evaluate the performance of energy conversion devices
4. The students will be able to differentiate between high grade and low grade energies.

### References

1. Sonntag, R. E, Borgnakke, C. and Van Wylen, G. J., 2003, 6th Edition, Fundamentals of Thermodynamics, John Wiley and Sons.
2. Jones, J. B. and Duggan, R. E., 1996, Engineering Thermodynamics, Prentice-Hall of India
3. Moran, M. J. and Shapiro, H. N., 1999, Fundamentals of Engineering Thermodynamics, John Wiley and Sons.
4. Nag, P.K, 1995, Engineering Thermodynamics, Tata McGraw-Hill Publishing Co. Ltd.

<b>AE 304</b>	<b>Advanced Workshop Technology</b>	<b>0L:0T:4P</b>	<b>2 Credits</b>
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**Teaching Scheme :** Laboratory – 4 hours/week

### Objectives

To motivate and challenge students to understand and develop an appreciation of the processes in correlation with material properties which change the shape, size and form of the raw materials into the desirable product by conventional or unconventional manufacturing methods

### Syllabus Contents

#### Conventional Manufacturing processes:

Casting and moulding: Metal casting processes and equipment, Heat transfer and solidification, shrinkage, riser design, casting defects and residual stresses.

Introduction to bulk and sheet metal forming, plastic deformation and yield criteria; fundamentals of hot and cold working processes; load estimation for bulk forming (forging, rolling, extrusion, drawing) and sheet forming (shearing, deep drawing, bending) principles of powder metallurgy.

Metal cutting: Single and multi-point cutting; Orthogonal cutting, various force components: Chip formation, Tool wear and tool life, Surface finish and integrity, Machinability, Cutting tool materials, Cutting fluids, Coating; Turning, Drilling, Milling and finishing processes, Introduction to CNC machining.

Additive manufacturing: Rapid prototyping and rapid tooling.

Joining/fastening processes: Physics of welding, brazing and soldering; design considerations in welding, Solid and liquid state joining processes; Adhesive bonding.

#### Unconventional Machining Processes:

Abrasive Jet Machining, Water Jet Machining, Abrasive Water Jet Machining, Ultrasonic



Machining, principles and process parameters.

Electrical Discharge Machining, principle and processes parameters, MRR, surface finish, tool wear, dielectric, power and control circuits, wire EDM; Electro-chemical machining (ECM), etchant & maskant, process parameters, MRR and surface finish.

Laser Beam Machining (LBM), Plasma Arc Machining (PAM) and Electron Beam Machining.

### Course Outcomes

Upon completion of this course, students will be able to understand the different conventional and unconventional manufacturing methods employed for making different products.

### References

1. Kalpakjian and Schmid, Manufacturing processes for engineering materials (5th Edition)- Pearson India, 2014
2. Mikell P. Groover, Fundamentals of Modern Manufacturing: Materials, Processes, and Systems
3. Degarmo, Black & Kohser, Materials and Processes in Manufacturing

<b>AE 401</b>	<b>Strength of Materials</b>	<b>2L:1T:0P</b>	<b>3 Credits</b>
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**Teaching Scheme :** Lectures - 2 hours/week; Tutorial – 1 hour/week

### Objectives

- To understand the nature of stresses developed in simple geometries such as bars, cantilevers, beams, shafts, cylinders and spheres for various types of simple loads.
- To calculate the elastic deformation occurring in various simple geometries for different types of loading.

### Syllabus Contents

Deformation in solids- Hooke's law, stress and strain- tension, compression and shear stresses elastic constants and their relations- volumetric, linear and shear strains- principal stresses and principal planes- Mohr's circle. (8 lectures)

Beams and types transverse loading on beams- shear force and bend moment diagrams- Types of beam supports, simply supported and over-hanging beams, cantilevers. Theory of bending of beams, bending stress distribution and neutral axis, shear stress distribution, point and distributed loads. (8 lectures)

Moment of inertia about an axis and polar moment of inertia, deflection of a beam using double integration method, computation of slopes and deflection in beams, Maxwell's reciprocal theorems. (8 lectures)

Torsion, stresses and deformation in circular and hollow shafts, stepped shafts, deflection of shafts fixed at both ends, stresses and deflection of helical springs. (8 lectures)

Axial and hoop stresses in cylinders subjected to internal pressure, deformation of thick and thin cylinders, deformation in spherical shells subjected to internal pressure (8 lectures)

### Course Outcomes

- After completing this course, the students should be able to recognise various types loads applied on machine components of simple geometry and understand the nature of internal stresses that will develop within the components.
- The students will be able to evaluate the strains and deformation that will result due to the elastic stresses developed within the materials for simple types of loading.

### References

1. Egor P. Popov, Engineering Mechanics of Solids, Prentice Hall of India, New Delhi, 2001.
2. R. Subramanian, Strength of Materials, Oxford University Press, 2007.

3. Ferdinand P. Been, Russel Johnson Jr and John J. Dewole, Mechanics of Materials, Tata McGraw Hill Publishing Co. Ltd., New Delhi 2005.

<b>AE 402</b>	<b>Surveying and Leveling</b>	<b>2L:0T:0P</b>	<b>2 Credits</b>
<b>AE406</b>	<b>Surveying and Leveling Lab.</b>	<b>0L:0T:2P</b>	<b>1 Credit</b>
<b>Teaching Scheme :</b> Lectures - 2 hours/week; Laboratory – 2 hours/week			
<b>Course Outcomes</b>			
<b>Syllabus Contents</b>			
<b>References</b>			

<b>AE 403</b>	<b>Soil Science and Soil Mechanics</b>	<b>2L:0T:0P</b>	<b>2 Credits</b>
<b>AE407</b>	<b>Soil Science and Soil Mechanics Lab.</b>	<b>0L:0T:2P</b>	<b>1 Credit</b>
<b>Teaching Scheme :</b> Lectures - 2 hours/week; Laboratory – 2 hours/week			
<b>Course Outcomes</b>			
<b>Syllabus Contents</b>			
<b>References</b>			

<b>AE 404</b>	<b>Farm Power</b>	<b>2L:0T:0P</b>	<b>2 Credits</b>
<b>AE408</b>	<b>Farm Power Lab.</b>	<b>0L:0T:2P</b>	<b>1 Credit</b>

**Teaching Scheme :** Lectures - 2 hours/week; Laboratory – 2 hours/week

#### **Course Outcomes**

At the end of this course, students will be able to

- Understand the working principle and working of tractor and automobile engine
- Demonstrate the transmission power from engine to the rear wheels of tractor and automobiles
- Carry out maintenance and adjustment of tractor systems.

#### **Syllabus Contents**

**Unit 1:** Sources of farm power -conventional & non-conventional energy sources. Classification of tractors and IC engines. Review of thermodynamic principles of IC (CI & SI) engines and deviation from ideal cycle.

**Unit 2:** Study of engine components their construction, operating principles and functions.

**Unit 3:** Engine systems : valves & valve mechanism. Fuel & air supply, cooling, lubricating, ignition, starting and electrical systems. Engine governing systems.

**Unit 4:** Study of transmission system: Clutch: single and multi-plate clutches and their functions, gear box: sliding and constant mesh, differential, final drive mechanism and wheels.

**Unit 5:** Brake mechanism: Mechanical and hydraulic. Steering: Ackerman and hydraulic., Front axle and wheel alignment, Hydraulic system of tractor: Automatic position and draft control.

**Unit 6:** Tractor power outlets: P.T.O., belt pulley, drawbar. Introduction to traction mechanics.

**Unit 7:** Tractor chassis mechanics: C.G. determination and weight transfer. Tractor stability: Grade and non-parallel pull, turning at high speed, Ergonomic considerations and operational

safety.

### Practicals

- Introduction to different systems of an CI engine; Engine parts and functions, working principles etc.
- Valve system – study, construction and adjustments
- Oil & Fuel - determination of physical properties
- Air cleaning system
- Fuel supply system of SI engine; Diesel injection system & timing
- Cooling system, and fan performance, thermostat and radiator performance evaluation
- Part load efficiencies & governing
- Lubricating system & adjustments
- Starting and electrical system
- Ignition system
- Tractor engine heat balance and engine performance curves
- Mechanical power transmission in agricultural tractors, clutch, gear box, differential and final drive,
- Wheels and wheel tread adjustment
- Brake and its adjustment.
- Steering system
- Hydraulic lift and hitch system .

### References

1. Liljedahl, J.B., Turnquist, P.K., Smith, D.W. and Hoki, M. 2004. Tractors and their Power Units, 4<sup>th</sup> Edition. CBS Publishers & Distributors, New Delhi.
2. Mathur, M.L. and Sharma, R.P. 2014. Internal Combustion Engines. Dhanpat Rai Publications (P) Ltd., New Delhi.
3. Goering, C.E. and Hansen, A.C. 2013. Engine and Tractor Power. ASABE, USA.
4. Domkundwar A.V. 1999. A course in internal combustion engines. Dhanpat Rai & Co. (P) Ltd., Educational and Technical Publishers, Delhi.
5. Jain, S.C. and Rai, C.R. 2012. Farm Tractor: Maintenance and Repair, Standard Publishers and Distributors, New Delhi.

<b>AE 405</b>	<b>Post Harvest Operations</b>	<b>2L:0T:0P</b>	<b>2 Credits</b>
<b>AE409</b>	<b>Post Harvest Operations Lab.</b>	<b>0L:0T:2P</b>	<b>1 Credit</b>
<b>Teaching Scheme :</b> Lectures - 2 hours/week; Laboratory – 2 hours/week			
<b>Course Outcomes</b>			
<b>Syllabus Contents</b>			
<b>References</b>			

<b>AE 501</b>	<b>Kinematics and Theory of Machines</b>	<b>2L:1T:0P</b>	<b>3 Credits</b>
<b>Teaching Scheme :</b> Lectures - 2 hours/week; Tutorial – 1 hour/week			

### Objectives

1. To understand the kinematics and rigid- body dynamics of kinematically driven machine

components

2. To understand the motion of linked mechanisms in terms of the displacement, velocity and acceleration at any point in a rigid link
3. To be able to design some linkage mechanisms and cam systems to generate specified output motion
4. To understand the kinematics of gear trains

### Syllabus Contents

Classification of mechanisms-Basic kinematic concepts and definitions-Degree of freedom, mobility-Grashof's law, Kinematic inversions of four bar chain and slider crank chains-Limit positions- Mechanical advantage-Transmission angle-Description of some common mechanisms-Quick return mechanism, straight line generators-Universal Joint-Rocker mechanisms (8 lectures)

Displacement, velocity and acceleration analysis of simple mechanisms, graphical velocity analysis using instantaneous centers, velocity and acceleration analysis using loop closure equations kinematic analysis of simple mechanisms- slider crank mechanism dynamics- Coincident points- Coriolis component of acceleration- introduction to linkage synthesis- three position graphical synthesis for motion and path generation (8 lectures)

Classification of cams and followers-Terminology and definitions-Displacement diagrams-Uniform velocity, parabolic, simple harmonic and cycloidal motions- derivatives of follower motions specified contour cams- circular and tangent cams- pressure angle and undercutting, sizing of cams, graphical and analytical disc cam profile synthesis for roller and flat face followers (8 lectures)

Involute and cycloidal gear profiles, gear parameters, fundamental law of gearing and conjugate action, spur gear contact ratio and interference/undercutting- helical, bevel, worm, rack & pinion gears, epicyclic and regular gear train kinematics (8 lectures)

Surface contacts- sliding and rolling friction- friction drives- bearings and lubrication- friction clutches- belt and rope drives- friction in brakes (8 lectures)

### Course Outcomes

After completing this course, the students can design various types of linkage mechanisms for obtaining specific motion and analyse them for optimal functioning

### References

1. Thomas Bevan, Theory of Machines, 3rd edition, CBS Publishers & Distributors, 2005.
2. Cleghorn W.L., Mechanisms of Machines, Oxford University Press, 2005.
3. Robert L. Norton, Kinematics and Dynamics of Machinery, Tata McGrawHill, 2009.
4. Ghosh A. and Mallick A.K., Theory of Mechanisms and Machines, Affiliated East-West Pvt. Ltd, New Delhi, 1988.

<b>AE 502</b>	<b>Watershed Hydrology</b>	<b>2L:0T:0P</b>	<b>2 Credits</b>
<b>AE 506</b>	<b>Watershed Hydrology Lab.</b>	<b>0L:0T:2P</b>	<b>1 Credit</b>
<b>Teaching Scheme :</b> Lectures - 2 hours/week; Laboratory – 2 hours/week			
<b>Course Outcomes</b>			
<b>Syllabus Contents</b>			
<b>References</b>			

<b>AE 503</b>	<b>Farm Machinery</b>	<b>2L:0T:0P</b>	<b>2 Credits</b>
<b>AE507</b>	<b>Farm Machinery Lab.</b>	<b>0L:0T:2P</b>	<b>1 Credit</b>

**Teaching Scheme :** Lectures - 2 hours/week; Laboratory – 2 hours/week

### **Course Outcomes**

At the end of this course, students will be able to

- Select the appropriate farm machinery and matching power source for various farm operations
- Demonstrate the operation and maintenance of farm machines
- Generate idea for developing suitable machines for the farm operations for specific tasks.

### **Syllabus Contents**

**Unit 1:** Objectives of farm mechanization. Classification of farm machines. Materials of construction & heat treatment. Principles of operation and selection of machines used for production of crops. Field capacities & economics. Performance evaluation, selection and cost analysis.

**Unit 2:** Tillage; primary and secondary tillage equipment. Forces acting on tillage tools. Hitching systems and controls. Draft measurement of tillage equipment

**Unit 3:** Sowing, planting & transplanting equipment – their calibration and adjustments. Fertilizer application equipment.

**Unit 4:** Weed control, intercultural implement and Plant protection equipment - sprayers and dusters, their calibration, selection, constructional features of different components and adjustments

**Unit 5:** Principles & types of cutting mechanisms. Construction & adjustments of shear & impact-type cutting mechanisms. Crop harvesting machinery : mowers, windrowers, reapers, reaper binders and forage harvesters. Forage chopping & handling equipment.

**Unit 6:** Threshing mechanics & various types of threshers. Threshers, straw combines & grain combines, maize harvesting & shelling equipment,

**Unit 7:** Testing of farm machine. Test codes & procedure. Interpretation of test results. Selection and management of farm machines for optimum performance.

### **Practicals**

- Construction details, adjustments and working of M.B. plow, disc plow and disc harrow and secondary tillage tools.
- Construction and working of rotavators and other rotary tillers.
- Constructional and functional study of different types of seed-drill and planters
- Calibration of seed drills
- Study of sprayers and dusters
- Study of Self-propelled rice transplanter
- Weeding equipments and their use
- Study of sprayers and dusters, measurement of nozzle discharge, field capacity etc.
- Study of different types of power operated reapers and threshers
- Measurement of speed and working width
- Field capacity and field efficiency measurement of machines/implements
- Draft and fuel consumption measurement for different implements under different soil conditions

### **References**

1. Srivastava, A.K., Goering, C.E., Rohrbach, R.P. and Buckmaster, D.R. 2013. Engineering

Principles of Agricultural Machines, 2<sup>nd</sup> Edition. ASABE, St. Joseph, USA.

2. Kepner, R.A., Bainer, R. and Berger, E.L. 1978. Principles of Farm Machinery. John Wiley and Sons, New York.
3. Singh, T.P. 2017. Farm Machinery. PHI Learning Pvt. Ltd., Delhi.
4. Singh, S. 2007. Farm Machinery Principles and Applications. ICAR, New Delhi.
5. Michael, A.M. and Ojha, T.P. 2005. Principles of Agricultural Engineering, Vol. I. Jain Brothers, New Delhi

<b>AE 504</b>	<b>Mechanical Operation in Food Processing</b>	<b>2L:0T:0P</b>	<b>2 Credits</b>
<b>AE 508</b>	<b>Mechanical Operation in Food Processing Lab.</b>	<b>0L:0T:2P</b>	<b>1 Credit</b>
<b>Teaching Scheme :</b> Lectures - 2 hours/week; Laboratory – 2 hours/week			
<b>Course Outcomes</b>			
<b>Syllabus Contents</b>			
<b>References</b>			

<b>AE 505</b>	<b>Renewable Energy Technologies</b>	<b>2L:0T:0P</b>	<b>2 Credits</b>
<b>AE509</b>	<b>Renewable Energy Technologies Lab.</b>	<b>0L:0T:2P</b>	<b>1 Credit</b>

**Teaching Scheme :** Lectures - 2 hours/week; Laboratory – 2 hours/week

#### **Course Outcomes**

At the end of this course, students will be able to

- Understand the working principle and working of various appliances based on renewable energy sources
- Carry out the task of operation and maintenance of biogas plant, gasifier, solar water heater solar cooker etc.
- Apply the working principle of renewable energy for development of appropriate technologies

#### **Syllabus Contents**

**Unit 1:** Solar Energy; Heat transfer processes, radiation estimation and physical conversion, Instruments for measurement. Energy collection and thermal analysis; FPC, ETC, concentrating collectors. Solar thermal energy technology application; direct and indirect heating/cooling, refrigeration solar cooker and Water heater, Solar dryers, Solar green house, Active/passive heating, stills and solar pond. Solar photovoltaic technology; Conversion, Systems components and integrations, Balance of systems, applications and utilization in agriculture and agro based industries.

**Unit 2:** Energy from biomass and wastes; Production, distribution, Sources, characterization and properties of waste, composition, treatments, recycling. Biomass conversion technologies; Thermo-chemical, bio-chemical and agro-chemical technology- briquetting, gasification, Producer gas engines applications, Anaerobic digestion; crop residues and animal waste digestion, biogas engine system for power generation, Liquid fuels; aerobic and aerobic fermentation, ethanol, methanol production process and technologies.

**Unit 3:** Wind energy; Resource estimation, technologies, performance curves, wind farms design and considerations, wind mill parameters, power and torque characteristics; design and performance of rotors, wind mill structure design.

**Unit 4:** Other Renewable Energy Technologies; Ocean Thermal Energy Conversion ,

Geothermal, Tidal and Hydro Energy conversion systems

**Unit 5:** Resources, systems integrations and analysis, applications and utilization. Energy storage; Sensible and latent heat storage, thermos-chemical storage, Phase Change Material (PCM), characteristics and utilization.

**Practical**

- Evaluation of solar thermal devices; Solar cooker, water heater, dryer, still, solar pond, solar green house.
- Solar Photovoltaic cell characteristics
- Analysis of SPV system for home lighting, remote electrification
- SPV pumping system.
- Characterization of biomass; Proximate and Ultimate
- Calorific value estimation of biomass
- Biogas and producer gas
- Design and benefit analysis of community biogas plant
- Simulated anaerobic studies
- Solid state fermentation
- Study of ethanol and methanol plants.
- Design and efficiency testing of wind energy conversion devices; water pumping, electricity generation
- Study of solar- wind hybrid systems

**References**

1. Culp, A.W. 1991. Principles of Energy Conversion, McGraw Hill Pub. Co Inc.
2. Odum, H.T. and Odum, E.C. 1976. Energy Basis For Man and Nature. McGraw, Hill Pub. Co. Inc.
3. Garg, H.P. and Praksh J. 1976. Solar Energy- Fundamentals and Applications. Tata McGraw, Hill Pub. Co. Inc.
4. Sukhatmes, S.P. 1997. Solar Energy- Principles of Thermal Collection and Storage, 2<sup>nd</sup> Edition. Tata McGraw Hill. Pub. Co. Ltd., New Delhi.
5. Duffie, J.A. and Beckman W.A. 1991. Solar Engineering of Thermal Processes. John Willey, New York.
6. Twidell, J.W. and Weir, A.D. 1986. Renewable Energy Sources, E & FN Spon Ltd., London.
7. Rai, G.D. 2001. Non Conventional Energy Sources, Khanna Publishers, Delhi.

<b>AE 601</b>	<b>Thermal Operation in Food Processing</b>	<b>2L:0T:0P</b>	<b>2 Credits</b>
<b>AE 605</b>	<b>Thermal Operation in Food Processing Lab.</b>	<b>0L:0T:2P</b>	<b>1 Credit</b>
<b>Teaching Scheme :</b> Lectures - 2 hours/week; Laboratory – 2 hours/week			
<b>Course Outcomes</b>			
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<b>Syllabus Contents</b>			
<b>References</b>			

<b>AE 602</b>	<b>Machine Design and Drawing</b>	<b>2L:0T:0P</b>	<b>2 Credits</b>
<b>AE 606</b>	<b>Machine Design and Drawing Lab.</b>	<b>0L:0T:2P</b>	<b>1 Credit</b>

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**Teaching Scheme :** Lectures - 2 hours/week; Laboratory – 2 hours/week

### **Objectives**

This course seeks to provide an introduction to the design of machine elements commonly encountered in mechanical engineering practice, through

- A strong background in mechanics of materials based failure criteria underpinning the safety-critical design of machine components
- An understanding of the origins, nature and applicability of empirical design principles, based on safety considerations
- An overview of codes, standards and design guidelines for different elements
- An appreciation of parameter optimization and design iteration
- An appreciation of the relationships between component level design and overall machine system design and performance
- To provide an overview of how computers can be utilized in mechanical component design

### **Syllabus Contents**

**Unit 1:** Design considerations - limits, fits and standardization, Review of failure theories for static and dynamic loading (including fatigue failure).

**Unit 2:** Design of shafts under static and fatigue loadings.

**Unit 3:** Analysis and design of sliding and rolling contact bearings.

**Unit 4:** Design of transmission elements: spur, helical, bevel and worm gears; belt and chain drives.

**Unit 5:** Design of springs: helical compression, tension, torsional and leaf springs.

**Unit 6:** Design of joints: threaded fasteners, pre-loaded bolts and welded joints.

**Unit 7:** Analysis and applications of power screws and couplings.

**Unit 8:** Analysis of clutches and brakes.

### **Practical**

Engineering Graphics Software; -Spatial Transformations; Orthographic Projections; Model Viewing; Co-ordinate Systems; Multi-view Projection; Exploded Assembly; Model Viewing; Animation; Spatial Manipulation; Surface Modelling; Solid Modelling; Preparation of engineering drawings of machine / implement components.

### **Course Outcomes**

Upon completion of this course,

- Students will get an overview of the design methodologies employed for the design of various machine components.
- Students can use computer and CAD software for modeling mechanical components

### **References**

1. Shigley, J.E. and Mischke, C.R., Mechanical Engineering Design, Fifth Edition, McGraw-Hill International; 1989.
2. Deutschman, D., Michels, W.J. and Wilson, C.E., Machine Design Theory and Practice, Macmillan, 1992.
3. Juvinall, R.C., Fundamentals of Machine Component Design, John Wiley, 1994.
4. Spottes, M.F., Design of Machine elements, Prentice-Hall India, 1994.
5. R. L. Norton, Mechanical Design – An Integrated Approach, Prentice Hall, 1998.
6. Ibrahim Zeid, Mastering CAD CAM, Tata McGraw Hill Publishing Co. 2007.
7. C. McMohan and J. Browne, CAD/CAM Principles, II edition, Pearson Education, 1999.
8. W. M. Neumann and R.F. Sproul, Principles of Computer Graphics, McGraw Hill, 1989.
9. D. Hearn and M.P. Baker, Computer Graphics, Prentice Hall Inc., 1992.



<b>AE 603</b>	<b>Soil &amp; Water Conservation Engg.</b>	<b>2L:0T:0P</b>	<b>2 Credits</b>
<b>AE 607</b>	<b>Soil &amp; Water Conservation Engg. Lab.</b>	<b>0L:0T:2P</b>	<b>1 Credit</b>
<b>Teaching Scheme :</b> Lectures - 2 hours/week; Laboratory – 2 hours/week			
<b>Course Outcomes</b>			
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<b>Syllabus Contents</b>			
<b>References</b>			

<b>AE 604</b>	<b>Irrigation &amp; Drainage Engineering</b>	<b>2L:0T:0P</b>	<b>2 Credits</b>
<b>AE 608</b>	<b>Irrigation &amp; Drainage Engineering Lab.</b>	<b>0L:0T:2P</b>	<b>1 Credit</b>
<b>Teaching Scheme :</b> Lectures - 2 hours/week; Laboratory – 2 hours/week			
<b>Course Outcomes</b>			
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<b>Syllabus Contents</b>			
<b>References</b>			

<b>AE 701</b>	<b>Land and Water Resource Management</b>	<b>3L:0T:0P</b>	<b>3 Credits</b>
<b>Teaching Scheme :</b> Lectures - 3 hours/week			
<b>Course Outcomes</b>			
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<b>Syllabus Contents</b>			
<b>References</b>			

<b>AE 702</b>	<b>Fruits and Vegetable Processing</b>	<b>3L:0T:0P</b>	<b>3 Credits</b>
<b>Teaching Scheme :</b> Lectures - 3 hours/week			
<b>Course Outcomes</b>			
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<b>Syllabus Contents</b>			
<b>References</b>			

## PROFESSIONAL ELECTIVE COURSES

<b>AE A01</b>	<b>Environmental Engineering Fundamentals</b>	<b>3L:0T:0P</b>	<b>3 Credits</b>
<b>Teaching Scheme :</b> Lectures - 3 hours/week			
<b>Course Outcomes</b>			
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<b>Syllabus Contents</b>			
<b>References</b>			

<b>AE A02</b>	<b>Watershed Planning and Management</b>	<b>3L:0T:0P</b>	<b>3 Credits</b>
<b>Teaching Scheme :</b> Lectures - 3 hours/week			
<b>Course Outcomes</b>			
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<b>Syllabus Contents</b>			
<b>References</b>			

<b>AE A03</b>	<b>Environmental Microbiological Principles</b>	<b>3L:0T:0P</b>	<b>3 Credits</b>
<b>Teaching Scheme :</b> Lectures - 3 hours/week			
<b>Course Outcomes</b>			
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<b>Syllabus Contents</b>			
<b>References</b>			

<b>AE B01</b>	<b>Food Chemistry and Microbiology</b>	<b>3L:0T:0P</b>	<b>3 Credits</b>
<b>Teaching Scheme :</b> Lectures - 3 hours/week			
<b>Course Outcomes</b>			
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<b>Syllabus Contents</b>			
<b>References</b>			

<b>AE B02</b>	<b>Refrigeration and Air Conditioning</b>	<b>3L:0T:0P</b>	<b>3 Credits</b>
<b>Teaching Scheme :</b> Lectures - 3 hours/week			
<b>Objectives</b>			
<ul style="list-style-type: none"> <li>• To familiarize with the terminology associated with refrigeration systems and air conditioning</li> <li>• To understand basic refrigeration processes</li> <li>• To understand the basics of psychrometry and practice of applied psychrometrics</li> <li>• To acquire the skills required to model, analyse and design different refrigeration as well as air conditioning processes and components</li> </ul>			

### Syllabus Contents

**Unit-1:** Classification of refrigeration systems; Ozone depletion and global warming issues

**Unit-2:** Advanced vapour compression cycles, Refrigerants and their mixtures: properties and characteristics.

**Unit-3:** System components: Compressors, Condensers, Expansion devices and Evaporators- Performance matching of components of refrigeration systems

**Unit-4:** Advanced sorption refrigeration systems and their components.

**Unit-5:** Review of Psychrometry and Air-conditioning processes-Comfort air conditioning and Cooling load calculations

**Unit-6:** Applications of AC systems - Concept of enthalpy potential - Air washers, Cooling towers, Evaporative condensers, Cooling and dehumidifying coils.

### Course Outcomes

A student who has done the course will have a good understanding of the working principles of refrigeration and air-conditioning systems

### References

1. Gosney, W.B, Principles of Refrigeration, Cambridge University Press, 1982.
2. Stoecker, W.F. and Jones, J.W., Refrigeration and Air conditioning, Tata McGraw Hill, 1986.
3. Arora, C.P., Refrigeration and Air conditioning, Tata McGraw Hill, 2nd Edition, 2000.
4. Kuehn, T.H., Ramsey, J.W. and Threlkeld, J.L., Thermal Environmental Engineering, 3<sup>rd</sup> Edition, Prentice Hall, 1998.

<b>AE B03</b>	<b>Tea Technology</b>	<b>3L:0T:0P</b>	<b>3 Credits</b>
<b>Teaching Scheme :</b> Lectures - 3 hours/week			
<b>Course Outcomes</b>			
<b>Syllabus Contents</b>			
<b>References</b>			

<b>AE B04</b>	<b>Dairy Food Technology</b>	<b>3L:0T:0P</b>	<b>3 Credits</b>
<b>Teaching Scheme :</b> Lectures - 3 hours/week			
<b>Course Outcomes</b>			
<b>Syllabus Contents</b>			
<b>References</b>			

<b>AE C01</b>	<b>Testing &amp; Evaluation of Tractors &amp; Machines</b>	<b>3L:0T:0P</b>	<b>3 Credits</b>
<b>Teaching Scheme :</b> Lectures - 3 hours/week			
<b>Course Outcomes</b>			
At the end of this course, students will be able to			
<ul style="list-style-type: none"> <li>• Acquire the skills for testing tractor, farm implements and machinery, power tiller etc.</li> <li>• Carry out the performance evaluation of farm implements and machinery.</li> </ul>			

- Understand the technical specification of engines, tractors and farm machinery.

### Syllabus Contents

**Unit 1:** Test code, performance index, selection of machines, testand soil conditions, measurement of power, preparation of data sheet and analysis, Instrumentation for testing and data acquisition.

**Unit 2:** Ergonomic appraisal of agricultural equipment, Ergonomic assessments, animal and machine performance, Human characteristics, energy demands, environmental factors, safety and comfort.

**Unit 3:** Test procedures for agricultural hand tools and animal drawn agricultural equipment and implements. Procedure for evaluation of implements for primary tillage, secondary tillage, hand hoes

**Unit 4:** Procedure for evaluation of seeders, seed drills and planters, transplanters, fertiliser distributors. Procedure for evaluation of knapsack sprayer, field sprayer and dusters,

**Unit 5:** Testing procedures for power tiller drawn/self-propelled agricultural equipment/ implements, reapers, binders, grain threshers and combine harvesters, maize shellers, decorticators, winnowers.

**Unit 5:** Testing of farm tractor and power tiller – Tractor test codes: BIS: ISO: ASABE, OECD and SAE

### References

1. Smith, D.W., Sims, B.G. and O'Neill, D.H. 1994. Testing and Evaluation of Agricultural Machinery and Equipment: Principles and Practices. FAO, Rome.
2. Goering, C.E. and Hansen, A.C. 2013. Engine and Tractor Power. ASABE, USA.
3. Singh, T.P. 2017. Farm Machinery. PHI Learning Pvt. Ltd., Delhi.
4. Singh, S. 2007. Farm Machinery Principles and Applications. ICAR, New Delhi.

<b>AE C02</b>	<b>Advanced Farm Power</b>	<b>3L:0T:0P</b>	<b>3 Credits</b>
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**Teaching Scheme :** Lectures - 3 hours/week

### Course Outcomes

At the end of this course, students will be able to

- Understand the recent trends and developments in tractor design
- Acquire the knowledge of application of hydraulic system and mechanics in lifting of loads and pulling the implement by the tractor under actual field conditions.
- Carry out the design of hydraulic circuit for various applications and know the importance of ergonomics in the design of tractor.

### Syllabus Contents

**Unit 1:** Hydraulic system circuits, design and selection of hydraulic system components, automatic draft and position control system. Hydrostatic transmission, Power steering

**Unit 2:** Tractor chassis mechanics, hitching systems, 3-point hitch linkage design, hydraulic control of tractors, Determination of CG and moment of inertia, Dynamic stability and tractive ability of tractor, Tire selection.

**Unit 3:** Recent trends in tractor design, emissions and control of pollutants, Design of mechanical steering and brake system of tractor, hydraulic brake system, Steering geometry and stability during turning

**Unit 4:** Introduction of traction devices, tyres-types, function and size, their selection; mechanics of traction devices. Deflection between traction devices and soil, slippage and sinkage of wheels, evaluation and prediction of traction performance, design of traction and transport devices.

**Unit 5:** Ergonomics in tractor system design, noise and vibration effects, Design of operators' seat and suspension, work-place area and controls.

### References

1. Liljedahl, J.B., Turnquist, P.K., Smith, D.W. and Hoki, M. 1999. Tractors and their Power Units. Wiley, New York.
2. Mathur, M.L. and Sharma, R.P. 1994. Internal Combustion Engines. DhanpatRai and Sons, New Delhi.
3. Goering, C.E. and Hansen, A.C. 2013. Engine and Tractor Power. ASABE, USA.
4. Lal, R. and Datta, A.C. 1979. Agricultural Engineering (through worked examples). SarojParkashan, Karta.
5. Upadhyaya, S.K. 2013. Advances in Soil Dynamics. ASABE, St. Joseph, USA.

<b>AE C03</b>	<b>Instrumentation and Control</b>	<b>3L:0T:0P</b>	<b>3 Credits</b>
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**Teaching Scheme :** Lectures - 3 hours/week

### Objectives

- To provide a basic knowledge about measurement systems and their components
- To learn about various sensors used for measurement of mechanical quantities
- To learn about system stability and control.
- To integrate the measurement systems with the process for process monitoring and control

### Syllabus Contents

**Unit-1:** Measurement systems and performance – accuracy, range, resolution, error sources; Introduction to functional elements of instruments. Active and passive transducers, Analog and digital modes. Static and dynamic characteristics of instruments.

**Unit-2:** Strain and stress, strain relationship, strain gauges. Mechanical, optical, electrical acoustical and pneumatic etc. and their use. Various methods of determining strain/stress experimentally. Strain gauges: types and their application in two and three dimensional force measurement.

**Unit-3:** Instrumentation system elements – sensors for common engineering measurements; Measuring devices for displacement (linear and rotational), velocity, force, torque and shaft power. Devices for measurement of temperature, relative humidity, pressure, flow, sound and vibration. Measuring instruments for calorific value of solid, liquid and gaseous fuels.

**Unit-4:** Signal processing and conditioning; correction elements- actuators: pneumatic, hydraulic, electric; Recording devices and their types. Data acquisition system, micro computers, data storage and their application.

**Unit-5:** Control systems – basic elements, open/closed loop, design of block diagram; control method – P, PI, PID, when to choose what, tuning of controllers. System models, transfer function and system response, frequency response; Nyquist diagrams and their use.

### Course Outcomes

Upon completion of this course, the students will be able to understand the measurement of various quantities using instruments, their accuracy & range, and the techniques for controlling devices automatically.

### References

1. Instrumentation and control systems by W. Bolton, 2<sup>nd</sup> edition, Newnes, 2008
2. Thomas G. Beckwith, Roy D. Marangoni, John H. LienhardV , Mechanical Measurements (6<sup>th</sup> Edition) 6<sup>th</sup> Edition, Pearson Education India, 2007
3. Gregory K. McMillan, Process/Industrial Instruments and Controls Handbook, 5<sup>th</sup> Edition,

McGraw-Hill: New York, 1999.

<b>AE C04</b>	<b>Earth Moving Machinery</b>	<b>3L:0T:0P</b>	<b>3 Credits</b>
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**Teaching Scheme :** Lectures - 3 hours/week

**Course Outcomes**

At the end of this course, students will be able to

- Select the appropriate machinery for various earth moving operations.
- Apply the skills of hydraulic and mechanics to understand the working of various earth moving machines.
- Evaluate the performance of earth moving machinery.

**Syllabus Contents**

**Unit 1:** Types of earth moving machinery, Crawler tractor: Differential, brake, clutch, suspension, track assembly.

**Unit 2:** Study of bulldozer, grubber, ditcher, excavator, and their applications in agricultural operations.

**Unit 3:** Machinery for grading, terracing, gully control, land levelling, ditch making etc. Principles of operation of shovels, excavators.

**Unit 4:** Application of hydraulic system in earth moving machinery. Repair and maintenance of hydraulic system, Trouble shooting, repair and maintenance of earth moving machinery.

**Unit 5:** Production in Earth moving machinery, cost of operation, and management of earth moving machines.

**References**

1. De, Amitosh. 2015. Latest Development of Heavy Earth Moving Machinery. Galgotia Publications Pvt. Ltd., New Delhi.
2. Herbert L. Nichols, Jr. 2005. Moving the Earth: The Workbook of Excavation, 5<sup>th</sup> Edition. McGraw-Hill, New York.
3. Borshchov, T., Mansurou, R. and Sergeev, V. 1988. Land Reclamation Machinery, MIR Publication, Moscow.
4. Alekseeva, T.V. 1985. Machines for Earthmoving Work: Theory and Calculations. Amerind Publishing Co., New York.

<b>AE C05</b>	<b>Ergonomics and Safety</b>	<b>3L:-0T:0P</b>	<b>3 Credits</b>
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**Teaching Scheme :** Lectures – 3 hours/week; Tutorial – 1 hour/week

**Course Outcomes**

At the end of this course, students will be able to

- Apply the data of anthropometry and strength parameter for the design of farm machinery.
- Evaluate the farm machines from ergonomic considerations.

**Syllabus Contents**

**Unit-1:** Concept and design criteria for optimum mutual adjustment of man and his work: Importance of ergonomics and its application in agriculture, liberation and transfer of energy in human body, concept of indirect calorimeter, work physiology in various agricultural tasks.

**Unit-2:** Physiological stress indices and their methods of measurement: Mechanical efficiency of work, fatigue and shift work.

**Unit-3:** Anthropometry and Biomechanics: Anthropometric data and measurement techniques, joint movement and method of measurement, analysis and application of anthropometric data, measurement of physical and mental capacities.

**Unit-4:** Human limitations in relation to stresses and demands of working environments. Mechanical environment; noise and vibration and their physiological effects, thermal environment; heat stress, thermal comfort, effect on performance and behavior, field of vision, color discrimination, general guidelines for designing visual display, safety standards at work place during various farm operations and natural hazards on the farm. Farm safety legislation.

**Unit-5:** Man-machine system concept. Human factors in adjustment of man and his work. Design aspects of foot and hand controls on tractors and farm equipment. Design of operator's seat for tractors and agricultural equipment.

### References

1. Bridger RS. 1995. Introduction to Ergonomics. McGraw Hill.
2. Charles D Reese. 2001. Accident / Incident Prevention Techniques. Taylor & Francis.
3. Gavriel Salvendy. 1997. Hand Book of Human Factors and Ergonomics. John Wiley & Sons.
4. Kromer KHE. 2001. Ergonomics. Prentice Hall.
5. Mathews J & Knight AA. 1971. Ergonomics in Agricultural Design. National Institute of Agric. Engineering, Wrest Park Silsoe, Bedford.
6. Sanders, M.S and McCormick, E.J. 1978. Human Factors in Engineering and Design. McGraw Hill Inc., Singapore
7. William D McArdle. 1991. Exercise Physiology. 1991: Lea &Febiger. Zander J.1972. Principles of Ergonomics. Elsevier.
8. Zander J. 1972. Ergonomics in Machine Design. Elsevier.
9. Grandjean, E. 1988. Fitting the Task to the Man. Taylor and Francis, London
10. Griffin, M. J., 1996. Hand Book of Human Vibration, Academic Press, London

<b>AE C06</b>	<b>Hydraulic Drives and Controls</b>	<b>3L:0T:0P</b>	<b>3 Credits</b>
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**Teaching Scheme :** Lectures - 3 hours/week

### Course Outcomes

At the end of this course, students will be able to

- Develop hydraulic circuit for particular applications
- Select the appropriate components for the development of hydraulic system
- Acquire the knowledge of working of hydraulic system of tractor and other farm machinery.

### Syllabus Contents

**Unit 1 :**Hydraulic Basics: Pascal's Law, Flow, Energy, Work, and Power. Hydraulic Systems, Color Coding, Reservoirs, Strainers and Filters, Filtering Material and Elements. Accumulators, Pressure Gauges and Volume Meters, Hydraulic Circuit, Fittings and Connectors.

**Unit 2 :**Pumps, Pump Classifications, Performance, Displacement, Designs, Gear Pumps, Vane Pumps, Piston Pumps, Pump Operation. Hydraulic Actuators, Cylinders, Construction and Applications, Maintenance, Hydraulic Motors.

**Unit 3 :**Valves, Pressure-Control Valves, Directional- Control Valves, Flow-Control Valves, Valve. Installation, Valve Failures and Remedies, Valve Assembly, Troubleshooting Valves.

**Unit 4 :**Hydraulic Circuit Diagrams and Troubleshooting, United States of American Standards Institute USASI Graphical Symbols. Tractor hydraulics, nudging system, ADDC.

**Unit 5 :**Pneumatics: Air services, logic units, Fail safe and safety systems Robotics: Use of Hydraulics and Pneumatics drives in agricultural systems, PLCs (Programmable Logic Controls).

### References

1. Rabie, M.G. 2009. Fluid Power Engineering, McGraw Hill, New Delhi
2. Jagadeesha, T. and Gowda, T. 2009. Fluid Power: Generation, Transmission and Control,

Wiley India Limited, New Delhi

3. Goering, C.E. and Hansen, A.C. 2013. Engine and Tractor Power. ASABE, USA.
4. Esposito, A. 2009. Fluid Power with Applications, 7<sup>th</sup> Edition, Pearson Education, New York.
5. Sullivan, J. 1997. Fluid Power: Theory and Applications, 4<sup>th</sup> Edition, Pearson Education, New York.

<b>AE D01</b>	<b>Aquacultural Engineering</b>	<b>3L:0T:0P</b>	<b>3 Credits</b>
<b>Teaching Scheme :</b> Lectures - 3 hours/week			
<b>Course Outcomes</b>			
<b>Syllabus Contents</b>			
<b>References</b>			

<b>AE E01</b>	<b>Agricultural Business Management</b>	<b>3L:0T:0P</b>	<b>3 Credits</b>
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**Teaching Scheme :** Lectures - 3 hours/week

**Course Outcomes**

At the end of this course, students will be able to

- Acquire the knowledge of labour, marketing and financial management
- Develop the interest in running a small agri-business enterprise.
- Understand various agricultural extension activities and programmes

**Syllabus Contents**

**Unit 1: Introduction:** Basics of agri-business management, planning, organising, controlling and leading, Forecasting for agri-business, location and layout of facilities, work force management, Quality management and maintenance, financial analysis of agri-business, process strategy, inventory management, Knowledge management, organisational behaviour, human resource management

**Unit 2: Marketing:** Core concepts: needs & Maslow's hierarchy of needs, wants, demands, products, utility, value, satisfaction, exchange, transactions, relationships, markets; management: production concept, product concept, selling concept, marketing concept; planning and process: SBU identification, SWOT analysis, marketing mix, resource allocation; industrial markets; segmentation variables in consumer and industrial markets; state of branding in agro and food sectors; pricing strategies and programs; product life cycle.

**Unit 3: Finance:** Elements of engineering economics; balance sheet & loss and profit accounts; agricultural finance, institutional and non-institutional credits; principles of farm finance – need for specialised agencies for agricultural credit, risk involved in finance, recovery of loans, supervision, linking credit with marketing management of agricultural credit

**Unit 4: Agrarian Economics:** Quantitative techniques for agri-business, rural credit, agri-finance, micro-finance, WTO, cost and financial analysis, agri-insurance, custom hiring and agro-service centres, cooperative and contract farming, agricultural policy, business statistics, farm business organisations, labour management, business policy analysis – concepts and methods, leadership, motivation.

**Unit 5: Agril Extension:** Definitions, philosophy and scope of agricultural extension, basic principles and their applications to agricultural engineering, Role and quality of extension workers, Various extension agencies, their functions and mode of working with reference to



agricultural engineering, Extension programme planning and its importance, extension need for farm implements and machinery, soil and water engineering, farm structures and post harvest technology. Transfer of technology, training and visit system, monitoring of extension activities and feed back

### References

1. Wills, W.J. 1979. An introduction to agri-business management, 2<sup>nd</sup> Edition. Vero Media Inc.
2. Megginson, L.C., Byrd, M.J. and Megginson, W.L. 2012. Small business management: An Entrepreneur's Guidebook, 7<sup>th</sup> Edition. McGraw Hill Education, New York.
3. Truett, L.J. and Truett, D.B. Managerial Economics, 8<sup>th</sup> Edition. John Wiley and Sons.

<b>AE E02</b>	<b>Building Materials &amp; Structural Design</b>	<b>3L:0T:0P</b>	<b>3 Credits</b>
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**Teaching Scheme :** Lectures - 3 hours/week

### Course Outcomes

At the end of this course, students will be able to

- Select the appropriate building materials for various applications
- Design the beam, columns, roof etc. for various structures.
- Design the farm house, cattle shed and various storage structures for the farm.

### Syllabus Contents

**Unit 1:** Properties and classification of conventional building materials, like bricks, lime, cement, sand, coarse aggregates, timber, asbestos, glass etc. Classification of seasoning and preservation of timbers.

**Unit 2:** Use of materials like plywood, asbestos, plastic and PVC, glass, aluminium etc. in buildings and sheds. Use of flyash and flyash products in construction and waterproofing materials for concrete. Constructional elements such as brick work, stone work, mortar, concrete, plastering, painting, ceiling, roofing etc.

**Unit 3:** Concept of determinate and indeterminate structures, moments of inertia of sections, bending moment and shear force diagrams and design of steel and concrete beams.

**Unit 4:** Design of steel and R.C.C. columns and column footings. Design of roof slabs, roof trusses. Partitions and bracings for sheds, concept of ferro-cement structures like grain containers used in agricultural work.

**Unit 5:** Structural details of underground and overhead liquid containers, silos, cold storage structures and open web structures. Design of farm house, cattle shed, farm fence etc.

### References

1. Michael, A.M. and Ojha, T.P. 2005. Principles of Agricultural Engineering, Vol. I. Jain Brothers, New Delhi
2. Pandey, P.H. 2014. Principles and Practices of Agricultural Structures and Environmental Control. Kalyani Publishers, New Delhi
3. Lindley, J.A. 1997. Agricultural Buildings & Structures. ASABE, USA.
4. Merritt, F.S. and Ricketts, J.T. 2001. Building Design and Construction Handbook, 6<sup>th</sup> Edition. McGraw Hill, New York.

<b>AE E03</b>	<b>Statistical Methods in Agriculture</b>	<b>2L:1T:0P</b>	<b>3 Credits</b>
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**Teaching Scheme :** Lectures – 2 hours/week; Tutorial – 1 hour/week

### Course Outcomes

At the end of this course, students will be able to

- Apply probability and probability distributions to various applications.

- Test the hypothesis for conducting experiments.
- Analyze the variances in the experiment and study the effect of variables on the outcome of the experiment.

### **Syllabus Contents**

**Unit-1:** Probability and probability distributions.

**Unit-2:** Principle of least squares. Linear and non-linear regression. Multiple regression. Correlation analysis. Selection of variables. Validation of models. Sampling techniques. Determination of sample size. Sampling distribution of mean and proportion.

**Unit-3:** Hypothesis testing. Concept of p-value. Student's t-test. Chi-square test and large sample tests. Confidence intervals.

**Unit-4:** ANOVA and testing of hypothesis in regression analysis. Analysis of variance for one way and two way classification (with equal cell frequency).

**Unit-5:** Transformation of data. Advantages and disadvantages of non-parametric statistical tests. Scales of measurements. Sign test. Median test. Run-test. Wilcoxon-Mann-Whitney test. Chi-square test for two independent samples. Kruskal-Wallis's one way and Friedman's two way ANOVA by ranks. Kendall's Coefficient of concordance.

**Tutorial:** Fitting of distributions. Sample and sampling distributions. Correlation analysis. Regression analysis (exponential, power function, quadratic, multi-variate, selection of variables, validation of models, ANOVA and testing of hypothesis). Tests of significance (Z-test, t-test, F test and Chi-square test). Analysis of variance. Non-parametric tests.

### **References**

1. K.P. Dhamu and K. Ramamoorthy. 2007. Statistical Methods, Agrobios (India), Jodhpur.
2. Holman JP 1996. Experimental Methods for Engineers. McGraw Hill.
3. RudraPratap. 2003. Getting Started with MATLAB. A Quick Introduction for Scientists and Engineers. Oxford Univ. Press.
4. Santhosh Gupta. 1979. Research Methodology and Statistical Techniques. Khanna Publ.
5. Stephen J Chapman. 2003. MATLAB Programming for Engineers. Eastern Press.
6. Steven C Chapra & Raymond P Canale. 2000. Numerical Methods for Engineers with Programming and Software Applications. Tata McGraw.
7. William J Palm. 2001. Introduction to Matlab 6 for Engineers. McGraw Hill

**PROJECT WORK, SEMINAR AND INTERNSHIP IN INDUSTRY OR ELSEWHERE  
[PROJ]**

<b>AE 510</b>	<b>Summer Industry Internship - I</b>	<b>2 Credits</b>
<b>AE 703</b>	<b>Summer Industry Internship - II</b>	<b>2 Credits</b>

Minimum of 4 weeks in an Industry / Training Institute in the area of Agricultural Engineering. The summer internship should give exposure to the practical aspects of the discipline. In addition, the student may also work on a specified task or project which may be assigned to him/her. The outcome of the internship should be presented in the form of a report.

<b>AE 704</b>	<b>Project- I</b>	<b>0L:0T:10P</b>	<b>5 Credits</b>
<b>AE 801</b>	<b>Project- II</b>	<b>0L:0T:12P</b>	<b>6 Credits</b>

This course is aimed to provide more weightage for project work. The project work could be done in the form of a summer project in the industry or even a minor practical project in the college. Participation in any technical event / competition to fabricate and demonstrate an innovative machine or product could be encouraged under this course. It is intended to start the project work early in the seventh semester and carry out both design and fabrication of a mechanical device whose working can be demonstrated. The design is expected to be completed in the seventh semester and the fabrication and demonstration will be carried out in the eighth semester.

#### **MANDATORY COURSES (ENVIRONMENTAL SCIENCES, INDUCTION PROGRAM, INDIAN CONSTITUTION, ESSENCE OF INDIAN KNOWLEDGE TRADITION) [MC]**

<b>MC 1</b>	<b>Environmental Sciences</b>	<b>0 Credits</b>
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We as human being are not an entity separate from the environment around us rather we are a constituent seamlessly integrated and co-exist with the environment around us. We are not an entity so separate from the environment that we can think of mastering and controlling it rather we must understand that each and every action of ours reflects on the environment and vice versa. Ancient wisdom drawn from Vedas about environment and its sustenance reflects these ethos. There is a direct application of this wisdom even in modern times. Idea of an activity based course on environment protection is to sensitize the students on the above issues through following two type of activities.

##### **(a) Awareness Activities:**

- (i) Small group meetings about water management, promotion of recycle use, generation of less waste, avoiding electricity waste
- (ii) Slogan making event
- (iii) Poster making event
- (iv) Cycle rally
- (v) Lectures from experts

##### **(b) Actual Activities:**

- (i) Plantation
- (ii) Gifting a tree to see its full growth
- (iii) Cleanliness drive
- (iv) Drive for segregation of waste
- (v) To live some big environmentalist for a week or so to understand his work
- (vi) To work in kitchen garden for mess
- (vii) To know about the different varieties of plants

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(viii) Shutting down the fans and ACs of the campus for an hour or so

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<b>MC 2</b>	<b>Constitution of India / Essence of Indian Knowledge Tradition</b>	<b>0L:0T:0P</b>	<b>0 Credits</b>
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The Constitution of India is the supreme law of India. Parliament of India can not make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the “basic structure” of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of “Constitutionalism” – a modern and progressive concept historically developed by the thinkers of “liberalism” – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of “constitutionalism” in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America.

The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India’s legacy of “diversity”. It has been said that Indian constitution reflects ideals of its freedom movement, however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be “static” and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it “as one of the strongest court in the world”.

#### **Course content**

1. Meaning of the constitution law and constitutionalism
  2. Historical perspective of the Constitution of India
  3. Salient features and characteristics of the Constitution of India
  4. Scheme of the fundamental rights
  5. The scheme of the Fundamental Duties and its legal status
  6. The Directive Principles of State Policy – Its importance and implementation
  7. Federal structure and distribution of legislative and financial powers between the Union and the States
  8. Parliamentary Form of Government in India – The constitution powers and status of the President of India
  9. Amendment of the Constitutional Powers and Procedure
  10. The historical perspectives of the constitutional amendments in India
  11. Emergency Provisions : National Emergency, President Rule, Financial Emergency
  12. Local Self Government – Constitutional Scheme in India
  13. Scheme of the Fundamental Right to Equality
  14. Scheme of the Fundamental Right to certain Freedom under Article 19
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15. Scope of the Right to Life and Personal Liberty under Article 21.

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### Essence of Indian Knowledge Tradition Part-I

#### Course objective

The course aims at imparting basic principles of thought process, reasoning and inferencing. Sustainability is at the core of Indian Traditional knowledge Systems connecting society and nature. Holistic life style of yogic science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions. Part-I focuses on introduction to Indian Knowledge Systems, Indian perspective of modern scientific world-view, and basic principles of Yoga and holistic health care system.

#### Course Contents

Basic structure of Indian Knowledge System: ऋग्वेद, यजुर्वेद, सामवेद, अथर्ववेद, पञ्चवेद, गणितवेद, व्याकरण आदि। श्वेदोपनिषद् (सिद्धि, सत्य, निष्कल, स्वकाय, ज्योतिष, कर्म, च उपायान् (सर्वसाधन, मीमांसा, पुराण, तर्कशास्त्र)

Modern Science and Indian Knowledge System

Yoga and Holistic Health care

Case studies

#### References

1. V. Sivaramakrishnan (Ed.), *Cultural Heritage of India-course material*, Bharatiya Vidya Bhavan, Mumbai. 5th Edition, 2014
2. Swami Jitatmanand, *Modern Physics and Vedant*, Bharatiya Vidya Bhavan
3. Swami Jitatmanand, *Holistic Science and Vedant*, Bharatiya Vidya Bhavan
4. Fritzof Capra, *Tao of Physics*
5. Fritzof Capra, *The Wave of life*
6. VN Jha (Eng. Trans.), *Tarkasangraha of Annam Bhatta*, International Chinmay Foundation, Velliarnad, Arnakulam
7. *Yoga Sutra of Patanjali*, Ramakrishna Mission, Kolkata
8. GN Jha (Eng. Trans.), Ed. RN Jha, *Yoga-darshanam with Vyasa Bhashya*, Vidyanidhi Prakashan, Delhi 2016
9. RN Jha, *Science of Consciousness Psychotherapy and Yoga Practices*, Vidyanidhi Prakashan, Delhi 2016
10. B Sharma (English translation), *Shodashang Hridayan*

**Pedagogy:** Problem based learning, group discussions, collaborative mini projects.

**Outcome:** Ability to understand, connect up and explain basics of Indian traditional knowledge in modern scientific perspective.

**DEPARTMENT OF AGRICULTURAL ENGINEERING  
ASSAM UNIVERSITY: SILCHAR**

**M. Tech. (Agricultural Engineering)  
Specialization: Aquacultural Engineering  
Course Structure**

**Semester I**

Sl. No	Course Code	Course Name	Teaching Scheme			Credits
			L	T	P	
1.	1AE401	Open Channel Hydraulics & Coastal Engineering	3	0	0	3
2.	1AE402	Planning and Design of Aquaculture Project	3	0	0	3
3.	1AE4xx	Programme Elective – I	3	0	0	3
4.	1AE4xx	Programme Elective - II	3	0	0	3
5.	1ST101	Research Methodology & IPR	2	0	0	2
6.	1ST1xx	Audit Course - 1	2	0	0	0
7.	1AE403	Water Quality Management Lab	0	0	4	2
8.	1AE404	Aquaculture Facilities and Equipment Lab-1	0	0	4	2
<b>Total</b>			<b>16</b>	<b>0</b>	<b>8</b>	<b>18</b>

**Semester II**

Sl. No	Course Code	Course Name	Teaching Scheme			Credits
			L	T	P	
1.	2AE405	Design of Aquaculture Facilities	3	0	0	3
2.	2AE406	Processing and Preservation of Aquacultural Products	3	0	0	3
3.	2AE4xx	Programme Elective - III	3	0	0	3
4.	2AE4xx	Programme Elective – IV	3	0	0	3
5.	2ST1xx	Audit Course - 2	2	0	0	0
6.	2AE407	Aquaculture Facilities and Equipment Lab-II	0	0	4	2
7.	2AE408	Recirculatory Aquaculture System Lab	0	0	4	2
8.	2AE409	Mini Project	0	0	4	2
<b>Total</b>			<b>14</b>	<b>0</b>	<b>12</b>	<b>18</b>

**Semester III**

Sl. No	Course Code	Course Name	Teaching Scheme			Credits
			L	T	P	
1.	3AE4xx	Programme Elective – V	3	0	0	3
2.	3ST2xx	Open Elective	3	0	0	3
3.	3AE410	Dissertation Phase - I	0	0	20	10
<b>Total</b>			<b>6</b>	<b>0</b>	<b>20</b>	<b>16</b>

**Semester IV**

Sl.	Course	Course Name	Teaching Scheme	Credits
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No	Code		L	T	P	
1.	4AE411	Dissertation Phase - II	0	0	32	16
<b>Total</b>			<b>0</b>	<b>0</b>	<b>32</b>	<b>16</b>

### Programme Elective – I

1AE412	Planning and Design of Aquacultural Farms
1AE413	Computer Programming and Application in Engineering
1AE414	Fishery Biology and Fish Culture Techniques

### Programme Elective – II

1AE415	Water Quality Management Practices
1AE416	Environmental Engineering Fundamentals
1AE417	Land Husbandry and Watershed Management

### Programme Elective – III

2AE418	Design of Aquaculture Equipment
2AE419	Recirculatory Aquaculture Systems
2AE420	Water and Wastewater Treatment Engineering

### Programme Elective – IV

2AE421	Unit Operations in Aquaculture Products Processing
2AE422	Advanced Water and Wastewater Treatment
2AE423	Advanced Aquaculture Technology

### Programme Elective – V

3AE424	Principles of Fishing Technology
3AE425	Modelling of Aquaculture & Fisheries Systems
3AE426	Manpower Economics

### Audit Course 1&2

1ST102	English for Research Paper Writing
1ST103	Disaster Management
1ST104	Sanskrit for Technical Knowledge
1ST105	Value Education
2ST106	Constitution of India
2ST107	Pedagogy Studies
2ST108	Stress Management by Yoga
2ST109	Personality Development through Life Enlightenment Skills.

### Open Elective Courses

3ST201	Business Analytics
3ST202	Industrial Safety
3ST203	Operations Research
3ST204	Cost Management of Engineering Projects

3ST205	Composite Materials
3ST206	Waste to Energy



## Core courses

<b>1AE401, Open Channel Hydraulics &amp; Coastal Engineering</b>
<b>Teaching Scheme</b> Lecture: 3 hours/week
<b>Courses Outcomes</b> At the end of this course, students will be able to <ul style="list-style-type: none"> <li>• Solve the problem related to open channel and Coastal Engineering.</li> <li>• Acquainted with the different type of open channel and their properties.</li> <li>• Analyze flow profile analysis of open channel</li> <li>• Strengthen the knowledge to manage the problem related to Ocean Water</li> </ul>
<b>Syllabus Contents</b> <b>Unit 1:</b> Open Channel and their Properties, Energy and Momentum Principle, Critical flow, Uniform Flow, Design of Channels for Uniform flow. <b>Unit 2:</b> Gradually Varied Flow, Flow Profile Analysis, Flow Over Spillway, Hydraulic Jump, Flow Through Non-prismatic Channel, Gradually Varied Unsteady Flow. <b>Unit 3:</b> Equilibrium and Dynamic Theory of Tides, Types of Tides and Tidal Theory, Tidal Propagation in the Channel, Estuaries and Coastal Inlets, Tidal Mixing. <b>Unit 4:</b> Properties of Ocean Water, Provinces of Ocean, Generation and Prediction of waves, Propagation and Transformation of Waves, Longshore Currents, Rip Current, Littoral Transport, <b>Unit 5:</b> Artificial Protection of Coastline- Structure and forces acting on them, Coastal Protection Planning for Design of Aquacultural Farm.
<b>References</b> <ol style="list-style-type: none"> <li>1. Chow, Ven TE, Open Channel Hydraulics, McGraw-Hill International book Company.</li> <li>2. Kamphuis, J.W. Introduction to coastal engineering and management. Advance series in ocean engineering.</li> <li>3. Pillay, TVR and Kutty. M N. Aquaculture: Principles and Practices</li> </ol>

## 1AE402, Planning and Design of Aquaculture Project

<b>Teaching Scheme</b> Lecture: 3 hours/week
<b>Courses Outcomes</b> At the end of this course, students will be able to <ul style="list-style-type: none"> <li>• Finalize the project site for Aquaculture design the aquaculture Farm.</li> <li>• Generate scenarios of protection of coastline- structure and forces acting on them.</li> <li>• Address the pertinent coastal protection planning for design of aquaculture farm.</li> </ul>
<b>Syllabus Contents</b> <b>Unit 1:</b> Selection of Aquacultural Project Site - Water Supply, Soil Type, Topography, Drainage. <b>Unit 2:</b> Computations for Water Requirement, Seepage and Evaporation, Seed Requirement, Seed Availability. <b>Unit 3:</b> Environmental Considerations, Tidal Effects, Effects of Flood and Cyclone, Requirements of Manpower, Energy and Equipment. Proposed Cultural Practices and Calculations for Expected Productions. <b>Unit 4:</b> Market Study and Evaluation of Economic Viability of the project. Society and Social Benefits, Project Layout <b>Unit 5:</b> Types of Ponds and their Designs, Flow Scheme for Water Supply and Drainage, Flow Channel Design, Inlet and Outlet Designs.
<b>References</b> <ol style="list-style-type: none"> <li>1. Lawson, Thomas B., Fundamental of Aquacultural Engineering, Springer.</li> <li>2. J.F. Muir and R.J. Roberts, In Recent advances in aquaculture, Croom Helm</li> <li>3. T.V.R. Pillay M.N. Kutty., Aquaculture: Principles and Practices.</li> </ol>

1AE403, Water Quality Management Lab
<b>Teaching Scheme</b> Lecture: 4 hours/week
<b>Courses Outcomes</b> At the end of this course, students will be able to <ul style="list-style-type: none"> <li>• Maintain water quality parameter in Fish Farm</li> </ul>

- Solve the problem related to water quality parameter.

### Syllabus Contents

The lab practice consists of the tutorials and experiments as decided by the coursesupervisor of the course, Water Quality Management Lab. It includes but not restricted to the following:

1. Determination pH of aquaculture pond.
2. Determination of dissolved oxygen concentration of aquaculture pond.
3. Determination of nitrogenous compound of aquaculture pond.
4. Determination of BOD of Aquaculture Pond.
5. Determination COD of Aquaculture pond

### References

1. Lawson, Thomas B., Fundamental of Aquacultural Engineering, Springer.
2. J.F. Muir and R.J. Roberts, In Recent advances in aquaculture, Croom Helm
3. Boyad, C.E. and Toker C.S. Pond Aquaculture Water Quality Management, Springer

## 1AE404, Aquaculture Facilities and Equipment Lab-1

### Teaching Scheme

Lecture: 4 hours/week

### Courses Outcomes

At the end of this course, students will be able to

- design the aquaculture farms.
- calculate the water holding capacity of Aquacultural Farm
- decide suitable the nature of water flow for fisheries.

### Syllabus Contents

The lab practice consists of the tutorials and experiments as decided by the coursesupervisor of the course, Aquaculture Facilities and Equipment Lab-1. It includes but not restricted to the following:

1. Exercise based on aquaculture farm design.
2. Design of primary dike for aquaculture pond
3. Design of secondary dike for aquaculture pond
4. Determination of water holding capacity of aquaculture pond
5. Determination of Reynolds' number and Froude number in open channel
6. Demonstration of laminar and turbulent flows.

7. Exercise based on different types of open channel flow
8. Demonstration of critical flow and critical depth.
<b>References</b>
1. Lawson, Thomas B., Fundamental of Aquacultural Engineering, Springer.
2. J.F. Muir and R.J. Roberts, In Recent advances in aquaculture, Croom Helm
3. Boyad, C.E. and Toker C.S. Pond Aquaculture Water Quality Management, Springer

<b>2AE405, Design of Aquaculture Facilities</b>
<b>Teaching Scheme</b> Lecture: 3 hours/week
<b>Courses Outcomes</b> At the end of this course, students will be able to <ul style="list-style-type: none"> <li>• Select the suitable size of Tank and Raceway for Aquaculture</li> <li>• Design the pens, cages and raceways</li> <li>• Understand need of Development of Hatchery</li> </ul>
<b>Syllabus Contents</b> <b>Unit 1:</b> Tanks and Raceways: Type, Uses and Design and Selection Criteria in Aquacultural Farms. <b>Unit 2:</b> Water Circulation Systems: Type and Material of Construction <b>Unit 3:</b> Design and construction of enclosures for mariculture operations, pens, cages, raceways, flow through systems and re-circulatory systems. Selection of materials for mariculture facilities. Sea farming, site selection and structures. Cage farming <b>Unit 4:</b> Carp Hatchery: Component of carp hatchery, Design, Construction and Operation, Fish Seed Transport. <b>Unit 5:</b> Fresh Water Prawn Hatchery: Component of carp hatchery Design, Construction and Operation
<b>References</b> <ol style="list-style-type: none"> <li>1. Thomas B Lawson. Fundamentals of Aquaculture Engineering</li> <li>2. Wheaton, F.W. Aquaculture Engineering 1942 Wiler Inter-science publication</li> <li>3. Santhosh Kumar Garg. Water supply Engineering</li> </ol>

<b>2AE406, Processing and Preservation of Aquacultural Products</b>
<b>Teaching Scheme</b> Lecture: 3 hours/week
<b>Courses Outcomes</b> At the end of this course, students will be able to <ul style="list-style-type: none"> <li>• Understand the need of fish protein and significance of omega 3 and omega 6 fatty acid</li> <li>• Prevent the fish product from Spoilage</li> <li>• Analyze basic concept of quality control methods for Processing and Preservation of Aquacultural Products</li> </ul>
<b>Syllabus Contents</b> <b>Unit 1:</b> Nutritional Aspects of Fish and Fishery Products, Elementary idea of structure and classification of carbohydrate, protein, lipid and amino acids. Essential amino acids and fatty acids. Significance of omega3 and omega 6 fatty acids <b>Unit 2:</b> Causes of Spoilage of Fresh Fish, Principles of Preservation and Processing. Handling and Transport of Wet Fish-Icing, Containers and Packages. Chilling and Freezing- physical aspects, Methods of Freezing, Typical Frozen Products <b>Unit 3:</b> Thermal Processing-Principles of Canning, Canning Process, Canned Products. Drying of Fish- Fundamentals, Salting, Methods of Drying, Smoking, Typical Dry Products Miscellaneous Products-Crabs, Molluscs <b>Unit 4:</b> Utilization of fishery wastes such as prawn shell, fish offal, fish meal, chitin, chitosan. Fish silage. <b>Unit 5:</b> — Basic concepts, quality and quality control. Sanitation procedures in seafood processing plants. Waste management in fish processing industries. Risk factors in seafood biotoxins, seafood pathogens, endogenous parasites. Quality control programmes - pre-shipment inspection, IPQC, MIPQC, HACCP and ISO Series in seafood industry. Quality standards in India and major importing countries like USA, Japan and EU
<b>References</b> <ol style="list-style-type: none"> <li>1. Biswas, k. P., Fish Processing and Preservation. Daya Publishing House</li> <li>2. Ninawe, A., kumar R.K., Fish Processing Technology and Product Development. Narendra Publishing House</li> </ol>

<b>2AE407, Aquaculture Facilities and Equipment Lab-II</b>	
<b>Teaching Scheme</b>	Lecture: 4 hours/week
<b>Courses Outcomes</b>	<p>At the end of this course, students will be able to</p> <ul style="list-style-type: none"> <li>• Determine efficiency of Aeration System</li> <li>• Design the Carp and Prawn hatchery</li> <li>• Select the suitable and economically viable pumping unit for Aquacultural Farm</li> </ul>
<b>Syllabus Contents</b>	<p><b>The lab practice consists of the tutorials and experiments as decided by the course supervisor of the course, Aquaculture Facilities and Equipment Lab-II. It includes but not restricted to the following:</b></p> <ol style="list-style-type: none"> <li>1. Performance evaluation of centrifugal pumps</li> <li>2. Design of aeration system.</li> <li>3. Determination of SOTR and SAE of aerator.</li> <li>4. Exercise based on Design of Carp hatchery</li> <li>5. Exercise based on Design of Prawn hatchery</li> </ol>
<b>References</b>	<ol style="list-style-type: none"> <li>1. Thomas B Lawson. Fundamentals of Aquaculture Engineering</li> <li>2. Wheaton, F.W. Aquaculture Engineering 1942 Wiler Inter-science publication</li> <li>3. Santhosh Kumar Garg. Water supply Engineering</li> </ol>

<b>2AE408, Recirculatory Aquaculture System Lab</b>	
<b>Teaching Scheme</b>	Lecture: 4 hours/week
<b>Courses Outcomes</b>	<p>At the end of this course, students will be able to</p> <ul style="list-style-type: none"> <li>• Understand the necessity of recirculatory aquacultural System.</li> <li>• Select the suitable filter media for RAS</li> <li>• Evaluate the performance of component of RAS</li> </ul>
<b>Syllabus Contents</b>	

**The lab practice consists of the tutorials and experiments as decided by the course supervisor of the course, Recirculatory Aquaculture System Lab. It includes but not restricted to the following:**

1. Demonstration of Recirculating Aquaculture System.
2. Performance evaluation of sand filters
3. Performance evaluation of cartridge filters
4. Performance evaluation of Trickling filters
5. Performance evaluation Disinfection unit
6. Exercise based on performance evaluations of recirculating aquaculture system

#### **References**

1. Thomas B Lawson. Fundamentals of Aquaculture Engineering
2. Wheaton, F.W. Aquaculture Engineering 1942 Wiler Inter-science publication
3. Santhosh Kumar Garg. Water supply Engineerin

### **2AE409, Mini Project**

#### **Teaching Scheme**

Lectures: 4 hours/week

#### **Course Outcomes**

At the end of this course,

- Students will solve a live problem using software/analytical/computational tools.
- Students will learn to write technical reports.
- Students will develop skills to present and defend their work in front of technically qualified audience.

#### **Syllabus Contents**

Students can take up small problems in the field of design and development or design refinement of farm machines or computer application in tractor and farm machinery design as mini project. It can be related to solution to an engineering problem, verification and analysis of experimental data available, comparative performance of various farm equipment, conducting experiments on various engineering subjects, studying a software tool for the solution of an engineering problem etc.

### **3AE410, Dissertation Phase - I**

#### **Teaching Scheme**

Lectures: 20 hours/week

#### **Course Outcomes**

At the end of this course,

- Students will be exposed to self-learning various topics.
- Students will learn to survey the literature such as books, national/international refereed

<p>journals and contact resource persons for the selected topic of research.</p> <ul style="list-style-type: none"> <li>• Students will learn to write technical reports.</li> <li>• Students will develop oral and written communication skills to present and defend their work in front of technically qualified audience.</li> </ul>
<p><b>Guidelines</b></p> <p>The Project Work will start in semester III and should preferably be a problem with research potential and should involve scientific research, design, generation/collection and analysis of data, determining solution and must preferably bring out the individual contribution. Seminar should be based on the area in which the candidate has undertaken the dissertation work as per the common instructions for all branches of M. Tech. The examination shall consist of the preparation of report consisting of a detailed problem statement and a literature review. The preliminary results (if available) of the problem may also be discussed in the report. The work has to be presented in front of the examiners panel set by Head and PG coordinator. The candidate has to be in regular contact with his guide and the topic of dissertation must be mutually decided by the guide and student.</p>
<p align="center"><b>4AE411, Dissertation Phase - II</b></p>
<p><b>Teaching Scheme</b></p> <p>Lectures: 32 hours/week</p>
<p><b>Course Outcomes</b></p> <ul style="list-style-type: none"> <li>• At the end of this course,</li> <li>• Students will be able to use different experimental techniques.</li> <li>• Students will be able to use different software/ computational/analytical tools.</li> <li>• Students will be able to design and develop an experimental set up/ equipment/test rig.</li> <li>• Students will be able to conduct tests on existing set ups/equipments and draw logical conclusions from the results after analyzing them.</li> <li>• Students will be able to either work in a research environment or in an industrial environment.</li> <li>• Students will be conversant with technical report writing.</li> <li>• Students will be able to present and convince their topic of study to the engineering community.</li> </ul>
<p><b>Guidelines</b></p> <p>It is a continuation of Project work started in semester III. He has to submit the report in prescribed format and also present a seminar. The dissertation should be presented in standard format as provided by the department. The candidate has to prepare a detailed project report consisting of introduction of the problem, problem statement, literature review, objectives of the work, methodology (experimental set up or numerical details as the case may be) of solution and results and discussion. The report must bring out the conclusions of the work and future scope for the study. The work has to be presented in front of the examiners panel consisting of an approved external examiner, an internal examiner and a guide, co-guide etc. as decided by the Head and PG coordinator. The candidate has to be in regular contact with his guide.</p>

### PROGRAMME ELECTIVES – I

<p><b>1AE412, Planning and Design of Aquacultural Farms</b></p>
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<b>Teaching Scheme</b> Lecture: 3 hours/week
<b>Courses Outcomes</b> At the end of this course, students will be able to <ul style="list-style-type: none"> <li>• Enhance the knowledge for selection of Aqua-farm.</li> <li>• Strengthen the knowledge to identify problem related to farm constructions.</li> <li>• Design the peripheral and secondary dikes</li> </ul>
<b>Syllabus Contents</b> <p><b>Unit 1:</b> Site selection of aquaculture farm, General study of chain survey, plain table survey, contouring and leveling. General principles of Theodolite survey Calculation of area of land by trapezoidal and Simpsons rule. Importance of engineering survey for Aquaculture farm</p> <p><b>Unit 2</b> <b>Unit 3:</b> Types of soil, different properties of soil, soil sampling methods, structure and textural classification, grain size distribution, bearing strength, prevention of erosion. Methods of soil compaction and seepage reduction</p> <p><b>Unit 4:</b> Design and construction of aquafarms – type of ponds, shape, size and their orientation from meteorological point. Design of various components of aquafarms – peripheral dykes, secondary dykes, feeder canals, drainage canals.</p> <p><b>Unit 5:</b> water intake and outlet systems – seawater intake systems, sluice gate, monks and spillways. Calculation of earthwork for constructing ponds and requirement of water during water exchange.</p>
<b>References</b> <ol style="list-style-type: none"> <li>1. Thomas B Lawson. Fundamentals of Aquaculture Engineering</li> <li>2. Wheaton, F.W. Aquaculture Engineering 1942 Wiler Interscience publication</li> <li>3. Santhosh Kumar Garg. Water supply Engineering</li> <li>4. Odd-Ivar Lekang . Aquaculture Engineering</li> <li>5. Pillay, TVR and Kutty. M N. Aquaculture: Principles and Practices</li> <li>6. Michael B.T and Thomas L. Aquaculture water reuse systems</li> </ol>

<b>1AE413, Computer Programming and Application in Engineering</b>
<b>Teaching Scheme</b> Lectures: 3 hours/week
<b>Course Outcomes</b> <ul style="list-style-type: none"> <li>• Acquaint with comprehensive concept of differentiation and standard integration.</li> </ul>

- Understanding simulation programming in MATLAB for Aquaculture related issues.,

### Syllabus Contents

**Unit 1:** C-programming, arrays, pointers and structures.

**Unit 2:** MATLAB programming, 2-D and 3-D plotting, Simulation programming in MATLAB.

**Unit 3:** Computational algorithms and computer arithmetic. Iterative methods and solution to polynomial and simultaneous non-linear equations. Solution to simultaneous algebraic equations.

**Unit 4:** Interpolation, Least square approximation of functions, Taylor series representation, Chebyshev series.

**Unit 5:** Differentiation and integration, Simpson's rule, numerical solution for differential equations.

### References

1. King, K.N. 1996. C Programming: A Modern Approach, 1<sup>st</sup> Edition. W.W. Norton & Co. Inc., New York.
2. Chapman, S.J. 2007. MATLAB Programming for Engineers. Thomson Learning, London.
3. Steffensen, J.F. 2006. Interpolation: Second Edition (Dover Books on Mathematics), Dover Publications, New York.
4. Mircea, V. 2012. Computer Arithmetic: Algorithms and Hardware Implementations. Springer-Verlag Berlin Heidelberg, New Jersey.
5. Atkinson, K., Han, W. and Stewart, D. 2009. Numerical Solution of Ordinary Differential Equations. John Wiley & Sons, Inc., New Jersey.

## 1AE414, Fishery Biology and Fish Culture Techniques

### Teaching Scheme

Lecture: 3 hours/week

### Courses Outcomes

At the end of this course, students will be able to

- Understand the anatomy of Aquatic animal.
- Establish the hypothesis of Ecology and Aquatic Ecosystems
- Develop the novel Culture Techniques in Freshwater.

### Syllabus Contents

**Unit 1:** Principles of Taxonomy, Classification and Nomenclature; Species Concept, External Morphology of Culturable Fin-Fishes, Shell- fishes and Other Commercially Important Aquatic Organisms,

**Unit 2:** Anatomical Features and Physiological Systems of Fish and Prawn.

**Unit 3:** Ecology and Aquatic Ecosystems - Freshwater and Marine. Techniques of Artificial Propagation of Different Organisms of Fisheries Importance.

**Unit 4:** Different Culture Techniques in Freshwater, Brackishwater and Seawater- Composite Fish Culture, Prawn Culture, Mariculture, Cage and Pen Culture, Intensive Fish Culture, etc.

**Unit 5:** Recycling of Waste Through Aquaculture and Integrated Aquaculture.

#### References

1. Srivastava C.B.L. A Text book of Fishery Science and Indian Fisheries. Kitab Mahal.
2. Timmons. B. Michal, Recirculating Aquacultural System. Ithaca Publishing Company.
3. Lawson, Thomas B., Fundamental of Aquacultural Engineering, Springer.
4. Robert R. Stickney, Aquaculture :An Introductory Text, CABI Publishing

### PROGRAMME ELECTIVES – II

1AE415, Water Quality Management Practices
<b>Teaching Scheme</b> Lecture: 3 hours/week
<b>Courses Outcomes</b> At the end of this course, students will be able to Understand the importance of water quality parameter for aquatic life. Buildup knowledge for pond dynamics Design the water quality management system.
<b>Syllabus Contents</b> <b>Unit 1:</b> Water quality: Water quality criteria for industrial, drinking, irrigation and aquatic life. Concept of water reuse and recirculation.

**Unit 2:** Important water quality parameter: pH. Dissolved oxygen, carbon dioxide, Biological Oxygen demand, Chemical oxygen demand and nitrogenous compound

**Unit 3:** Pond dynamics. Water Treatment Methods: Aeration, nitrogen removal, carbonate system and pH control, solids removal, disinfection and ion exchange

**Unit 4:** Design and Operation of Water Quality Management System and Equipment: Aerator, mechanical and biological filters, settling basin, water exchange and water reuse system.

**Unit 5:** Mixing and water circulation in ponds, tanks and raceways. Effects of interacting factors on water quality management

### References

1. Timmons. B. Michal, Recirculating Aquacultural System. Ithaca Publishing Company.
2. Lawson, Thomas B., Fundamental of Aquacultural Engineering, Springer.
3. Robert R. Stickney, Aquaculture :An Introductory Text, CABI Publishing

## 1AE416, Environmental Engineering Fundamentals

### Teaching Scheme

Lecture: 3 hours/week

### Courses Outcomes

At the end of this course, students will be able to

- Perceive the different issues, domains and management of environmental engineering
- Have meticulous knowledge for the environmental quality (water and air pollution) and control.

### Syllabus Contents

**Unit I:** Introduction to environmental engineering, Domains of environmental engineering, History of environmental engineering, Environmental issues of emerging concern, laws and regulations, Environmental engineering management, Development of environmental regulations, environmental legislation in India, environmental ethics.

**Unit II:** Ecology and the environment, Ecosystems, Nutrient cycles, Biodiversity, Ecology and the environment, Limnology, Water budget, Population growth.

**Unit III:** Overview of chemistry, Mass relationships, Units of measurement, Equilibrium,

Acidbase

reactions, Solubility reactions, Redox reactions, Chemical reaction rates; Mass balance.

**Unit IV:** Overview of microbiology, Microbes in the environment, Microbes in engineering systems, Microbial energetic, Microbial growth kinetics, Microbial genetics; Microbial diseases.

**Unit V:** Environmental quality, Water pollution (Organic pollutants, Inorganic pollutants, Physical pollutants), Water pollution (Oxygen sag curve), Air pollution (Greenhouse gases; Hazardous gases), Pollution control (Wastewater treatment), Pollution control (Water treatment; Desalination & Membranes; Land-based treatment)

### References

1. Davis M.L., Cornwell D.A., "Introduction to Environmental Engineering", Tata McGrawHill Education (P) Ltd., New Delhi
2. De A.K., "Environmental Chemistry ", New Age International (P) Ltd., New Delhi.
3. Khopkar S.M., "Environmental Pollution Analysis", New Age International (P) Ltd., New Delhi.
4. Cunningham W.P., Cunningham M.A., "Principles of Environmental Science", Tata McGraw Hill
5. Krishnamoorthy B., "Environmental Management, Text Book and Cases", PHI Learning(P) Ltd.
6. Chandrappa R., Das D.B., "Solid Waste Management: Principals and Practice"
7. Droste R.L., "Theory and Practice of Water and Wastewater Treatment", Wiley India (P)Ltd.
8. Dara S.S., "A Textbook of Environmental Chemistry and Pollution Control", S. Chandand Company Ltd., New Delhi.

### 1AE417, Land Husbandry and Watershed Management

#### Teaching Scheme

Lecture: 3 hours/week

#### Courses Outcomes

At the end of this course, students will be able to

- Familiarize with the concept and issues of land husbandry and watershed management.
- Acquainted with the different watershed development plans and their objectives.
- Classify the land based on land capability classification and land use in different climatic regions.
- Strengthen the knowledge to identify the problem of soil erosion and conservation in watershed management.
- Identify the causes and effect of soil erosion and application of soil conservation techniques.
- Analyze and interpret soil fertility and role of different fertilizers and their management for sustainable farming system

### Syllabus Contents

**Unit I:** The concept of watershed, objectives, characteristics, delineation and coding of watershed, importance of land husbandry in watershed management.

**Unit II:** Watershed development plan, programmes in retrospect, NWDPRA, the hariayali programme, common guide lines.

**Unit III:** The problem of soil erosion and conservation, agronomic measures in watershed management, Land preparation and planting methods for conservation

**Unit IV:** Land capability classification and land use in the humid tropics, more crops per drop: importance of water management

**Unit V:** Maintenance of soil fertility, Organic Recycling: Role of manures, composts and bio fertilizers, fertilizers and their management, diversity farming system for sustainable

### References

1. Suresh, R. Soil and Water Conservation Engineering. Standard Publishers, and Distributors, New Delhi
2. Schwab, G. O., Fangeir, D. D., Edminister, W. T., and Frevert, R.K. Soil and Water Conservation Engineering, John Wiley and Sons.
3. Murty, V.V.N. and Jha, M. K. Land and Water Management Engineering. Kalyani Publisher, Ludhiana, India
4. Tideman, E.M. Watershed Management (Guidelines for Indian Conditions) Omega Scientific Publishers, New Delhi.
5. Sing, Rajvir. Watershed Planning and Management. Yash Publishing House, Bikaner.
6. Dhruvanarayan, V.V. Sastry, G., Patnaik, V. S. Watershed Management. Publ. And Inf. Div. ICAR, New Delhi

### PROGRAMME ELECTIVES – III

<b>2AE418, Design of Aquaculture Equipment</b>
<b>Teaching Scheme</b> Lecture: 3 hours/week
<b>Courses Outcomes</b> At the end of this course, students will be able to <ul style="list-style-type: none"> <li>• Familiarize with the concept and issues of aquaculture equipments.</li> <li>• Strengthen the knowledge to select the suitable pumping unit, Blower and air compressors</li> </ul>
<b>Syllabus Contents</b> <b>Unit I:</b> Pumps: Centrifugal, Turbine, Propellor, Air-Lift, Selection and Application in Aquacultural Farms, <b>Unit 2:</b> Blowers and Air-Compressors: Types, Uses and Applications. Reciprocating air compressors, centrifugal compressors, Rotary screw compressors. <b>Unit 3:</b> Earth Moving Equipments: Types and Uses in Farm Construction. Performance of earth moving equipments. <b>Unit 4:</b> Weed Control Equipments: Type and Uses and Applications, Performance of Weeding Tools <b>Unit 5:</b> Feed Mill Equipment: Pellet Mill, Screw Extruder, Hammer Mill and Mixers, Screening and Conveying Equipment, Dryers, Fish Feeders
<b>References</b> <ol style="list-style-type: none"> <li>1. Lawson, Thomas B., Fundamental of Aquacultural Engineering, Springer.</li> <li>2. J.F. Muir and R.J. Roberts, In Recent advances in aquaculture, Croom Helm.</li> <li>3. Gupta O. P., Weed Management Principles and Practices</li> </ol>

<b>2AE419, Recirculatory Aquaculture System</b>
<b>Teaching Scheme</b> Lecture: 3 hours/week

### Courses Outcomes

At the end of this course, students will be able to

- Familiarize with the concept and issues of Recirculatory Aquaculture system (RAS).
- Acquainted with the different component of RAS.
- Strengthen the knowledge to identify the problem of RAS
- Develop the small scale Recirculatory Aquaculture system

### Syllabus Contents

**Unit I:** Concept of Recirculatory Aquaculture system, need and components of Recirculatory Aquaculture system, Advantage and disadvantage of recirculatory aquaculture system.

**Unit 2:** Type of culture unit, requirement of culture unit, constructions of pond and tank, calculations of water holding capacity of pond and Tank. Limitations of embankment type culture unit.

**Unit 3:** Type of Solid removal unit, mechanical filtration, uses of rapid sand filter, uses and limitation of pressure filter and cartridge filter, efficiency of rapid sand filter, pressure and cartridge filter.

**Unit 4:** Type of Nitrogen removal unit, Biofiltration, trickling filters, types and selection of filter media for the trickling filter, calculation of TAN, Efficiency of trickling filters.

**Unit 5:** Type of Disinfection unit, selection of type of disinfection unit for RAS, Advantage of UV-unit, Economics of RAS

### References

1. Davison, A., Recirculating Aquaculture Systems: A Guide to Farm Design and Operations Aquaculture Technology.
2. Richard, S. W., Flowing Water and Static Water Fish Culture. 1st Edition, Kindle Edition. CRC Press.
3. Losordo, T. M., Aquaculture Water Reuse Systems: Engineering Design and Management. Elsevier Science.
4. Lawson, Thomas B., Fundamental of Aquacultural Engineering, Springer.



<b>2AE420, Water and Waste water Treatment Engineering</b>
<b>Teaching Scheme</b> Lecture: 3 hours/week
<b>Courses Outcomes</b> At the end of this course, students will be able to <ul style="list-style-type: none"> <li>• Aware of the importance and the scope of waste water treatment and management.</li> <li>• Outline the concept and methods of waste water treatment processes.</li> <li>• Acquaint and equip with techniques of water and wastewater treatment and management</li> </ul>
<b>Syllabus Contents</b> <b>Unit I:</b> Total Water Management - Hydrologic Cycle, Supply and Demand, Regulations, Watershed Management, Ground and Surface Water, Hydrology, Overview of Water Treatment –Supply Water Characteristics, Water Quality, Drinking Water Standards, Water Chemistry, Chemical Reaction and Kinetics, Water Conveyance and Distribution, Hydraulics <b>Unit II:</b> Conventional Water Treatment Processes - Aeration, Sedimentation, Rapid Mixing, Flocculation, Coagulation, Filtration, Disinfection, Fluoridation, Water Softening, Turbidity Removal, Taste and Odor Control, Advanced Water Treatment Processes - Ion Exchange, Ozonation, Adsorption, Ultra Filtration, Membrane Processes, UV Disinfection <b>Unit III:</b> Overview of Wastewater Management - Wastewater Characteristics, Flows and Pollutant Loads, Biochemistry and Microbiology, Sanitary and Stormwater Collection Systems, Effluent Quality Standards, Receiving Stream Quality, Design Standards, Economic Analysis <b>Unit IV:</b> Wastewater Preliminary and Primary Treatment Processes - Screening, Grit Removal, Sedimentation, Secondary Wastewater Treatment Processes - Activated Sludge, Trickling Filters, Rotating Biological Contactors, Stabilization Ponds, Lagoons, Aeration, Clarification, Filtration, Chlorination-Dechlorination <b>Unit V:</b> Advanced Wastewater Treatment Processes - Chemical Coagulation, Carbon Adsorption, Phosphorus Removal, Nitrogen Removal (Nitrification/Denitrification), Media Filtration, UV Disinfection, Solids Handling Processes - Gravity Thickening, Flotation Thickening, Dewatering, Pressure Filtration, Stabilization, Aerobic and Anaerobic Digestion, Composting, Drying, Incineration, Land filling, Land Application

**References**

1. Water, waste water and storm water infrastructure management by Neil S Grigg
2. Water, sanitary and waste services for buildings by a F E Wise and J A Swaffield
3. Handbook of water treatment by Kurita water industries limited, Japan
4. Standard handbook of environmental engineering by Robert A Corbitt
5. Sanitation and water supply handbook by Tony Gage
6. Handbook of water and wastewater treatment technologies by Nicholas P. Cheremisinoff

**PROGRAMME ELECTIVES – IV****2AE421, Unit Operations in Aquaculture Products Processing****Teaching Scheme**

Lecture: 3 hours/week

**Courses Outcomes**

At the end of this course, students will be able to

- Familiarize with the concept and issues of Unit Operations in Aquaculture Products Processing.
- Strengthen the knowledge to Pre-treatment of fish.
- Analyze and interpret Rigor mortis and methods of controlling spoilage.

**Syllabus Contents**

**Unit I:** Pre-treatment of fish washing, gutting, filleting, beheading, peeling, deveining etc. Simple mechanical refrigeration systems. Ice plants, chilling, supper chilling, refrigerated and chilled seawater.

**Unit 2:**Freezing, slow freezing, quick freezing, types of freezers, freezing time, freezing of fish and shell fish. Anti-oxidant treatment-Glazing of fish-Types of glazing- Packaging and packaging materials for frozen fish and shrimps. Storage life, transportation and marketing.

**Unit 3:**Sanitary and phytosanitary requirements for maintenance of quality during post harvest handling of fish. processing unit construction and management; Water budgeting; Waste management. Sanitation in processing plants and Quality control of fresh and processed fish and fishery products

**Unit 4:** Post mortem changes occurring in fish muscle. Chemical, microbial and enzymatic action during fish spoilage Stages of fish spoilage- Rigor mortis, Autolysis, microbial changes,

Belly burst, Rancidity. Causative agents for fish spoilage. Role of bacteria in fish spoilage, Effect of temperature, pH, Oxygen, Salinity etc. on bacterial growth, methods of controlling spoilage

**Unit 5:** Principles and methods involved in the separation and analysis of fish muscle constituents: thin layer, paper & column chromatography, spectrophotometry, colorimetry, flame photometry, atomic absorption spectrophotometry, gel electrophoresis.

### References

1. Balachandran, K. K., Post-harvest Technology of fish and fish products.
2. Cleland C Andrew, Food Refrigeration Processes,
3. Clucas, I.J., Fish Handling, Preservation and Processing in the Tropics:
4. Fennema, K. et al. Low Temperature Preservation of Foods and Living Matter
5. Fennema, O. R. Principle of Food Science.
6. Gopakumar K. Text Book of Fish Processing Technology.
7. Hall G. M. Fish Processing Technology
8. Regenssein, J.M. & Regenssein, C.E. Introduction to fish technology.
9. Sen D.P. Advances in Fish Processing Technology. 10. Rudolf, K. Freezing and irradiation of fish.

## 2AE422, Advanced Water and Wastewater Treatment

### Teaching Scheme

Lecture: 3 hours/week

### Courses Outcomes

At the end of this course, students will be able to

- Identify the importance and the scope of Advance waste water treatment and management.
- Outline the concept and methods of Advance waste water treatment processes.
- Acquaint and equip with Advance techniques of water and wastewater treatment and management

### Syllabus Contents

**Unit I:** Conventional water and waste water treatment methods, their capabilities and limitations,

Need for advanced treatment of water and waste water.

**Unit 2:**Advanced water treatment- Iron and manganese removal, colour and odour removal, activated carbon treatment, carbonate balance for corrosion control, ion exchange, electro-dialysis, reverse osmosis and modern methods and fluoride management.

**Unit 3:**Advanced waste water treatment- Nutrient control in effluents, Nitrogen and phosphorus removal methods including biological methods, Methods for the removal of heavy metals, oil and refractory organics, Micro-screening, ultra-filtration, centrifugation and other advanced physical methods- aerobic digestion, anaerobic filtration.

**Unit 4:** Rotating biological contractor, novel methods of aeration etc., Combined physico-chemical and biological processes, Activated carbon treatment, chlorination of waste water, Pure oxygen systems, Filtration for high quality effluents.

**Unit 5:**Multistage treatment systems, Land and water treatment and other resources recovery systems

#### References

1. Water, waste water and storm water infrastructure management by Neil S Grigg
2. Water, sanitary and waste services for buildings by a F E Wise and J A Swaffield
3. Handbook of water treatment by Kurita water industries limited, Japan
4. Standard handbook of environmental engineering by Robert A Corbitt
5. Sanitation and water supply handbook by Tony Gage
6. Handbook of water and wastewater treatment technologies by Nicholas P. Cheremisinoff

### 2AE423, Advanced Aquaculture Technology

#### Teaching Scheme

Lecture: 3 hours/week

#### Courses Outcomes

At the end of this course, students will be able to

- Understand the requirement of hatchery
- Necessity of Aquaculture with Agriculture and Livestock
- Understand the Environmental Considerations in Aquaculture

#### Syllabus Contents

**Unit I:** Maturation, Spawning, Hatchery and Grow-out Techniques for Crustaceans, Culture of

Molluscs, Sea Weeds etc.

**Unit 2:** Carp hatchery and Seed Transport, Advanced Aquaculture-Farming Systems, Propagation and Stock Improvement,

**Unit 3:** Nutrition and Growth, Health and Diseases, Aquaculture with Agriculture and Livestock Farming

**Unit 4:** Hydroponics in Aquaculture, Use of Geothermal Water, Recirculating Aquaculture Systems, Offshore Farming, Artificial Reefs, Sea Ranching.

**Unit 5:** Environmental Considerations in Aquaculture, Impacts from Aquaculture Operations Effects on natural resources, Effects of Aquaculture on National Interests.

### References

1. Y. Sreekrishna, Latha Shenoy, Fishing Gear and Craft Technology, Directorate of Information and Publications of Agriculture, Indian Council of Agricultural Research.
2. Balachandran, K. K., Post-harvest Technology of fish and fish products.
3. Richard, S. W., Flowing Water and Static Water Fish Culture. 1st Edition, Kindle Edition. CRC Press.
4. Losordo, T. M., Aquaculture Water Reuse Systems: Engineering Design and Management. Elsevier Science.
5. Lawson, Thomas B., Fundamental of Aquacultural Engineering, Springer.
6. Cleland C Andrew, Food Refrigeration Processes,

## PROGRAMME ELECTIVES – V

3AE424, Principles Fishing Technology
<b>Teaching Scheme</b> Lecture: 3 hours/week
<b>Courses Outcomes</b> At the end of this course, students will be able to <ul style="list-style-type: none"> <li>• Familiarize with the concept and issues of land Fishing Gear and Fishing Vessels, Netting Materials.</li> <li>• Acquainted with the concept of buoyancy and water plane area and volume.</li> </ul>

- Strengthen the knowledge Economics of Trawler Operation .

### Syllabus Contents

**Unit I:** Classification of Fishing Methods, Fishing Gear and Fishing Vessels, Netting Materials, Numbering System.

**Unit 2:** Concept of Buoyancy, Geometry of Ship Hull. Netting Geometry, Fishing Efficiency, Fishing Gear Selectivity. Tailoring of Nets. Ships Transverse Section Area.

**Unit 3:** Water Plane Area and Volume of Displacement. Analysis of Shape of Flexible Systems. Hydrodynamic Force on Fishing Gear and Resistance of Fishing Vessels

**Unit 4:** Model Similarity Laws. Concept of Stability of Ship. Material of Construction of Fishing Vessels

**Unit 5:** Theory of Trawl Motion and Trawl Design. Economics of Trawler Operation. Visit to Fishing Harbour

### References

1. Y. Sreekrishna, Latha Shenoy, Fishing Gear and Craft Technology, Directorate of Information and Publications of Agriculture, Indian Council of Agricultural Research.
2. Regenssein, J.M. & Regenssein, C.E. Introduction to fish technology.
3. Lawson, Thomas B., Fundamental of Aquacultural Engineering, Springer

## 3AE425, Modeling of Aquaculture & Fisheries Systems

### Teaching Scheme

Lecture: 3 hours/week

### Courses Outcomes

At the end of this course, students will be able to

- Understand the concept and issues of fisheries.
- Strengthen the knowledge to identify the problem of aquaculture and modelling.
- Identify model parameter related to aquaculture to solve the problem.

### Syllabus Contents

**Unit 1:** Modelling –Modelling terminology - systems and models – constraints to modelling aquaculture systems.

**Unit 2:** Modelling aquaculture systems – need – tools for theoretical analysis study of interactions, use of mathematics and computers.

**Unit 3:** Empirical modelling – collection and organizing data and calculations, Theoretical models – developing a frame of reference, defining model objectives, determination of model components – relationship between model components –

**Unit 4:** Estimation of model parameters and calibration of model – testing and validating of model – simulation and forecasting.

**Unit 5:** Application of modelling in Aquaculture – fish growth model – pond ecosystem model – dissolved oxygen model, ammonia model, water temperature model, salinity model, recirculating aquaculture model.

#### References

1. Fikret Berkes, Robin Mahon, Patrick mcconney, Richard Pollnac, and Robert Pomeroy. Managing Small-scale Fisheries. International development research centre. New Delhi.
2. Bernard A. Megrey l Erlend Moksness Editors. Computers in Fisheries Research. Second Edition. Springer.
3. Robert R. Stickney. Aquaculture: An introductory text. CABI Publishers.

### 3AE426, Manpower Economics

#### Teaching Scheme

Lecture: 3 hours/week

#### Courses Outcomes

At the end of this course, students will be able to

- Acquainted with the different problem related to Employment.
- Strengthen the knowledge to manage the labour union
- Understand the economics behind human capital.

#### Syllabus Contents

**Unit 1:** Nature and scope; Human capital formation; Employment and manpower utilization: supply of and demand for labour, pricing of labour under various market forms,

**Unit 2:** labour unions and collective bargaining, compensating wage differentials, labour market

discrimination;

**Unit 3:** Concepts and patterns of unemployment and underemployment; Emergence of education as a work prerequisite; Returns to investment in education.

**Unit 4:** Economics of training and motivation; Manpower planning: quantitative and qualitative techniques Forecasting and auditing of manpower.

**Unit 5:** Manpower planning and total quality management; Comparative manpower planning and development policies of selected countries

### **References**

1. E.B. Jakubauskas, N.E. Palomba, Manpower Economics Hardcover, Addison-Wesley Educational Publishers Inc.
2. M.A. Sudhir, Skill Development for Socio-economic Progress, New Century Publications;
3. G. Rowe, Manpower Economic Utilization Indexes by Counties, 1970, Forgotten Books publications



**DEPARTMENT OF AGRICULTURAL ENGINEERING  
ASSAM UNIVERSITY: SILCHAR**

**M. Tech. (Agricultural Engineering)  
Specialization: Farm Machinery and Power Engineering  
Course Structure**

<b>Semester I</b>						
<b>Sl. No</b>	<b>Course Code</b>	<b>Course Name</b>	<b>Teaching Scheme</b>			<b>Credits</b>
			<b>L</b>	<b>T</b>	<b>P</b>	
1.	MAE3 101	Design and Testing of Farm Power Systems	3	0	0	3
2.	MAE3 102	Soil Dynamics in Tillage and Traction	3	0	0	3
3.	MAE3 Axx	Programme Elective – I	3	0	0	3
4.	MAE3 Bxx	Programme Elective - II	3	0	0	3
5.	MASH 101	Research Methodology & IPR	2	0	0	2
6.	MASH 1xx	Audit Course - 1	2	0	0	0
7.	MAE3 103	Farm Power Design and Testing Lab.	0	0	4	2
8.	MAE3 104	Soil Dynamics Lab.	0	0	4	2
<b>Total</b>			<b>16</b>	<b>0</b>	<b>8</b>	<b>18</b>

<b>Semester II</b>						
<b>Sl. No</b>	<b>Course Code</b>	<b>Course Name</b>	<b>Teaching Scheme</b>			<b>Credits</b>
			<b>L</b>	<b>T</b>	<b>P</b>	
1.	MAE3 201	Design and Testing of Farm Machinery Systems	3	0	0	3
2.	MAE3 202	Recent Advances in Farm Machinery and Power Engineering	3	0	0	3
3.	MAE3 Cxx	Programme Elective - III	3	0	0	3
4.	MAE3 Dxx	Programme Elective – IV	3	0	0	3
5.	MASH 2xx	Audit Course - 2	2	0	0	0
6.	MAE3 203	Farm Machinery Design and Testing Lab.	0	0	4	2
7.	MAE3 204	Advanced Farm Machinery and Power Lab.	0	0	4	2
8.	MAE3 205	Mini Project	0	0	4	2
<b>Total</b>			<b>14</b>	<b>0</b>	<b>12</b>	<b>18</b>

<b>Semester III</b>						
<b>Sl. No</b>	<b>Course Code</b>	<b>Course Name</b>	<b>Teaching Scheme</b>			<b>Credits</b>
			<b>L</b>	<b>T</b>	<b>P</b>	
1.	MAE3 Exx	Programme Elective – V	3	0	0	3
2.	MASH Axx	Open Elective	3	0	0	3
3.	MAE3 301	Dissertation Phase - I	0	0	20	10
<b>Total</b>			<b>6</b>	<b>0</b>	<b>20</b>	<b>16</b>

<b>Semester IV</b>						
<b>Sl. No</b>	<b>Course Code</b>	<b>Course Name</b>	<b>Teaching Scheme</b>			<b>Credits</b>
			<b>L</b>	<b>T</b>	<b>P</b>	
1.	MAE3 401	Dissertation Phase - II	0	0	32	16
<b>Total</b>			<b>0</b>	<b>0</b>	<b>32</b>	<b>16</b>

**Programme Elective – I**

- MAE3 A01 System Simulation and Computer Aided Problem Solving in Engineering
- MAE3 A02 Computer Programming and Application in Engineering
- MAE3 A03 Computerized Design of Agricultural Machines

**Programme Elective – II**

- MAE3 B01 Instrumentation and Research Techniques
- MAE3 B02 Machinery System for Precision Agriculture
- MAE3 B03 Experimental and Whole Field Stress Analysis

**Programme Elective – III**

- MAE3 C01 Renewable Sources of Energy and Utilization
- MAE3 C02 Energy Conservation and Management
- MAE3 C03 Design of Solar and Wind Systems

**Programme Elective – IV**

- MAE3 D01 Hydraulic System and Control
- MAE3 D02 Fluid Power System and Automation
- MAE3 D03 Land Reclamation Machinery

**Programme Elective – V**

- MAE3 E01 Human Factors Engineering in the Design of Tractor and Farm Machinery
- MAE3 E02 Finite and Boundary Element Methods in Engineering
- MAE3 E03 Principles of Mechanization and Management

**Audit Course 1&2**

- MASH 102 English for Research Paper Writing
- MASH 103 Disaster Management
- MASH 104 Sanskrit for Technical Knowledge
- MASH 105 Value Education
- MASH 201 Constitution of India
- MASH 202 Pedagogy Studies
- MASH 203 Stress Management by Yoga
- MASH 204 Personality Development through Life Enlightenment Skills.

**Open Elective Courses**

- MASH A01 Business Analytics
- MASH A02 Industrial Safety
- MASH A03 Operations Research
- MASH A04 Cost Management of Engineering Projects
- MASH A05 Composite Materials
- MASH A06 Waste to Energy

## CORE COURSES

### MAE3 101, Design and Testing of Farm Power Systems

#### Teaching Scheme

Lectures: 3 hours/week

#### Course Outcomes

At the end of this course, students will be able to

- Understand the recent trends, design and construction of farm power systems
- Apply the design principles for the design and development engine and tractor systems.
- Demonstrate the procedure for testing of farm power systems.

#### Syllabus Contents

**Unit 1:** Technical specifications of tractors available in India, modern trends in tractor design and development, special design features of tractors in relation to Indian agriculture. Engineering thermodynamics, power cycles, fuels, various systems of I.C engines, operations, adjustments and trouble shooting of different systems, calculations of power, torque, speed, firing arrangement and intervals, heat loss and power transmission from piston to the flywheel.

**Unit 2:** Parameters affecting design of tractor engine and their selection. Design of fuel efficient engine components and transmission, differential, final drives, power outlets such as PTO and drawbar.

**Unit 3:** Engine performance, design of clutch, gear box and power transmission system to wheels.

**Unit 4:** Recent trends in tractor design, emissions and control of pollutants, Design of mechanical steering and brake system of tractor, hydraulic brake system, Steering geometry and stability during turning.

**Unit 5:** Measurement of tractor engine power, torque, fuel consumption, draft and drawbar power, Engine and tractor performance testing, evaluation and interpretation of results.

#### References

1. Liljedahl, J.B., Turnquist, P.K., Smith, D.W. and Hoki, M. 2004. Tractors and their Power Units, 4<sup>th</sup> Edition. CBS Publishers & Distributors, New Delhi.
2. Mathur, M.L. and Sharma, R.P. 2014. Internal Combustion Engines. Dhanpat Rai Publications (P) Lrd., New Delhi.
3. Goering, C.E. and Hansen, A.C. 2013. Engine and Tractor Power. ASABE, USA.
4. Sharma, D.N. and Mukesh, S. 2018. Design of Agricultural Tractor (Principles and Problems), 3<sup>rd</sup> Edition. Jain Brothers, New Delhi.

### MAE3 102, Soil Dynamics in Tillage and Traction

#### Teaching Scheme

Lectures: 3 hours/week

#### Course Outcomes

At the end of this course, students will be able to

- Understand the measurement of dynamic properties of soil and evaluate the performance tillage tools and traction devices.
- Apply the dynamic properties of soil to the design of tillage tools and selection of traction devices.

- Understand the relationship between soil-tillage tool and soil-traction device interactions along with operating parameters.

### **Syllabus Contents**

**Unit 1:** Dynamic properties of soil and their measurement, stress-strain relationships, theory of soil failure.

**Unit 2:** Mechanics of tillage tools and geometry of soil tool system, design parameters and performance of tillage tools. Dimensional soil tool system, design parameters and performance of tillage tools.

**Unit 3:** Dimensional analysis of different variables related to soil-tyre system; soil vehicle models; mechanics of steering of farm tractor; special problems of wet land traction and floatation.

**Unit 4:** Introduction of traction devices, tyres-types, function and size, their selection; mechanics of traction devices. Deflection between traction devices and soil, slippage and sinkage of wheels, evaluation and prediction of traction performance, design of traction and transport devices. Soil compaction by agricultural vehicles and machines.

**Unit 5:** Recent advances in soil dynamics in tillage and traction, impact of recent research on vehicle design.

### **References**

1. Gill, W.R. and Vandenberg, G.E. 1968. Soil Dynamics in Tillage and Traction. Agricultural Research Service, US Dept. of Agriculture, Washington, D.C., USA.
2. Upadhyaya, S.K. 2013. Advances in Soil Dynamics. ASABE, St. Joseph, USA.
3. Wong, J.Y. 2010. Terramechanics and Off-road Vehicle Engineering. Elsevier, New York.
4. Srivastava, A.K., Goering, C.E., Rohrbach, R.P. and Buckmaster, D.R. 2013. Engineering Principles of Agricultural Machines, 2<sup>nd</sup> Edition. ASABE, St. Joseph, USA.

## **MAE3 103, Farm Power Design and Testing Lab.**

### **Teaching Scheme**

Lectures: 4 hours/week

### **Course Outcomes**

At the end of this course, students will be able to

- Design various engine components and tractor systems
- Demonstrate the testing of engine and tractor according to the standards.
- Evaluate the performance of tractor and power tiller under actual field conditions.

### **Syllabus Contents**

The lab practice consists of the tutorials and experiments as decided by the course supervisor of the course, Design and Testing of Farm Power Systems. It includes but not restricted to the following:

Mechanical design of engine components.

Design of clutch system.

Design of gear box for tractor and power tiller.

Design of differential and final drive.

Design considerations of brake and steering system of tractor.

Testing of engines and power units.

Drawbar performance evaluation of tractor and power tillers.

Design of Safety devices for tractors and farm implements.

### **References**

1. Liljedahl, J.B., Turnquist, P.K., Smith, D.W. and Hoki, M. 2004. Tractors and their Power Units, 4<sup>th</sup> Edition. CBS Publishers & Distributors, New Delhi.
2. Goering, C.E. and Hansen, A.C. 2013. Engine and Tractor Power. ASABE, USA.
3. Sharma, D.N. and Mukesh, S. 2018. Design of Agricultural Tractor (Principles and Problems), 3<sup>rd</sup> Edition. Jain Brothers, New Delhi.
4. MacMillan, R.H. 2002. Mechanics of Tractor Implement Performance. University of Melbourne.

### **MAE3 104, Soil Dynamics Lab.**

#### **Teaching Scheme**

Lectures: 4 hours/week

#### **Course Outcomes**

At the end of this course, students will be able to

- Measure the dynamic properties of soil and evaluate the performance tillage tools and traction devices.
- Design of tillage tools and selection of traction devices based in dynamic properties of soil
- Apply the traction prediction equation for the performance of traction devices.

#### **Syllabus Contents**

The lab practice consists of the tutorials and experiments as decided by the course supervisor of the course, Soil Dynamics in Tillage and Traction. It includes but not restricted to the following:

Determination of dynamic properties of soil.

Relationship of soil parameters to the forces acting on tillage tools

Determination of wheel slippage

Design and performance of traction devices

Design and performance of soil working tools.

Deflection and contact characteristics of tyres.

Determination of tractive effort and slip of tractor tyres.

Evaluation and prediction of traction performance.

#### **References**

1. Gill, W.R. and Vandenberg, G.E. 1968. Soil Dynamics in Tillage and Traction. Agricultural Research Service, US Dept. of Agriculture, Washington, D.C., USA.
2. Upadhyaya, S.K. 2013. Advances in Soil Dynamics. ASABE, St. Joseph, USA.
3. Wong, J.Y. 2010. Terramechanics and Off-road Vehicle Engineering. Elsevier, New York.
4. Srivastava, A.K., Goering, C.E., Rohrbach, R.P. and Buckmaster, D.R. 2013. Engineering Principles of Agricultural Machines, 2<sup>nd</sup> Edition. ASABE, St. Joseph, USA.

### **MAE3 201, Design and Testing of Farm Machinery Systems**

#### **Teaching Scheme**

Lectures: 3 hours/week

#### **Course Outcomes**

At the end of this course, students will be able to

- Understand the design principles and dynamics of various farm machinery, and apply them to design and construction of farm machinery.
- Design and develop appropriate machinery for various applications.
- Evaluate the performance of farm machinery under actual field conditions.

#### **Syllabus Contents**

**Unit 1:** Modern trends, principles, procedures, fundamentals and economic considerations for design and development of farm power and machinery systems. Design considerations, procedure and their applications in agricultural tractors and typical machines. Reliability criteria in design and its application, Status of farm mechanization in India, power availability on farms. Hand tools used for different kinds of farm operations and materials for construction.

**Unit 2:** Functional requirement, principle of working, construction features and operations of animal and power operated equipment for land development, tillage, sowing, planting, transplanting, fertilizer application, intercultivation, plant protection, Theory of atomization, specific energy for atomization, electrostatic spraying and dusting, spray distribution patterns.

**Unit 3:** Design and selection of machinery elements viz. gears, pulleys, chain and sprockets, belts, bearings couplings and springs and fasteners. Farm machine system characteristics and evaluation, dynamic balancing and stability of farm machines. Force analysis of agricultural tools and implements, pull, draft and power of farm equipment.

**Unit 4:** Design of soil working tools for sowing and planting. Design of seed drill, planter, fertilizer applicators, intercultivation equipment and plant protection equipment. Design of rotary, vibratory and oscillating machines.

**Unit 5:** Types of tests; test procedure, national and international codes. Test equipment, usage and limitations. Power losses in dynamometers and hydraulic test equipment. Prototype feasibility testing and field evaluation. Laboratory and field testing of selected farm equipment.

#### References

1. Bernacki, H., Haman, J. and Kanafojski, Cz. 1972. Agricultural Machines: Theory and Construction. U.S. Dept. of Commerce, National Technical Information Service, Springfield, Virginia.
2. Kepner, R.A., Bainer, R. and Berger, E.L. 1978. Principles of Farm Machinery. John Wiley and Sons, New York.
3. Srivastava, A.K., Goering, C.E., Rohrbach, R.P. and Buckmaster, D.R. 2013. Engineering Principles of Agricultural Machines, 2<sup>nd</sup> Edition. ASABE, St. Joseph, USA.
4. Singh, T.P. 2017. Farm Machinery. PHI Learning Pvt. Ltd., Delhi.
5. Singh, S. 2007. Farm Machinery Principles and Applications. ICAR, New Delhi.
6. Sharma, D.N. and Mukesh, S. 2008. Farm Machinery Design: Principles and Problems, 3<sup>rd</sup> Edition. Jain Brothers, New Delhi.

### **MAE3 202, Recent Advances in Farm Machinery and Power Engineering**

#### **Teaching Scheme**

Lectures: 3 hours/week

#### **Course Outcomes**

At the end of this course, students will be able to

- Understand the kinematics and dynamics of various farm power and machinery systems.
- Apply the principles of ergonomics in the design of farm power and machinery systems.
- Develop precision agricultural system, and hydraulic system and control for the design of farm machinery.

#### **Syllabus Contents**

**Unit 1:** Kinematics of reapers/harvesting machines. Theory of mechanical separation of grains from ear heads/pods. Parameters affecting performance of threshers aerodynamic properties of straw and grain mixture, Design consideration and constructional features of harvesting, threshing, mowing, chaff cutting and baling machines, Testing of harvesters, threshers,

combines, mowers, chaff cutting and baling machines.

**Unit 2:** Theory of root crop harvesters, power requirement of various components of field machines. Design consideration and constructional features of special equipment for crops such as sugarcane, cotton, groundnut, potato and plantation crops like coconut, areca nut, cashew nut etc. Recent trends in the design and testing of tractor and farm machinery, Emissions and control of pollutants, Mechanical noise and vibrations and their reduction, Farm machinery management.

**Unit 3:** Hydraulic system circuits, design and selection of hydraulic system components, automatic draft and position control system. Hydrostatic transmission, Power steering, Design of pneumatic and hydraulic controls, Working principle and operation of land reclamation machinery.

**Unit 4:** Tractor chassis mechanics, hitching systems, 3-point hitch linkage design, hydraulic control of tractors, Determination of CG and moment of inertia, Dynamic stability and tractive ability of tractor, Tire selection.

**Unit 5:** Ergonomics in tractor system design, noise and vibration effects, Design of operators' seat and suspension, work-place area and controls, Strain gauges and instruments for the measurement of tractor engine power, torque, fuel consumption, draft and drawbar power, Precision agriculture, sensors, GPS, GIS, Variable rate applications.

### References

1. Srivastava, A.K., Goering, C.E., Rohrbach, R.P. and Buckmaster, D.R. 2013. Engineering Principles of Agricultural Machines, 2<sup>nd</sup> Edition. ASABE, St. Joseph, USA.
2. Kepner, R.A., Bainer, R. and Berger, E.L. 1978. Principles of Farm Machinery. John Wiley and Sons, New York.
3. Singh, T.P. 2017. Farm Machinery. PHI Learning Pvt. Ltd., Delhi.
4. Singh, S. 2007. Farm Machinery Principles and Applications. ICAR, New Delhi.
5. MacMillan, R.H. 2002. Mechanics of Tractor Implement Performance. University of Melbourne.
6. Bernacki, H., Haman, J. and Kanafojski, Cz. 1972. Agricultural Machines: Theory and Construction. U.S. Dept. of Commerce, National Technical Information Service, Springfield, Virginia.
7. Liljedahl, J.B., Turnquist, P.K., Smith, D.W. and Hoki, M. 2004. Tractors and their Power Units, 4<sup>th</sup> Edition. CBS Publishers & Distributors, New Delhi.

### MAE3 203, Farm Machinery Design and Testing Lab.

#### Teaching Scheme

Lectures: 4 hours/week

#### Course Outcomes

At the end of this course, students will be able to

- Demonstrate the design of farm machinery for various farm operations.
- Design, develop and evaluate the performance of the farm machines for various applications.
- Select the appropriate power source and design the machinery matching to the power source.

#### Syllabus Contents

The lab practice consists of the tutorials and experiments as decided by the course supervisor of the course, Design and Testing of Farm Machinery Systems. It includes but not restricted to the following:

Design of mechanisms and prototypes in farm machinery.  
 Calibration of seed drills and planters.  
 Calibration of plant protection equipments.  
 Design of animal and power operated equipment for land development and tillage.  
 Design of animal and power operated equipment for sowing, planting, transplanting, fertilizer application and intercultivation  
 Design of plant protection equipment.  
 Methods of testing and performance evaluation of tillage equipments  
 Methods of testing and performance evaluation of seed drills, planters and fertilizer applicators  
 Design of rotary, vibrating and oscillating machines.  
 Methods of testing and performance evaluation of sprayers and dusters  
 Design and selection of matching power unit.  
 Cost analysis of animal and tractor operated implements and tractors.

### References

1. Bernacki, H., Haman, J. and Kanafojski, Cz. 1972. Agricultural Machines: Theory and Construction. U.S. Dept. of Commerce, National Technical Information Service, Springfield, Virginia.
2. Singh, T.P. 2017. Farm Machinery. PHI Learning Pvt. Ltd., Delhi.
3. Singh, S. 2007. Farm Machinery Principles and Applications. ICAR, New Delhi.
4. Srivastava, A.K., Goering, C.E., Rohrbach, R.P. and Buckmaster, D.R. 2013. Engineering Principles of Agricultural Machines, 2<sup>nd</sup> Edition. ASABE, St. Joseph, USA.

### MAE3 204, Advanced Farm Machinery and Power Lab.

#### Teaching Scheme

Lectures: 4 hours/week

#### Course Outcomes

At the end of this course, students will be able to

- Design and evaluate the performance of harvesting, threshing and special equipment for various farm operations.
- Understand the principles of farm machinery management for different soil, crops and operations.
- Apply the principles of hydraulics, kinematics and dynamics for the design and development of farm machines.

#### Syllabus Contents

The lab practice consists of the tutorials and experiments as decided by the coursesupervisor of the course, Recent advances in Farm Machinery and Power Engineering. It includes but not restricted to the following:

Design of harvesting and threshing equipment.

Design of special equipment for sugarcane, cotton, rice and potato crops.

Methods of testing and performance evaluation of harvesting equipment.

Methods of testing and performance evaluation threshing equipment.

Methods of testing and performance evaluation grain and straw combines.

Methods of testing and performance evaluation of special equipment such as sugarcane, cotton, rice and potato planter.

Calculation of field capacity, efficiency and losses in threshers, harvesters and chaff cutters.

Farm machinery selection and management for different soil, crops and operations.



Design of hydraulic system components.  
 Kinematic and dynamic design of 3-point hitch linkages.  
 Determination of CG and moment of inertia of tractor.  
 Estimation of energy and power requirements.  
 Reliability of farm machinery.

### References

1. Bernacki, H., Haman, J. and Kanafojski, Cz. 1972. Agricultural Machines: Theory and Construction. U.S. Dept. of Commerce, National Technical Information Service, Springfield, Virginia.
2. Singh, T.P. 2017. Farm Machinery. PHI Learning Pvt. Ltd., Delhi.
3. Singh, S. 2007. Farm Machinery Principles and Applications. ICAR, New Delhi.
4. Srivastava, A.K., Goering, C.E., Rohrbach, R.P. and Buckmaster, D.R. 2013. Engineering Principles of Agricultural Machines, 2<sup>nd</sup> Edition. ASABE, St. Joseph, USA.
5. MacMillan, R.H. 2002. Mechanics of Tractor Implement Performance. University of Melbourne.

### MAE3 205, Mini Project

#### Teaching Scheme

Lectures: 4 hours/week

#### Course Outcomes

At the end of this course,

- Students will solve a live problem using software/analytical/computational tools.
- Students will learn to write technical reports.
- Students will develop skills to present and defend their work in front of technically qualified audience.

#### Syllabus Contents

Students can take up small problems in the field of design and development or design refinement of farm machines or computer application in tractor and farm machinery design as mini project. It can be related to solution to an engineering problem, verification and analysis of experimental data available, comparative performance of various farm equipment, conducting experiments on various engineering subjects, studying a software tool for the solution of an engineering problem etc.

### MAE3 301, Dissertation Phase - I

#### Teaching Scheme

Lectures: 20 hours/week

#### Course Outcomes

At the end of this course,

- Students will be exposed to self-learning various topics.
- Students will learn to survey the literature such as books, national/international refereed journals and contact resource persons for the selected topic of research.
- Students will learn to write technical reports.
- Students will develop oral and written communication skills to present and defend their work in front of technically qualified audience.

#### Guidelines

The Project Work will start in semester III and should preferably be a problem with

research potential and should involve scientific research, design, generation/collection and analysis of data, determining solution and must preferably bring out the individual contribution. Seminar should be based on the area in which the candidate has undertaken the dissertation work as per the common instructions for all branches of M. Tech. The examination shall consist of the preparation of report consisting of a detailed problem statement and a literature review. The preliminary results (if available) of the problem may also be discussed in the report. The work has to be presented in front of the examiners panel set by Head and PG coordinator. The candidate has to be in regular contact with his guide and the topic of dissertation must be mutually decided by the guide and student.

### **MAE3 401, Dissertation Phase - II**

#### **Teaching Scheme**

Lectures: 32 hours/week

#### **Course Outcomes**

At the end of this course,

- Students will be able to use different experimental techniques.
- Students will be able to use different software/ computational/analytical tools.
- Students will be able to design and develop an experimental set up/ equipment/test rig.
- Students will be able to conduct tests on existing set ups/equipments and draw logical conclusions from the results after analyzing them.
- Students will be able to either work in a research environment or in an industrial environment.
- Students will be conversant with technical report writing.
- Students will be able to present and convince their topic of study to the engineering community.

#### **Guidelines**

It is a continuation of Project work started in semester III. He has to submit the report in prescribed format and also present a seminar. The dissertation should be presented in standard format as provided by the department. The candidate has to prepare a detailed project report consisting of introduction of the problem, problem statement, literature review, objectives of the work, methodology (experimental set up or numerical details as the case may be) of solution and results and discussion. The report must bring out the conclusions of the work and future scope for the study. The work has to be presented in front of the examiners panel consisting of an approved external examiner, an internal examiner and a guide, co-guide etc. as decided by the Head and PG coordinator. The candidate has to be in regular contact with his guide.

## PROGRAMME ELECTIVES – I

### **MAE3 A01, System Simulation and Computer Aided Problem Solving in Engineering Teaching Scheme**

Lectures: 3 hours/week

#### **Course Outcomes**

At the end of this course,

- Understand the concept of dimensional analysis, mathematical modeling and software development process in solving the engineering problems related to design of farm machinery
- Apply the knowledge of CAD software in solving the engineering problems related to design of farm machinery
- Understand the application of soft computing techniques for the modeling and optimization of design of farm machinery.

#### **Syllabus Contents**

**Unit 1:** Concept, advantages and limitation of dimensional analysis, dimensions and units, fundamental and derived units, systems of units, conversion of units of measurement, conversion of dimensional constants, conversion of equations in different units, complete set of dimensionless products and their formulation methods- the Rayleigh's method, Buckingham's Pi theorem and other methods.

**Unit 2:** Mathematical modeling and engineering problem solving, Introduction to simulation, Simulation of Mechanical systems and visualization, Classification and regression modelling of biological systems using fuzzy logic and artificial neural networks.

**Unit 3:** Computers and softwares – software development process – Algorithm design, – program composition- quality control- documentation and maintenance – software strategy.

**Unit 4:** Approximation- round off errors- truncation errors. Nature of simulation systems models and simulation- discrete event simulation- time advance mechanisms- components of discrete event simulation model. Simulation of singular server queue- programme organization and logic-development of algorithm.

**Unit 5:** Solving differential equation on computers- modeling engineering systems with ordinary differential equations- solution techniques using computers, Optimization in mechanical and biological systems using nature-inspired techniques.

#### **References**

1. Law, A.M. and Kelton, W.D. 1997. Simulation Modeling and Analysis, 3<sup>rd</sup> Edition. Tata McGraw Hill Education, New Delhi.
2. Balagurusamy, E. 2000. Numerical Methods. Tata McGraw Hill Education, New Delhi.
3. Langhaar, H.L. 1980. Dimensional analysis and theory of models. Krieger Pub. Co., New York.
4. Veerarajan, T. and Ramachandran, T. 2004. Numerical Methods with Programmes in C and C++. Tata McGraw Hill, New Delhi
5. Rattan, S.S. 2009. Theory of Machines, 4<sup>th</sup> Edition, McGraw Hill Publishing, New Delhi
6. Pratihari, D.K. 2008. Soft Computing, 2<sup>nd</sup> Edition. Kartar Publication House Pvt. Ltd., New Delhi.
7. Jang, J.S.R., Sun, C.T. and Mizutani, E. 2002. Neuro - Fuzzy and Soft Computing:

Computational Approach to Learning and Machine Intelligence. Prentice Hall India Learning Pvt. Ltd., New Delhi.

8. Rajasekaran, S. and Pai, G.A.V. 2003. Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis and Applications. Prentice Hall India Learning Pvt. Ltd., New Delhi

### **MAE3 A02, Computer Programming and Application in Engineering**

#### **Teaching Scheme**

Lectures: 3 hours/week

#### **Course Outcomes**

At the end of this course, students will be able to

- Write the computer program in C and MATLAB for various applications.
- Understand the iterative techniques and numerical analysis with programming.
- Apply the programming in the design and simulation of farm machinery and power systems.

#### **Syllabus Contents**

**Unit 1:** C-programming, arrays, pointers and structures.

**Unit 2:** MATLAB programming, 2-D and 3-D plotting, Simulation programming in MATLAB.

**Unit 3:** Computational algorithms and computer arithmetic. Iterative methods and solution to polynomial and simultaneous non-linear equations. Solution to simultaneous algebraic equations.

**Unit 4:** Interpolation, Least square approximation of functions, Taylor series representation, Chebyshev series.

**Unit 5:** Differentiation and integration, Simpson's rule, numerical solution for differential equations.

#### **References**

1. King, K.N. 1996. C Programming: A Modern Approach, 1<sup>st</sup> Edition. W.W. Norton & Co. Inc., New York.
2. Chapman, S.J. 2007. MATLAB Programming for Engineers. Thomson Learning, London.
3. Steffensen, J.F. 2006. Interpolation: Second Edition (Dover Books on Mathematics), Dover Publications, New York.
4. Mircea, V. 2012. Computer Arithmetic: Algorithms and Hardware Implementations. Springer-Verlag Berlin Heidelberg, New Jersey.
5. Atkinson, K., Han, W. and Stewart, D. 2009. Numerical Solution of Ordinary Differential Equations. John Wiley & Sons, Inc., New Jersey.

### **MAE3 A03, Computerized Design of Agricultural Machines**

#### **Teaching Scheme**

Lectures: 3 hours/week

#### **Course Outcomes**

At the end of this course, students will be able to

- Develop the solid model and simulate the working of various machine elements.
- Apply the advanced techniques of stress analysis for the mechanical design of machine elements.
- Understand the design of machine elements from mechanical production considerations.

#### **Syllabus Contents**

**Unit 1:** Hardware, graphs and charts, two-dimensional transformations, lines, circles, ellipses and polygons. Storage of graphical data, animation, two-dimensional geometric construction

techniques, user interface techniques.

**Unit 2:** Introduction to three-dimensional graphics, three-dimensional transformations, surfaces, shading. Solid and wire frame modeling of machine components.

**Unit 3:** Graphical techniques in finite element analysis. Interfacing data between CAD and CAM applications, Concurrent engineering.

**Unit 4:** Introduction to manufacturing, part design specifications, computer-aided design. Automation, programmable logic controllers, fundamentals of numerical control, numerical-control programming, group technology, process planning.

**Unit 5:** Integrated computer-aided manufacturing. Planning of manufacturing process.

#### References

1. Alavala, C.R. 2008. CAD/CAM: Concepts and Applications. PHI Learning, New Delhi.
2. Kundra, T.K. 1993. Computer Aided Manufacturing. Tata McGraw-Hill Education, New Delhi.
3. Sarcar, M.M.M., Rao, K.M. and Narayan, K.L. 2008. Computer Aided Design and Manufacturing. PHI Learning Pvt. Ltd., New Delhi.
4. Xu, X. 2009. Integrating Advanced Computer-Aided Design, Manufacturing, and Numerical Control : Principles and Implementation. Information Science Reference.

### PROGRAMME ELECTIVES – II

#### MAE3 B01, Instrumentation and Research Techniques

##### Teaching Scheme

Lectures: 3 hours/week

##### Course Outcomes

At the end of this course, students will be able to

- Understand the working principle of instruments for the measurement of various parameters.
- Develop the instrumentation system for specific applications.
- Design the experiments, analyze the data and report the outcome of experiment

##### Syllabus Contents

**Unit 1:** Generalized configuration, functional description and performance characteristics of measuring instruments. Errors in measurement and their statistical analysis.

**Unit 2:** Measuring devices for moisture content, humidity, temperature, flow, force, torque, power, pressure, stress, strain, displacement, velocity, acceleration, noise and vibration.

**Unit 3:** Data manipulating, compiling and compensating devices. Data transmission and recording.

**Unit 4:** Dimensional analysis, design of experiments – RBD and factorial design. Developing empirical models, correlation and regression, rectification techniques

**Unit 5:** Statistical data analysis using software and interpretation of data, Presentation of data, Report writing.

#### References

1. Rajput, R.K. 2005. Mechanical Measurements and Instrumentation (Including Metrology and Control Systems). S.K. Kataria & Sons, New Delhi.
2. Northrop, R.B. 2005. Introduction to Instruments and Measurement, 2<sup>nd</sup> Edition. CRC Press, Taylor and Francis Group, New York.
3. Peter Bock. 2001. Getting it Right: R & D Methods for Science and Engineering. Academic Press, New Delhi.

4. Kothari, C.R. 2004. Research Methodology: Methods and Techniques. New Age International (P) Ltd., New Delhi.

### **MAE3 B02, Machinery System for Precision Agriculture**

#### **Teaching Scheme**

Lectures: 3 hours/week

#### **Course Outcomes**

At the end of this course, students will be able to

- Understand the concept of precision agriculture and implements for precision agricultural machinery.
- Design the farm implements for precise application of farm inputs.
- Develop decision support system and apply computer and electronics to the design of precision agricultural machines.

#### **Syllabus Contents**

**Unit 1:** Basics of precision agriculture, tools for implementation of precision agriculture. Information Technology. Spatial location, GPS, Information acquisition. Functional design, specifications, requirements and working of farm machinery needed for precision sowing and planting, laser guided leveller, power sprayer, straw chopper cum spreader, straw bailer, combine harvester etc.

**Unit 2:** Site-specific nutrient management, data sources and decision making for site-specific nutrient management. Economic, ecological and social impacts of site-specific nutrient management. Grain quality and yield. Yield monitoring and mapping, soil sampling and analysis. Role of electronics in farm machinery for precision farming.

**Unit 3:** Site-specific weed management, weed distribution, stability of weed populations, weed monitoring and control. Site-specific herbicide application. Agro-chemicals and fertilisers, patch spraying.

**Unit 4:** Use of microprocessor based systems and computer in precision agriculture, Automation.

**Unit 5:** Use of fuzzy logic, artificial neural network and genetic algorithm in precision agriculture and farm machinery and power system.

#### **References**

1. Zhang, Q. 2015. Precision Agriculture Technology for Crop Farming. CRC Press, New York.
2. Srinivasan, A. 2006. Handbook of Precision Agriculture – Principles and Applications. The Haworth Press, Inc., New York.
3. Brase, T.A. 2006. Precision Agriculture. Thomson Delmar Learning, New York.
4. Hermann, J.H. 2013. Precision in Crop Farming, Site Specific Concepts and Sensing Methods: Applications and Results. Springer, Netherlands.

### **MAE3 B03, Experimental and Whole Field Stress Analysis**

#### **Teaching Scheme**

Lectures: 3 hours/week

#### **Course Outcomes**

At the end of this course, students will be able to

- Understand the concept of measurement of stress in machine components using various experimental techniques.
- Apply the principle of stress analysis for design and force analysis of tractor and farm

machinery.

### **Syllabus Contents**

**Unit 1:** Stress and strain relations. Basic equations and plane elasticity theory.

**Unit 2:** Theory of brittle coating method, crack detection, test and calibration procedure for brittle coating analysis

**Unit 3:** Strain measurement, electrical resistance strain gauges, semi-conductor strain gauges, strain gauge circuits, recording instruments, analysis of strain gauge data.

**Unit 4:** Optical methods of stress analysis, basic optics, Moire methods, theory of photo-elasticity, 2-D and 3-D photo-elasticity, birefringent coatings.

**Unit 5:** Application of stress analysis in the design and testing of tractor and farm machinery systems.

### **References**

1. Ramesh, K. 2009. E-book on Experimental Stress Analysis. IIT Madras. [http://apm.iitm.ac.in/smlab/kramesh/book\\_5.htm](http://apm.iitm.ac.in/smlab/kramesh/book_5.htm)
2. Dally, J.W. and Riley, W.F. 1991. Experimental Stress Analysis, McGraw-Hill, New York.
3. Sharpe, W.N. 2008. Handbook of Experimental Solid Mechanics. Springer, Netherlands.
4. Pant, B., Gargasha, G., Lingaiah, K., Ramachandra, K., Srinath, L.S. and Raghavan, M.R. 1984. Experimental Stress Analysis. Tata McGraw Hill, New Delhi.

## **PROGRAMME ELECTIVES – III**

### **MAE3 C01, Renewable Sources of Energy and Utilization**

#### **Teaching Scheme**

Lectures: 3 hours/week

#### **Course Outcomes**

At the end of this course, students will be able to

- Understand the concept and utilization of various sources of renewable energy.
- Design various applications using the energy from renewable sources.
- Estimate the availability and utilization of energy from renewable sources

### **Syllabus Contents**

**Unit 1:** Conventional and renewable energy sources in agriculture, solar radiation and its measurement, characteristics of spectrum, solar energy collection, storage and application, solar photo voltaic conversion and SPV powered systems.

**Unit 2:** Types of wind mills and their applications. Theory of drag and lift forces, Design of wind turbine.

**Unit 3:** Thermo chemical conversion of biomass, direct combustion of pyrolysis and gasification, chemical conversion processes, carbonization, briquetting, pelletization and densification.

**Unit 4:** Bio conversion into alcohols, methyl and ethyl esters, organic acids, solvents of amino acids, types of biogas plants, biogas properties, uses and distribution, alternate fuels for I.C. engines.

**Unit 5:** Energy requirement in agricultural production systems, energy ratio and specific energy value, inflow and outflow of energy in unit agricultural operation, energy audit, accounting and analysis.

### **References**

1. Rao, S.S. and Parulekar, B.B. 1999. Non-conventional, Renewable and Conventional. Khanna Publishers, New Delhi

2. Sukhatme, S.P.1997. Solar Energy - Principles of Thermal Collection and Storage.2<sup>nd</sup>Edition, Tata McGraw Hill, New Delhi.
3. Grewal, N.S., Ahluwalia, S., Singh, S. and Singh, G. 1997. Hand Book of Biogas Technology. Solar Energy Fundamentals and Applications. Tata McGraw Hill, New Delhi.
4. Mittal, K.M. 1985. Biomass Systems: Principles & Applications. New Age International, New Delhi
5. Boyle, Godfrey. 1996. Renewable Energy: Power for Sustainable Future. Oxford University Press, London.

### **MAE3 C02, Energy Conservation and Management**

#### **Teaching Scheme**

Lectures: 3 hours/week

#### **Course Outcomes**

At the end of the course, students will be able to

- Acquire insight about the importance of energy
- Analyze all scenarios from energy consumption
- Generate scenarios of energy consumption and predict the future trend
- Suggest and plan energy conservation solutions

#### **Syllabus Contents**

**Unit 1:**Energy resources on the farm: conventional and non-conventional forms of energy and their use. Heat equivalents and energy coefficients for different agricultural inputs and products. Pattern of energy consumption and their constraints in production of agriculture. Direct and indirect energy. The energy market, energy scenario, planning, utilization pattern and future strategy, Importance of energy management. Energy intensity, long term energy scenario, energy pricing, energy security, energy conservation and its importance, energy strategy for the future.

**Unit 2:**Energy auditing- methodology and analysis: Definition, energy audit, need, types of energy audit. Energy management (audit) approach-understanding energy costs, Bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel and energy substitution, energy audit instruments and metering. Energy audit of production agriculture, and rural living and scope of conservation.

**Unit 3:**Energy conservation planning and practices. Energy forecasting, Energy economics, Energy pricing and incentives for energy conservation, factors effecting energy economics. Energy modelling.

**Unit 4:**Energy Efficiency in Thermal Utilities and systems: Boilers, Steam system, Furnaces, Insulation and refractories, Heat exchangers,Waste heat recovery, Cogeneration, Heating, ventilation, air conditioning (HVAC) and refrigeration system. Identification of energy efficient machinery systems, energy losses and their management. Energy analysis techniques and methods: energy balance, output and input ratio, resource utilization, conservation of energy sources.

**Unit 5:**Energy and environment, air pollution, climate change: United Nations Framework Convention on Climate Change (UNFCCC), sustainable development, Kyoto Protocol, Conference of Parties (COP), Clean Development Mechanism (CDM), CDM Procedures case of CDM – Bachat Lamp Yojna and industry; Prototype Carbon Fund (PCF).

#### **References**

1. Witte, L.C., Schmidt, P.S. and Brown, D.R. 1988. Industrial Energy Management and Utilization. Hemisphere Publishing Corp., New York.



2. O'Callaghan, P.W. 1981. Design and Management for Energy Conservation. Pergamon Press, Oxford.
3. Reay, D.A. 1980. Industrial Energy Conservation, Pergamon Press, Oxford..
4. Nagrath, I.J. and Gopal, M. 1982. Systems : Modeling and Analysis. Tata McGraw Hill, New Delhi.
5. Doty, S. and Turner, W.C. 2012. Energy Management Handbook, 8<sup>th</sup> Edition. Fairmont Press, Libum, USA.
6. Dryden, I.G.C. 1982. The Efficient Use of Energy, 2<sup>nd</sup> Edition. Butterworth Heinemann, London.

### **MAE3 C03, Design of Solar and Wind Systems**

#### **Teaching Scheme**

Lectures: 3 hours/week

#### **Course Outcomes**

At the end of the course, students will be able to

- Update about the technological status of implementation of NCES in India
- Analyze various techno-economical obstacles in the commercial development of NCES in India
- Conceptually model and design general NCES systems and predict the long term performance.
- Suggest and plan hybrid NCES solutions to conventional energy systems.

#### **Syllabus Contents**

**Unit 1:** Solar radiation analysis: Solar constant, Basic earth sun angles, Beam and diffused radiations, Radiation on tilted surfaces (estimation), Measurement of solar radiation, Heat Transfer for Solar Energy Utilization: Basic models of heat transfer, Radiation characteristics of opaque materials and partially transparent media, Heat transfer analysis for flat plate collectors, Numerical problems

**Unit 2:** Flat Plate Collectors: Physical principles of conversion of solar radiation into heat, Thermal Losses and efficiency of FPC, Practical considerations for flat plate collectors, Applications of FPC - Water heating and Drying. Focusing Type Collectors: Orientation and sun tracking systems, Types of concentrating collectors - Cylindrical parabolic collector, Compound parabolic collector, Thermal performance of focusing collectors, testing of solar collectors. Solar Green Houses, Solar thermo mechanical power, Solar refrigeration & air conditioning and Solar High Temperature Applications, Solar cooking, Solar desalination, Solar ponds and Solar space heating Solar Industrial process heating and Solar power generation. Fuel cells, thermionic, thermoelectric. Photovoltaic and Solar Thermal Systems.

**Unit 3:** Modern wind turbines, wind resources, wind Vs traditional electricity generation, technology advancements, material Usage. Applications: grid connected power, industrial applications, stand-alone system, water pumping, Wind resource assessment, Wind measurement

**Unit 4:** Aerodynamics: Aerofoil, two dimensional airfoil theory, relative wind velocity, Wind Turbines: Classification of wind turbines, Turbine components, Wind turbine design: Rotor torque and power, Power control, braking systems. Turbine blade design. Blade material, SERI blade sections,

**Unit 5:** Transmission and generation efficiency, Energy production and capacity factor, Torque at constant speeds, Drive train oscillations, Wind farm design

#### **References**

1. Goswami, D.Y., Kreith, F. and Kreider, J.F. 2000. Principle of Solar Engineering. Taylor and Francis, London.
2. Sukhatme S.P. 1994. Solar Energy. Tata McGraw Hill Publishing Co. Ltd., New Delhi.
3. Rai, G.D. 2000. Non-conventional Energy Sources. Khanna Publishers, New Delhi.
4. Kreider, J.F. and Kreith, F. 1981. Solar Energy Handbook. McGraw Hill, New York.
5. Duffie, J.A. and Beckman, W.A. 2013. Solar Engineering of Thermal Processes. John Wiley & Sons, New Jersey.

## **PROGRAMME ELECTIVES – IV**

### **MAE3 D01, Hydraulic System and Control**

#### **Teaching Scheme**

Lectures: 3 hours/week

#### **Course Outcomes**

At the end of the course, students will be able to

- Understand hydraulic system and circuit of tractor, land reclamation machinery and other machines.
- Design and develop the hydraulic system and circuit for various applications.

#### **Syllabus Contents**

**Unit 1:** Principles of fluid power system. Hydraulic oil and fluid properties, filters and filtration. Hydraulic pumps-construction, sizing and selection.

**Unit 2:** Direction control valves, flow and pressure control. Hydraulic servo techniques-recent trends.

**Unit 3:** Linear actuators, rotary actuators and hydraulic transmission and steering. Heat generation and control, hydraulic reservoirs and accumulators. Electro hydraulic motors and hydrostatic transmissions, control components.

**Unit 4:** Design and application of hydraulic circuits, draft, position and mixed controls. Seals and packings, hydraulic pipes, hoses and fittings, hydraulic system maintenance, repair and reconditioning. Regenerative pump unloading, pressure intensifier circuits. Speed control of hydraulic motors, mechanical hydraulic servo systems for tractors.

**Unit 5:** Application of hydraulic power systems in farm power and machinery systems, off-road vehicles, land reclamation machinery etc.

#### **References**

1. Rabie, M.G. 2009. Fluid Power Engineering. McGraw Hill, New Delhi
2. Jagadeesha, T. and Gowda, T. 2009. Fluid Power: Generation, Transmission and Control. Wiley India Limited, New Delhi
3. Goering, C.E. and Hansen, A.C. 2013. Engine and Tractor Power. ASABE, USA.
4. Esposito, A. 2009. Fluid Power with Applications, 7<sup>th</sup> Edition. Pearson Education, New York.
5. Sullivan, J. 1997. Fluid Power: Theory and Applications, 4<sup>th</sup> Edition. Pearson Education, New York.

### **MAE3 D02, Fluid Power System and Automation**

#### **Teaching Scheme**

Lectures: 3 hours/week

#### **Course Outcomes**

At the end of the course, students will be

- Aware of the importance and the scope of hydraulics and pneumatics in the modern industry.
- Able to select and size the different components required to design a fluid power system.
- Able to select a control system to control the operation of designed fluid power system.
- Able to design and implement low cost automation system.

### **Syllabus Contents**

**Unit 1:**Hydraulic Power Generators - Selection and specification of pumps, pump characteristics. Linear and Rotary Actuators - selection, specification and characteristics.

**Unit 2:**Pressure - direction and flow control valves - relief valves, non return and safety valves - actuation systems. Reciprocation, quick return, sequencing, synchronizing circuits - accumulator circuits - industrial circuits – press circuits - hydraulic milling machine - grinding, planning, copying, forklift, earth mover circuits - design and selection of components - safety and emergency mandrels.

**Unit 3:**Pneumatic fundamentals - control elements, position and pressure sensing, Pneumatic logic circuits - switching circuits - fringe conditions modules and these integration - sequential circuits - cascade methods - mapping methods – step counter method - compound circuit design - combination circuit design. Pneumatic circuits – properties of air. Compressors, control elements.

**Unit 4:**Pneumatic equipments - selection of components - design calculations -application - fault finding – hydro pneumatic circuits. Design of pneumatic circuits. Electrical control for fluid power circuits. Electronic sensors/ circuits used as controls in modern farm equipment. Maintenance of hydraulic and pneumatic circuits and devices. Trouble shooting

**Unit 5:**Use of microprocessors/microcontrollers for sequencing - PLC, Low cost automation - Robotic circuits.

### **References**

1. Antony Esposito, 2014. Fluid power with Applications, 7th Edition. Prentice Hall India, New Delhi.
2. Pease, D.A. and Pippenger, J.J. 1987. Basic Fluid Power.Prentice Hall India, New Delhi
3. Parr, A. 1999. Hydraulic and Pneumatics. Jaico Publishing House, Mumbai.
4. Bolton. W. 1997. Pneumatic and Hydraulic Systems. Butterworth - Heinemann, London.
5. Majumdar, S.R. 1995. Pneumatic Systems: Principles and Maintenance Tata McGrawHill, New Delhi.

## **MAE3 D03, Land Reclamation Machinery**

### **Teaching Scheme**

Lectures: 3 hours/week

### **Course Outcomes**

At the end of the course, students will be able to

- Understand the construction and working of various land reclamation machinery.
- Evaluate the performance of various land reclamation machinery.
- Select the appropriate machinery and apply the relevant machine management practices.

### **Syllabus Contents**

**Unit 1:**Principles of mechanisms used in crawler tractors. Land reclamation and development, equipment for land reclamation.

**Unit 2:** Dozers, scrapers and excavators. Grading of sloppy lands, finishing equipment. Trucks and hauling equipment. Compressed air, drilling rock and earth, blasting rock, aggregate production.

**Unit 3:** Cranes, drag lines and clamshells, piles and pile driving equipment, equipment for pumping water, belt conveyor system

**Unit 4:** Automation of earth moving and grading machines. Production and equipment cost. Geotechnical materials, compaction and stabilization. Engineering fundamentals related to earth moving machinery: Swell, shrinkage and compaction measurements. Use of tractors & Crawlers and effects of altitude & temperature on their performance. Grade resistance and gradability.

**Unit 5:** Design considerations and performance evaluation of Earth moving machinery. Economic analysis of land development machinery. Application of PERT and CPM to the problems related to land development.

### **References**

1. De, Amitosh. 2015. Latest Development of Heavy Earth Moving Machinery. Galgotia Publications Pvt. Ltd., New Delhi.
2. Herbert L. Nichols, Jr. 2005. Moving the Earth: The Workbook of Excavation, 5<sup>th</sup> Edition. McGraw-Hill, New York.
3. Borshchow, T., Mansurou, R. and Sergeev, V. 1988. Land Reclamation Machinery. MIR Publication, Moscow.
4. Alekseeva, T.V. 1985. Machines for Earthmoving Work: Theory and Calculations. Amerind Publishing Co., New York.

## **PROGRAMME ELECTIVES – V**

### **MAE3 E01, Human Factors Engineering in the Design of Tractor and Farm Machinery Teaching Scheme**

Lectures: 3 hours/week

#### **Course Outcomes**

At the end of the course, students will be able to

- Understand the importance of anthropometry and strength parameters on the design of farm machinery.
- Design and develop farm machinery based on ergonomic considerations.
- Design the workspace considering safest and comfort of the operators.

#### **Syllabus Contents**

**Unit 1:** Definitions and development of ergonomics. Man-machine system. Anthropometry and workplace design principles. Tractor operator's working environment.

**Unit 2:** Environmental stresses: thermal, dust and chemical stresses in agricultural operation. Physical and muscular fatigue in agricultural operation. Mental workload assessment. Work/rest schedule.

**Unit 3:** Vibration and noise: evaluation, reduction, application in tractor, power tiller and self propelled machines.

**Unit 4:** Visual perception in tractor control panel design. Warning signs and warning labels, vision at the workplace. Principle and design of ROPS, International standards and testing of ROPS.

**Unit 5:** Application of Anthropometry and Ergonomics in the design of tractor and Farm

Machinery Systems. Ergonomic evaluation of farm machinery.

### References

1. Grandjean, E. and Kroemer, K.H.E. 1997. Fitting the Task to the Human: A Textbook of Occupational Ergonomics, 5<sup>th</sup> Edition. Taylor & Francis, Philadelphia.
2. Sanders, M. S. and McCormick, E. J. 1993. Human Factors in Engineering and Design. McGraw-Hill, New York.
3. Kroemer, K. H. E., Kroemer, H. B. and Kroemer-Elbert, K. E. 2000. Ergonomics: How to Design for Ease and Efficiency, 2<sup>nd</sup> Edition. Prentice-Hall, New York.
4. Stanton, N., Hedge, A., Brookhuis, K., Salas, E. and Hendrick, H. 2005. Handbook of Human Factors and Ergonomics Methods. CRC Press, Boca Raton.
5. Tayyari, F. and Smith, J. L. 1997. Occupational Ergonomics: Principles and Applications. Springer-Verlag, New York.

## MAE3 E02, Finite and Boundary Element Methods in Engineering

### Teaching Scheme

Lectures: 3 hours/week

### Course Outcomes

At the end of the course, students will be able to

- Understand the application of FEM for stress analysis.
- Acquaint with the working of FEM and generate codes for specific applications.
- Apply FEM for the design and development of various machine components.

### Syllabus Contents

**Unit 1:** Basic concepts: The standard discrete system, Finite elements of an elastic continuum-displacement approach.

**Unit 2:** Generalization of the finite element concepts-weighted residual and variational approaches. Element types: triangular, rectangular, quadrilateral, sector, curved, isoparametric elements and numerical integration. Automatic mesh generation schemes.

**Unit 3:** Application to structural mechanics problems: plane stress and plane strains, Axisymmetric stress analysis, three dimensional stress analysis, bending of plates.

**Unit 4:** Introduction to the use of FEM in steady state field problems-heat conduction, fluid flow and non-linear material problems, plasticity, creep etc.

**Unit 5:** Computer procedures for Finite element analysis. Application of FEM for the design on tractor and farm machinery components.

### References

1. Gupta, O.P. 1991. Finite and Boundary Element Methods in Engineering. CRC Press, New York.
2. Seshu, P. 2003. Textbook of Finite Element Analysis. PHI Learning Pvt. Ltd., New Delhi.
3. Cook, R.D. 2002. Concepts and Applications of Finite Element Analysis. Wiley, New Delhi.
4. Desai, C.S. 2005. Introduction to the Finite Element Method: A Numerical Method for Engineering Analysis. CBS Publishers, Bangalore.

## MAE3 E03, Principles of Mechanization and Management

### Teaching Scheme

Lectures: 3 hours/week

### **Course Outcomes**

At the end of the course, students will be able to

- Select the appropriate machinery and power source for their effective utilization on the mechanized farm.
- Develop an optimum farm machinery management practices for the farm.
- Develop decision support system and apply the computer and internet for the management of farm resources and outputs.

### **Syllabus Contents**

**Unit 1:** Introduction to mechanization, mechanization policy, components of a mechanization system, harvesting and spraying systems. Labour and machinery planning, timeliness and work day probability, Principles of human resource development and management, leadership development

**Unit 2:** Machine capacity, field machinery management, matching machines to create an efficient system. Machinery selection, soil/climate/implement interface. Machinery cost, valuation of machines. Identifying, monitoring and reducing machinery costs..

**Unit 3:** Financing machinery, finance schemes and selection of appropriate scheme. Alternatives to ownership, contracting, hire schemes. Maintenance management. Machinery replacement, decision making, whole stock method and capital budget method. Principles of financial management.

**Unit 4:** Break-even analysis. Analysis and organization of various operation management programmes.

**Unit 5:** Use of computer and internet in planning of tractor and farm machinery management, Development of decision support systems for tractor and farm machinery.

### **References**

1. Hunt, D. 2001. Farm Power and Machinery Management, 10<sup>th</sup> Edition. Wiley, New York.
2. Hunt, D. 2001. Engineering Models for Agricultural Production . AVI Publishing Co., New York.

## AUDITCOURSES

### MASH 101, Research Methodology and IPR

#### Teaching Scheme

Lectures: 2 hours/week

#### Course Outcomes

At the end of this course, students will be able to

- Understand research problem formulation.
- Analyze research related information.
- Follow research ethics
- Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
- Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasize the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
- Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

#### Syllabus Contents

**Unit 1:** Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations.

**Unit 2:** Effective literature studies approaches, analysis. Plagiarism, Research ethics.

**Unit 3:** Effective technical writing, how to write report, Paper. Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

**Unit 4:** Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

**Unit 5:** Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

**Unit 6:** New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

#### References

1. Stuart Melville and Wayne Goddard, "Research methodology: An introduction for science & engineering students"
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
3. Ranjit Kumar, 2<sup>nd</sup> Edition, "Research Methodology: A Step by Step Guide for beginners"
4. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd, 2007.
5. Mayall, "Industrial Design", McGraw Hill, 1992.
6. Niebel, "Product Design", McGraw Hill, 1974.
7. Asimov, "Introduction to Design", Prentice Hall, 1962.
8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New

Technological Age”, 2016.

9. T. Ramappa, “Intellectual Property Rights Under WTO”, S. Chand, 2008.

### **MASH 102, English for Research Paper Writing**

#### **Teaching Scheme**

Lectures: 2 hours/week

#### **Course Objectives**

Students will be able to:

- Understand that how to improve your writing skills and level of readability
- Learn about what to write in each section
- Understand the skills needed when writing a Title
- Ensure the good quality of paper at very first-time submission

#### **Syllabus Contents**

#### **Hours**

**Unit 1:** Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

4

**Unit 2:** Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

4

**Unit 3:** Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

4

**Unit 4:** Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature.

4

**Unit 5:** Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions

4

**Unit 6:** Useful phrases, how to ensure paper is as good as it could possibly be the first-time submission

4

#### **Suggested Studies**

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book.
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011.

### **MASH 103, Disaster Management**

#### **Teaching Scheme**

Lectures: 2 hours/week

#### **Course Objectives**

Students will be able to:

- Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.



- Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in

Syllabus Contents	Hours
<b>Unit 1: Introduction</b> Disaster: Definition, Factors and significance; Difference between hazard and disaster; Natural and manmade disasters: Difference, Nature, Types and magnitude.	4
<b>Unit 2: Repercussions of Disasters and Hazards:</b> Economic damage, Loss of human and animal life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and famines, Landslides and avalanches, Man-made disaster: Nuclear reactor meltdown, Industrial accidents, Oil slicks and spills, Outbreaks of disease and epidemics, War and conflicts.	4
<b>Unit 3: Disaster Prone Areas in India</b> Study of seismic zones; Areas prone to floods and droughts, Landslides and avalanches; Areas prone to cyclonic and coastal hazards with special reference to tsunami; Post-disaster diseases and epidemics	4
<b>Unit 4: Disaster Preparedness and Management</b> Preparedness: Monitoring of phenomena triggering a disaster or hazard; Evaluation of risk: Application of remote sensing, Data from meteorological and other agencies, Media reports: Governmental and community preparedness.	4
<b>Unit 5: Risk Assessment</b> Disaster risk: Concept and elements, Disaster risk reduction, Global and national disaster risk situation. Techniques of risk assessment, Global Co-operation in risk assessment and warning, People's participation in risk assessment. Strategies for survival.	4
<b>Unit 6: Disaster Mitigation</b> Meaning, Concept and strategies of disaster mitigation, Emerging trends in mitigation. Structural mitigation and non-structural mitigation, Programs of disaster mitigation in India.	4

#### Suggested Readings

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies", New Royal Book Company.
2. Sahni, Pardeep et al. (Eds.), "Disaster Mitigation Experiences And Reflections", Prentice Hall of India, New Delhi.
3. Goel S. L. "Disaster Administration And Management Text And Case Studies", Deep & Deep Publication Pvt. Ltd., New Delhi.

### MASH 104, Sanskrit for Technical Knowledge

#### Teaching Scheme

Lectures: 2 hours/week

#### Course Objectives

- To get a working knowledge in illustrious Sanskrit, the scientific language in the world
- Learning of Sanskrit to improve brain functioning
- Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
- The engineering scholars equipped with Sanskrit will be able to explore the huge

knowledge from ancient literature	
<b>Syllabus Contents</b>	<b>Hours</b>
<b>Unit 1:</b> Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences	8
<b>Unit 2:</b> Order Introduction of roots Technical information about Sanskrit Literature	8
<b>Unit 3:</b> Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics	8

### Suggested Readings

1. “Abhyaspustakam” – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
2. “Teach Yourself Sanskrit” PrathamaDeeksha-VempatiKutumbshastri, Rashtriya SanskritSansthanam, New Delhi Publication
3. “India’s Glorious Scientific Tradition” Suresh Soni, Ocean books (P) Ltd., New Delhi

### Course Outcomes

Students will be able to

- Understanding basic Sanskrit language
- Ancient Sanskrit literature about science & technology can be understood
- Being a logical language will help to develop logic in students

## MASH 105, Value Education

### Teaching Scheme

Lectures: 2 hours/week

### Course Objectives

Students will be able to

- Understand value of education and self- development
- Imbibe good values in students
- Let the should know about the importance of character

<b>Syllabus Contents</b>	<b>Hours</b>
<b>Unit 1:</b> Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation. Standards and principles. Value judgments	4
<b>Unit 2:</b> Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National unity. Patriotism. Love for nature, Discipline	6
<b>Unit 3:</b> Personality and Behavior Development - Soul and scientific attitude. Positive thinking. Integrity and discipline. Punctuality, Love and kindness. Avoid fault Thinking. Free from anger, Dignity of labour. Universal brotherhood and religious tolerance. True friendship.	6

Happiness Vs suffering, love for truth.

Aware of self-destructive habits.

Association and Cooperation.

Doing best for saving nature

**Unit 4:** Character and Competence –Holy books Vs Blind faith.

6

Self-management and Good health.

Science of reincarnation.

Equality, Nonviolence, Humility, Role of Women.

All religions and same message.

Mind your Mind, Self-control.

Honesty, Studying effectively

### **Suggested Readings**

Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi

### **Course Outcomes**

Students will be able to

- Knowledge of self-development
- Learn the importance of Human values
- Developing the overall personality

## **MASH 201, Constitution of India**

### **Teaching Scheme**

Lectures: 2 hours/week

### **Course Objectives**

Students will be able to

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals’ constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

### **Syllabus Contents**

**Hours**

**Unit 1: History of Making of the Indian Constitution:**History, Drafting Committee (Composition & Working) 4

**Unit 2: Philosophy of the Indian Constitution:**Preamble, Salient Features 4

**Unit 3: Contours of Constitutional Rights & Duties:** 4

- Fundamental Rights
- Right to Equality
- Right to Freedom
- Right against Exploitation
- Right to Freedom of Religion
- Cultural and Educational Rights
- Right to Constitutional Remedies
- Directive Principles of State Policy

- Fundamental Duties.

#### **Unit 4: Organs of Governance:**

4

- Parliament
- Composition
- Qualifications and Disqualifications
- Powers and Functions
- Executive
- President
- Governor
- Council of Ministers
- Judiciary, Appointment and Transfer of Judges, Qualifications
- Powers and Functions

#### **Unit 5: Local Administration:**

4

- District's Administration head: Role and Importance,
- Municipalities: Introduction, Mayor and role of Elected Representative
- CEO of Municipal Corporation.
- Pachayati raj: Introduction, PRI: ZilaPachayat.
- Elected officials and their roles, CEO ZilaPachayat: Position and role.
- Block level: Organizational Hierarchy (Different departments),
- Village level: Role of Elected and Appointed officials.
- Importance of grass root democracy

#### **Unit 6: Election Commission:**

4

- Election Commission: Role and Functioning.
- Chief Election Commissioner and Election Commissioners.
- State Election Commission: Role and Functioning.
- Institute and Bodies for the welfare of SC/ST/OBC and women.

#### **Suggested Readings**

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

#### **Course Outcomes**

Students will be able to

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
- Discuss the passage of the Hindu Code Bill of 1956.

#### **MASH 202, Pedagogy Studies**

#### **Teaching Scheme**

Lectures: 2 hours/week

## Course Objectives

Students will be able to

- Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
- Identify critical evidence gaps to guide the development.

## Syllabus Contents

Hours

### Unit 1: Introduction and Methodology:

4

- Aims and rationale, Policy background, Conceptual framework and terminology
- Theories of learning, Curriculum, Teacher education.
- Conceptual framework, Research questions.
- Overview of methodology and Searching.

### Unit 2: Thematic overview:

2

- Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries.
- Curriculum, Teacher education.

### Unit 3: Evidence on the effectiveness of pedagogical practices

4

- Methodology for the in depth stage: quality assessment of included studies.
- How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?
- Theory of change.
- Strength and nature of the body of evidence for effective pedagogical practices.
- Pedagogic theory and pedagogical approaches.
- Teachers' attitudes and beliefs and Pedagogic strategies.

### Unit 4: Professional development: alignment with classroom practices and follow up support

4

- Peer support
- Support from the head teacher and the community.
- Curriculum and assessment
- Barriers to learning: limited resources and large class sizes

### Unit 5: Research gaps and future directions

2

- Research design
- Contexts
- Pedagogy
- Teacher education
- Curriculum and assessment
- Dissemination and research impact.

## Suggested Readings

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal

Educational Development, 33 (3): 272–282.

5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. [www.pratham.org/images/resource%20working%20paper%202.pdf](http://www.pratham.org/images/resource%20working%20paper%202.pdf).

### Course Outcomes

Students will be able to understand:

- What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
- What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
- How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

## MASH 203, Stress Management By Yoga

### Teaching Scheme

Lectures: 2 hours/week

### Course Objectives

- To achieve overall health of body and mind
- To overcome stress

### Syllabus Contents

Hours

**Unit 1:** Definitions of Eight parts of yog. (Ashtanga)

8

**Unit 2:** Yam and Niyam.

8

- Do's and Don't's in life.
- Ahinsa, satya, astheya, bramhacharya and aparigraha
- Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

**Unit 3:** Asan and Pranayam

8

- Various yog poses and their benefits for mind & body
- Regularization of breathing techniques and its effects-Types of pranayam

### Suggested Readings

1. "Yogic Asanas for Group Training-Part-I" : Janardan Swami YogabhyasiMandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, AdvaitaAshrama (Publication Department), Kolkata

### Course Outcomes

Students will be able to

- Develop healthy mind in a healthy body thus improving social health also
- Improve efficiency

## MASH 204, Personality Development Through Life Enlightenment Skills

### Teaching Scheme

Lectures: 2 hours/week

### Course Objectives

- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination
- To awaken wisdom in students

### Syllabus Contents

Hours

**Unit 1:** Neetisatakam-Holistic development of personality 8

- Verses- 19,20,21,22 (wisdom)
- Verses- 29,31,32 (pride & heroism)
- Verses- 26,28,63,65 (virtue)
- Verses- 52,53,59 (don't's)
- Verses- 71,73,75,78 (do's)

**Unit 2:** Approach to day to day work and duties. 8

- ShrimadBhagwadGeeta : Chapter 2-Verses 41, 47,48,
- Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,
- Chapter 18-Verses 45, 46, 48.

**Unit 3:** Statements of basic knowledge. 8

- ShrimadBhagwadGeeta: Chapter2-Verses 56, 62, 68
- Chapter 12 -Verses 13, 14, 15, 16,17, 18
- Personality of Role model. ShrimadBhagwadGeeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42,
- Chapter 4-Verses 18, 38,39
- Chapter18 – Verses 37, 38, 63

#### **Suggested Readings**

1. “Srimad Bhagavad Gita” by Swami SwarupanandaAdvaita Ashram (Publication Department), Kolkata
2. “Bhartrihari’s Three Satakam (Niti-sringar-vairagya)” by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

#### **Course Outcomes**

Students will be able to

- Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
- The person who has studied Geeta will lead the nation and mankind to peace and prosperity
- Study of Neetishatakam will help in developing versatile personality of students.

### **OPEN ELECTIVES**

#### **MASH A01, Business Analytics**

##### **Teaching Scheme**

Lectures: 3hours/week, Total Number of Lectures: 48

##### **Course Objectives**

- Understand the role of business analytics within an organization.
- Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.
- To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making.
- To become familiar with processes needed to develop, report, and analyze business data.
- Use decision-making tools/Operations research techniques.
- Manage business process using analytical and management tools.
- Analyze and solve problems from different industries such as manufacturing, service,

retail, software, banking and finance, sports, pharmaceutical, aerospace etc.

## Syllabus Contents

	No. of lectures
<b>Unit 1:</b> Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organisation, competitive advantages of Business Analytics. Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.	9
<b>Unit 2:</b> Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.	8
<b>Unit 3:</b> Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes. Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.	9
<b>Unit 4:</b> Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models. Monte Carlo Simulation and Risk Analysis: Monte Carlo Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.	10
<b>Unit 5:</b> Decision Analysis: Formulating Decision Problems, Decision Strategies with and without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making.	8
<b>Unit 6:</b> Recent Trends in : Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.	4

## Course Outcomes

- Students will demonstrate knowledge of data analytics.
- Students will demonstrate the ability of think critically in making decisions based on data and deep analytics.
- Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making.
- Students will demonstrate the ability to translate data into clear, actionable insights.

## References

1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.
2. Business Analytics by James Evans, Pearson Education.



### **MASH A02, Industrial Safety**

#### **Teaching Scheme**

Lectures: 3 hours/week

#### **Syllabus Contents**

**Unit-I:** Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

**Unit-II:** Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

**Unit-III:** Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

**Unit-IV:** Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, i. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

**Unit-V:** Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: i. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance.

#### **References**

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.
3. Pump-hydraulic Compressors, Audels, McGraw Hill Publication.
4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

### **MASH A03, Operations Research**

#### **Teaching Scheme**

Lectures: 3 hours/week

#### **Course Outcomes**

At the end of this course, students will be able to

- Apply the dynamic programming to solve problems of discrete and continuous variables.
- Apply the concept of non-linear programming.
- Carry out sensitivity analysis.

- Model the real world problem and simulate it.

### **Syllabus Contents**

**Unit 1:** Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models

**Unit 2:** Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming

**Unit 3:** Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT

**Unit 4:** Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

**Unit 5:** Competitive Models, Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation.

### **References**

1. H.A. Taha, Operations Research, An Introduction, PHI, 2008
2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
3. J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008
4. Hitler Libermann Operations Research: McGraw Hill Pub., 2009
5. Pannerselvam, Operations Research: Prentice Hall of India, 2010
6. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India, 2010

## **MASH A04, Cost Management of Engineering Projects**

### **Teaching Scheme**

Lectures: 3 hours/week

### **Syllabus Contents**

Introduction and Overview of the Strategic Cost Management Process

Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.

Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and nontechnical activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process

Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis. Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.

Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.

### **References**

1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi

2. Charles T. Horngren and George Foster, Advanced Management Accounting
3. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting
4. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A.H. Wheeler publisher
5. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd.

### **MASH A05, Composite Materials**

#### **Teaching Scheme**

Lectures: 3 hours/week

#### **Syllabus Contents**

**Unit 1:** Introduction: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

**Unit 2:** Reinforcements: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.

**Unit 3:** Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.

**Unit 4:** Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and preregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.

**Unit 5:** Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first ply failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

#### **Text Books**

1. Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany.
2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.

#### **References**

1. Hand Book of Composite Materials-ed-Lubin.
2. Composite Materials – K.K.Chawla.
3. Composite Materials Science and Applications – Deborah D.L. Chung.
4. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W. Tasi.

### **MASH A06, Waste to Energy**

#### **Teaching Scheme**

Lectures: 3 hours/week

#### **Syllabus Contents**

**Unit 1:** Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors.

**Unit 2:** Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods – Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

**Unit 3:** Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.

**Unit 4:** Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.- Design and constructional features - Biomass resources and their classification - Biomass

**Unit 5:** Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion – Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

#### References

1. Non Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.
2. Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.
3. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.
4. Biomass Conversion and Technology, C. Y. Wereko-Brobby and E. B. Hagan, John Wiley & Sons, 1996.

**DEPARTMENT OF AGRICULTURAL ENGINEERING**  
**ASSAM UNIVERSITY: SILCHAR**  
**M. Tech. (Agricultural Engineering)**  
**Specialization: Food Process Engineering**  
**Course Structure**

**Semester I**

Sl. No	Course Code	Course Name	Teaching Scheme			Credits
			L	T	P	
1.	1AE201	Advanced Food Process Engineering-I	3	0	0	3
2.	1AE202	Transport Processes in Food Engineering	3	0	0	3
3.	1AE2xx	Programme Elective – I	3	0	0	3
4.	1AE2xx	Programme Elective - II	3	0	0	3
5.	1ST101	Research Methodology & IPR	2	0	0	2
6.	1ST1xx	Audit Course - 1	2	0	0	0
7.	1AE203	Food Process Engineering Lab.	0	0	4	2
8.	1AE204	Food Chemistry and Microbiology Lab	0	0	4	2
<b>Total</b>			<b>16</b>	<b>0</b>	<b>8</b>	<b>18</b>

**Semester II**

Sl. No	Course Code	Course Name	Teaching Scheme			Credits
			L	T	P	
1.	2AE205	Advanced Food Process Engineering-II	3	0	0	3
2.	2AE206	Food Process and Products Technology	3	0	0	3
3.	2AE2xx	Programme Elective - III	3	0	0	3
4.	2AE2xx	Programme Elective – IV	3	0	0	3
5.	2ST1xx	Audit Course - 2	2	0	0	0
6.	2AE207	Advanced Food Process Engineering Lab	0	0	4	2
7.	2AE208	Food Analysis Lab.	0	0	4	2
8.	2AE209	Mini Project	0	0	4	2
<b>Total</b>			<b>14</b>	<b>0</b>	<b>12</b>	<b>18</b>

**Semester III**

Sl. No	Course Code	Course Name	Teaching Scheme			Credits
			L	T	P	
1.	3AE2xx	Programme Elective – V	3	0	0	3
2.	3ST2xx	Open Elective	3	0	0	3
3.	3AE210	Dissertation Phase - I	0	0	20	10
<b>Total</b>			<b>6</b>	<b>0</b>	<b>20</b>	<b>16</b>

**Semester IV**

Sl. No	Course Code	Course Name	Teaching Scheme			Credits
			L	T	P	
1.	4AE211	Dissertation Phase - II	0	0	32	16
<b>Total</b>			<b>0</b>	<b>0</b>	<b>32</b>	<b>16</b>

**Programme Elective – I**

1AE212	Data Structure and Computer Programming in food processing
1AE213	Computer application in food industry
1AE214	Bakery and Confectionary Products

**Programme Elective – II**

1AE215	Food Plant and Equipment Design
1AE216	Non-thermal Food Processing Technologies
1AE217	Advance refrigeration and air conditioning system

**Programme Elective – III**

2AE218	Technology of meat, poultry and fish processing
2AE219	Food Extrusion Technology
2AE220	Fruit and Vegetable Processing

**Programme Elective – IV**

2AE221	Food Handling and Packaging
2AE222	Food Safety and Quality Management
2AE223	Processing of Cereal, Pulse and Oilseed

**Programme Elective – V**

3AE224	Food Process Modelling
3AE225	Research methodology
3AE226	Milk and Milk Products Technology

**Audit Course 1&2**

1ST102	English for Research Paper Writing
1ST103	Disaster Management
1ST104	Sanskrit for Technical Knowledge
1ST105	Value Education
2ST106	Constitution of India
2ST107	Pedagogy Studies
2ST108	Stress Management by Yoga
2ST109	Personality Development through Life Enlightenment Skills.

**Open Elective Courses**

3ST201	Business Analytics
3ST202	Industrial Safety
3ST203	Operations Research
3ST204	Cost Management of Engineering Projects
3ST205	Composite Materials
3ST206	Waste to Energy

## CORE COURSES

<b>1AE201, Advanced Food Process Engineering-I</b>
<b>Teaching Scheme</b> Lectures: 3 hours/week
<b>Course Objectives</b> The objectives of the course are to introduce in a systematic way the most common food engineering unit operations required to design food processes and the equipment needed to carry them out as well as the economic, sanitation and safety design aspects in food plant operations to successfully produce food products with maximum quality.
<b>Syllabus Contents</b>  <b>Unit-1:</b> Drying technology: principles, methods and equipments, stages of drying, freeze drying, spray drying, solar drying, vacuum drying, hybrid drying systems, moisture content determination methods.  <b>Unit-2:</b> Evaporation: Importance of evaporation in food processing, types of evaporators, heat and mass balance, essence recovery. Kinetics of thermal processing, rate of microbial inactivation, thermal process calculations.  <b>Unit-3:</b> Particulate food solids: size distribution and characterization, size reduction and energy requirement in comminution, methods of size reduction, devices (roller, hammer, plate, ball and attrition mills) used for milling of cereals and spices.  <b>Unit-4:</b> Mixing and agitation: mechanisms and equipments used for mixing and agitation of solids, liquids, powders and pastes. Mixing time, mixing index, and relationship. Homogenization of milk: mechanism of homogenization, working principle of homogenizer.  <b>Unit-5:</b> Extrusion: Single and twin screw extruder, design of screw profile, drag flow, pressure flow, leakage flow, net flow, performance of screw press. Commercial retorts: batch and continuous retorts. Aseptic processing.
<b>References</b>  1) Fellows, P. J. 1988. Food Processing Technology: Principle and Practice. VCH Publ. 2) Geankoplis J. Christie. 1999. Transport Process and Unit Operations. Allyn & Bacon 3) King, C. J. 1980. Separation Processes, Tata McGraw-Hill 4) McCabe, W.L. and Smith, J.C. 1999. Unit Operations of Chemical Engineering. McGraw Hill.34 5) Rao, M.A. 2007. Rheology of Fluid and semisolid Foods: Principles and Applications, Springer

- 6) Romeo T Toledo, 1997. Fundamental of Food Process Engineering. CBS Pubs.
- 7) Sahay, K.M. and Singh, K.K. 1994. Unit Operation of Agricultural Processing. Vikas Publ. House

1AE202, Transport Processes in Food Engineering
<b>Teaching Scheme</b> Lectures: 3 hours/week
<b>Course Objectives</b> To understand the transport phenomena that govern the engineering analysis and design of food preservation process in improving processing conditions and the employment of energy resources, and to increase the quality of products.
<b>Syllabus Contents</b>  <b>Unit 1:</b> Heat Transfer- Fourier's law, conduction, convection and radiation heat transfer, steady state and transient heat transfer, heat transfer in Cartesian and cylindrical coordinates  <b>Unit 2:</b> Mass transfer, molecular diffusion, Fick's law, diffusion in solids, liquids and gases, effective moisture diffusion, heat and mass transfer analogy.  <b>Unit 3:</b> Equation of continuity, type of fluid flow and their classifications, Bernoulli's equation, pipe flow, channel flow, flow through porous media, Ergun's equation, and fluidization of solids, analytical and numerical solutions to transient state heat transfer.  <b>Unit 4:</b> Introduction of transport processes, viscosity and mechanism moment transport, thermal conductivity and mechanism of energy transport, diffusivity and mechanism of mass diffusivity, energy transport by radiation, different applications  <b>Unit 5:</b> Velocity distributions in laminar and turbulent flows, temperature distributions in solids and laminar and turbulent flows, concentration distributions in solids and laminar and turbulent flows, interphase transport
<b>References</b>  <ol style="list-style-type: none"> <li>1. Bird, R.B., Stewart, W.E., and Lightfoot, E.N. 2001. <i>Transport Phenomena</i>. John Wiley and Sons. New York.</li> <li>2. Datta, A. and Rakesh, V. 2009. <i>An Introduction to Modeling of Transport Processes</i>. Cambridge University Press, UK.</li> <li>3. Geankoplish, C.J. 2000. <i>Transport Processes and Unit Operations</i>. Prentice Hall of India Pvt. Ltd., New Delhi.</li> <li>4. Jorge, W., Jorge F.V., G.V. Barbosa-Canovas. 2003. <i>Transport Phenomena in Food Processing</i>. CRC Press. New York.</li> </ol>



5. Jorge, W., Jorge, Fernando, V., and Barbosa-Canovas, G.V. 2003. *Transport Phenomena in Food Processing*. CRC Press, New York.
6. Saravacos, G.D., Zacharias, B. and Maroulis. 2001. *Transport Properties of Foods*. Marcel Dekker, New York.
7. Treybal, R. 1980. *Mass Transfer Operations*. 3<sup>rd</sup>Edn. McGraw-Hill. New Delhi.
8. Vassilis, G. 1992. *Transport Phenomena of Foods and Biological Materials*. CRC Press, New York.

### **1AE203, Food Process Engineering Lab**

#### **Teaching Scheme**

Practical: 4hours/week

#### **Course Objectives**

To provide in-depth understanding of important concepts in food processing, including size reduction, drying, dehydration, high-pressure homogenization, mixing, and chemical preservation methods. Students will conduct experiments to illustrate these food processing principles and be able to apply them.

#### **Syllabus Contents**

1. Study of grinding, particle size analysis and energy requirement in comminution.
2. High pressure homogenization of milk and the measurement of fat-globule size before and after homogenization
3. Rheological properties of Newtonian and non-Newtonian liquid food
4. Estimation and measurement of flow rate, power requirement and pressure developed in single screw extruder
5. Establishing the relationship between performance index and mixing time in a planetary mixer
6. Estimation and measurement of cut-off size of milk fat-globules in a disk type centrifugal separator
7. Determination of flow pattern, port arrangement and flow rate-pressure drop relationship in a plate heat exchanger
8. Saturation vapor pressure-temperature relationships for pure solvent and dilute solutions
9. Thermal bactericide to achieve commercial sterility of food in sealed containers
10. Dehydration of vegetables in cabinet tray dryer.
11. Drying of fruits and vegetables in vacuum dryer

**References**

1. H. Das, 2005. *Food Processing Operations Analysis*. Asian Book Publications, New Delhi.
2. Jha, S.N. 2012. *Nondestructive Evaluation of Food Quality: Theory and Practice*. Springer.
3. Soojin J. and J. Irudayaraj. 2008. *Food Processing Operations Modeling: Design and Analysis*. CRC Press, New York.

**1AE204, Food Chemistry and Microbiology Lab****Teaching Scheme**

Practical: 4 hours/week

**Course Objectives**

To develop hands-on experience in laboratory techniques and to demonstrate the food chemistry concepts discussed in lecture for developing healthy and nutritious foods. Students will also become familiar with the laboratory methods used in the microbiological analysis of foods, and with the identifying characteristics of the major groups of microorganisms associated with food spoilage, food borne disease, and food fermentations.

**Syllabus Contents**

1. Quantitative analysis of food for proximate composition
2. Determination of acidity and pH of food sample
3. Determination of ascorbic acid from different food.
4. Determination of reducing and non-reducing sugar in food material.
5. Estimation of mineral content in food sample (Ca, P)
6. Microscopic observation of bacteria, yeasts and moulds
7. Staining of micro-organisms
8. Quantitative estimation of bacteria, yeasts and moulds
9. Isolation and identification of micro organism

**References**

1. Jha, S.N. 2012. *Nondestructive Evaluation of Food Quality: Theory and Practice*. Springer.
2. S. Ranganna. *Handbook of Analysis and Quality Control for Fruit and Vegetable Products*. McGraw Hill.

<b>2AE205, Advanced Food Process Engineering-II</b>	
<b>Teaching Scheme</b>	Lectures: 3 hours/week
<b>Course Objectives</b>	To acquaint with recent advances of Food Engineering and its Processes and develop an insight among the student about the existing modern techniques so as to aware them about their methodology and applications in food processing.
<b>Syllabus Contents</b>	<p><b>Unit-1:</b> Psychrometrics: Psychrometric chart, psychrometric properties, processes. Aeration systems in grain storage. Silo design.</p> <p><b>Unit-2:</b> Fluid flow: Movement of particulate solid in fluid – Stoke's law, flow of fluid foods through pipes, velocity profiles, pumps selection, pneumatic conveying of granular foods, Fluid flow through porous beds: permeability and Darcy's law, Kozeny-Karman equation, Burke-Plummer equation, fluidization -Ergun equations for pressure drop in packed bed, minimum fluidization velocity.</p> <p><b>Unit-3:</b> Filtration: equipments, cake resistance and medium resistance, vacuum and centrifugal filtration. Sieving, solvent extraction, gravity separation, distillation and leaching.</p> <p><b>Unit-4:</b> Novel thermal processing: radio frequency, ohmic heating, microwave heating. infrared. Thawing of foods. Commercial canning operations and equipments.</p> <p><b>Unit-5:</b> Low temperature preservation: preservation techniques, types of cold preservation, cooling/precooling techniques, refrigerated storage, refrigerant, freezing, freezing methods and equipments, freezing processes, freezing time and rate, freezing time models, temperature quotient, heating and cooling load calculation.</p>
<b>References</b>	<ol style="list-style-type: none"> <li>1) Fellows, P. J. 1988. Food Processing Technology: Principle and Practice. VCH Publ.</li> <li>2) Geankoplis J. Christie. 1999. Transport Process and Unit Operations. Allyn &amp; Bacon</li> <li>3) King, C. J. 1980. Separation Processes, Tata McGraw-Hill</li> <li>4) McCabe, W.L. and Smith, J.C. 1999. Unit Operations of Chemical Engineering. McGraw Hill.34</li> <li>5) Rao, M.A. 2007. Rheology of Fluid and semisolid Foods: Principles and Applications, Springer</li> <li>6) Romeo T Toledo, 1997. Fundamental of Food Process Engineering.CBS Pubs.</li> <li>7) Sahay, K.M. and Singh, K.K. 1994. Unit Operation of Agricultural Processing. Vikas</li> </ol>

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## 2AE206, Food Process and Products Technology

### Teaching Scheme

Lectures: 3 hours/week

### Course Objectives

The main objective of the course is to teach the categories and properties of food commodities and food products, and to outline their health, social and market relations surrounding their production, distribution, preparation and consumption.

### Syllabus Contents

**Unit-1.** Methods for extension of shelf life and value addition in foods, preservation of foods by addition of heat-pasteurization, sterilization, cooking, blanching; Thermal death rate kinetics of microorganism, reverse osmosis, ultrafiltration, hurdle technology, minimally processed foods

**Unit-2.** Processing of: market milk, butter, ghee, ice cream, cheese, yoghurt, concentrated milk, skim milk powder, whole milk powder, malted milk foods, infant and baby foods, food premixes and blends, milled rice, refined wheat flour

**Unit-3.** Processing and preservation of foods by: Pickling, Jam, Jelly, marmalade, brining, smoking, fermentation, Chutneys and sauces/ketchups.

**Unit-4.** Spices: major spices (chillies, turmeric, black pepper, ginger, cardemon) and minor spices (garlic, cinnamon, fenugreek, cloves, onion, coriander, tamarind) of India.

**Unit-5.** Agricultural wastes and by-products utilization, principles and methods of waste disposal quotient, heating and cooling load calculation.

### References

- 1) Chocolate, Cocoa and Confectionary Science and Technology- Benard W. Minifie
- 2) Food chemistry (Revised and Expanded Edition) Owen R. Fennema
- 3) Food Processing Technology Principles and Practice –P. J. Fellows
- 4) Modern Food Microbiology- James M. Jay
- 5) Outline of Dairy Technology- Sukumar De
- 1) Sahay, K.M. and Singh, K.K. 1994. Unit Operation of Agricultural Processing. Vikas Publ. House
- 6) Technology of Cereals- N. L. Kent
- 2) The Technology of Food Preservation (iv Edition)- Norman W. Desrosier and James N. Desrosier

<b>2AE207, Advance Food Process Engineering Lab</b>	
<b>Teaching Scheme</b>	Practical: 4 hours/week
<b>Course Objectives</b>	To provide in-depth understanding of important concepts in food processing, including heat and mass transfer, extrusion, size reduction, homogenization, and packaging. Students will conduct experiments to illustrate these food processing principles and be able to apply them.
<b>Syllabus Contents</b>	<ol style="list-style-type: none"> <li>1. Measurement of thermal conductivity, thermal diffusivity, emissivity and absorptivity of solid and liquid foods.</li> <li>2. Flow properties of food powders.</li> <li>3. Food packaging material evaluation for water vapor transmission range, gas permeability (O<sub>2</sub>, N<sub>2</sub> and CO<sub>2</sub>), oil permeability, impact resistance, dry and wet strength.</li> <li>4. Study of separation of cream and skim milk using disc bowl centrifugal separator.</li> <li>5. J –factor analogy</li> <li>6. Comparison of energy requirement in vacuum drying and microwave drying</li> <li>7. Study of spray drying of liquid food.</li> <li>8. To study about solar drying of food products.</li> <li>9. To study the canning process of food products.</li> <li>10. To study the pressure – temperature relationship for solvent and different solution.</li> </ol>
<b>References</b>	<ol style="list-style-type: none"> <li>1. H. Das, 2005. <i>Food Processing Operations Analysis</i>. Asian Book Publications, New Delhi.</li> <li>2. Ibtisam E. Tothill. 2011. <i>Rapid and On-Line Instrumentation for Food Quality Assurance</i>. Woodhead Publication, UK.</li> <li>3. Jha, S.N. 2012. <i>Nondestructive Evaluation of Food Quality: Theory and Practice</i>. Springer.</li> <li>4. Ranganna, S. 2008. <i>Handbook of Analysis and Quality Control for Fruit and Vegetable Products</i>. Tata McGraw Hill, New Delhi</li> <li>5. Robertson, G.L. 2006. <i>Food Packaging: Principle and Practice</i>. Taylor and Francis, New York.</li> </ol>

6. Singh, R.P., and Augusto G.M. 1989. *Food Properties and Computer-Aided Engineering of Food Processing Systems*. Kluwer Academic.

### **2AE208, Food Analysis Lab**

#### **Teaching Scheme**

Practical: 4 hours/week

#### **Course Objectives**

This course is intended to introduce the application of physical, chemical and biological methods and techniques of analysis used for in-line and off-line quality control laboratory measurement for process optimization and product quality assurance in the food industry.

#### **Syllabus Contents**

1. Color by reflective spectrophotometer
2. Refractive index of oil by Abbe Refractometer
3. Water activity and construction of MSI by dew point meter
4. Rheological behavior of Newtonian and Non-Newtonian liquids by Rheometer
5. Texture profile analysis by Texturometer
6. Fatty acid profile by Gas-Liquid Chromatograph
7. Flavor components by High Performance Liquid Chromatograph
8. Amylose in starch by Absorption Spectrophotometer
9. Measurement of fat particles after and before homogenization of milk
10. Measurement of whey protein denaturation

#### **References**

1. Clifton M & Pomeranz Y. 1988. *Food Analysis - Laboratory Experiments*. AVI Publ.
2. Gruenwedel DW & Whitaker JR. 1984. *Food Analysis Principles and Techniques*. Vol. I. *Physical Characterization*. Marcel Dekker.
3. Gruenwedel DW & Whitaker JR. 1984. *Food Analysis Principles and Techniques*. Vol. II. *Physicochemical Techniques*. Marcel Dekker.
4. Gruenwedel DW & Whitaker JR. 1984. *Food Analysis Principles and Techniques*. Vol. III. *Biological Techniques*. Marcel Dekker.
5. Gruenwedel DW & Whitaker JR. 1984. *Food Analysis Principles and Techniques*. Vol. IV. *Separation Techniques*. Marcel Dekker.
6. H. Das, 2005. *Food Processing Operations Analysis*. Asian Book Publications, New Delhi.
7. Jha, S.N. 2012. *Nondestructive Evaluation of Food Quality: Theory and Practice*.

Springer.

8. Leenheer AP, Lambert WE & van Bocxlaer JF. 2000. *Modern Chromatographic Analysis of Vitamins*. 3rd Ed. Marcel Dekker.
9. Nollet LML. 1986. *Handbook of Food Analysis*. Vol. I. Marcel Dekker.
10. Soojin J. and J. Irudayaraj. 2008. *Food Processing Operations Modeling: Design and Analysis*. CRC Press, New York.

### 1AE212, Data Structure and Computer Programming in food processing

#### Teaching Scheme

Lectures: 3 hours/week

#### Course Objectives

To expose the student with fundamental knowledge on software of computers as especially to 'C' Programming. It will also impart knowledge related to the applications of computation in food industries

#### Syllabus Contents

**Unit 1:** Computer- Fundamental: Hardware/Software: Computer & memory system, input/output organization and new tech.

**Unit 2:** software concepts and terminology/multimedia, operating system concepts, process computer software internet concepts/computer networks

**Unit 3:** System Analysis of Design: Structural System Design, input design and control, output system design, file and database design, system development, system control and quality assurance, documentation, system implementation Data Structure: Introduction to data structure, arrays, lists, stacks and queue, graphs

**Unit 4:** Programming preliminaries, some simple programs in C, numeric constants and variables, arithmetic expressions, input and output, conditional statements, loops, arrays, logical expressions, functions,

**Unit 5:** character strings, enumerated data type and stacks, structures, pointer data type, lists and trees, recursion, bit level operations, files in C, miscellaneous features of C.

#### References

1. Computer concepts for Agri Business concepts – M.V. Verton, AVI Pub. Corp, West Port, USA.

2. Computer Programming in „C“ – E. Balaguruswamy
3. Data Structures – Mark Allen Waise
4. Let us „C“ – Yeswanth Kanethkar
5. M. S Excel 2000 - Microsoft Corp.
6. M. S. Office – Microsoft Corp

### **1AE213, Computer application in food industry**

#### **Teaching Scheme**

Lectures: 3 hours/week

#### **Course Objectives**

Students will able to learn about industrial use of computer application in different field such as quality control, logistics, engineering data management, and product documentation. It also support in different industrial process such as design, manufacturing, purchasing, physical distribution, production management and supply chain management.

#### **Syllabus Contents**

**Unit 1:** Importance of computerization in food industry, operating environments and information systems for various types of food industries, principles of communication. Supervisory Control and Data Acquisition (SCADA): Introduction to SCADA, SCADA systems hardware and firmware, SCADA systems software and protocols, landlines, local area network systems, modems, central site computer facilities

**Unit 2:** Spreadsheet Applications: Data entry, interpretation and solving problems; Cells, cell reference, functions, preparation of charts, use of macros to solve engineering problems; use of add-ins, use of solver etc. Web hosting and Webpage Design: Domain registration, web hosting, webpage design using web publishing software; Introduction to File Transfer Protocol (FTP); Online food process control from centralized server system in processing plant.

**Unit 3:** Use of Matlabs in Food Industry: Introduction, MATLAB interactive sessions, computing with MATLAB, Script files and editor/debugger; MATLAB help system, problem solving methodologies; Numeric, cell and structure array; Arrays, multidimensional arrays, element by element operations ; Matrix operations, polynomial operations using arrays, cell arrays, structure arrays; Functions and Files in MATLAB: Elementary mathematical functions, user defined functions; Advanced function programming, working with data files; Programming using MATLAB, Program design and development, Relational operators and logical variables, Logical operators and functions, Conditional statements, loops, the switch structure, debugging



MATLAB programs, applications to simulations. Plotting and Model Building in MATLAB; XY plotting functions, subplots and overlayplots, special plot types, interactive plotting in MATLAB, function discovery, regression, the basic fitting interface, three dimensional plots; Introduction to Toolboxes useful to Food Industry: Curve fitting toolbox, Fuzzy logic toolbox, Neural Network toolbox, Image processing toolbox, statistical toolbox

**Unit 4:** Introduction to CFD Applications in Food Industry: Introduction to Computational Fluid Dynamics (CFD), governing equations of fluid dynamics. Models of flow, substantial derivative, divergence of velocity, continuity, momentum and energy equations. Physical boundary conditions, discretization. Applications of CFD in Food and beverage industry. Introduction to CFD softwares, GAMBIT and Fluent softwares

**Unit 5:** Use of Software packages for: Summarization and tabulation of data; Descriptive statistics; Graphical representation of data, Exploratory data analysis.

#### References

1. Chatfield C. 1983. *Statistics for Technology*. 3rd Ed. Chapman & Hall.
2. Da Wen Sun. *Computation Fluid Dynamics in Food Processing*. CRC press
3. David Bailey and Edwin Wright. *Practical SCADA for Industry*. Elsevier
4. Free Statistical Softwares: <http://freestatistics.altervista.org/en/stat.php>.
5. Fundamentals of Food Process Engineering by R.T.Toledo. Published by Springer
6. [http://www.iasri.res.in/design/Analysis of data/Analysis of Data.html](http://www.iasri.res.in/design/Analysis%20of%20data/Analysis%20of%20Data.html).
7. Introduction to Web Design Using Microsoft FrontPage by Glencoe/McGraw-Hill  
Published by Glencoe/McGraw Hill
8. Jenny Chapman. *Web Design: A Complete Introduction*. John Wiley & Sons
9. Learning Statistics: <http://freestatistics.altervista.org/en/learning.php>.
10. Statistics Glossary [http://www.cas.lancs.ac.uk/glossary\\_v1.1/main.html](http://www.cas.lancs.ac.uk/glossary_v1.1/main.html).
11. William J. Palm. *Introduction to MATLAB 7 for engineers*. McGraw Hill Professional

#### 1AE214, Bakery and Confectionary Products

##### Teaching Scheme

Lectures: 3 hours/week

##### Course Objectives

To impart basic and applied technology of baking and confectionary and acquaint with the manufacturing technology of bakery and confectionary products.

##### Syllabus Contents

**Unit 1:** History of Bakery and Confectionery, Raw materials used in Bakery and its characteristics, use of water, role of salt, yeast production, enzymes and their functions in dough, properties and role of milk and sugar, leavening agents and their functions in bakery industry, spices and their functions in baking, flavouring and their function in bread making.

**Unit 2:** Food colours, type of setting materials and their function in baking, Cocoa and Chocolate, Bakery unit operation, type of breads, bread faults and remedies, cream crackers, soda crackers, wafer biscuits and matzos, puff biscuits, hard sweet, semi sweet and garibaldi fruit sandwich biscuit, short dough biscuits, wafers.

**Unit 3:** Cakes – type, ingredients, processing of cakes, problem and remedies. Pizza and Pastries – their ingredients and processing, bakery equipment required – type, selection, maintenance, bakery norms and standards.

**Unit 4:** Type of confectionery, Technical considerations of confectionery – TSS, pH, Acidity, and ERH. Raw materials – types of sugar and their role in confectionery, alternative bulk sweeteners and their role in confectionery, enzymes used in syrup production, protein and fat related products and their role in confectionery.

**Unit 5:** Food colors and flavors, ingredients used in chocolate, chocolate processing, caramel, toffee and fudge processing, Processing of liquorices paste, and cream paste, and aerated confectionery products, Tablets, chewing gum, crystallize confectionery.

## References

1. Bent A, Bennion EB & Bamford GST. 1997. *The Technology of Cake Making*. 6th Ed. Blackie.
2. Dubey SC. 2002. *Basic Baking*. The Society of Indian Bakers, New Delhi.
3. Francis FJ. 2000. *Wiley Encyclopedia of Food Science & Technology*. John Wiley & Sons.
4. Jackson EB. 1999. *Sugar Confectionery Manufacture*. 2nd Ed. Aspen Publ. Junk WR & Pancost HM. 1973. *Hand Book of Sugars for Processors. Chemists and Technologists*. AVI Publ.
5. Manley D. 2000. *Technology of Biscuits, Crackers & Cookies*. 2nd Ed. CRC Press.
6. Matz SA. 1992. *Bakery Technology and Engineering*. 3rd Ed. Chapman & Hall.
7. Pyler EJ. *Bakery Science & Technology*. 3rd Ed. Vols. I, II. Sosland Publ.

8. Qarooni J. 1996. *Flat Bread Technology*. Chapman & Hall.

1AE215, Food Plant and Equipment Design
<b>Teaching Scheme</b> Lectures: 3 hours/week
<b>Course Objectives</b> To impart knowledge on design of various equipments used in food industries and theoretical aspect to be considered for plant layout and site selection.
<b>Syllabus Contents</b>  <b>Unit 1:</b> Physical properties of food materials, mass and energy balance calculations for preliminary estimation of plant capacity and equipment sizes, preparation of flow sheets for material movement and utility consumption in food plant  <b>Unit 2:</b> Selection of materials, design of storage vessels for foods, design of pressure vessels and design of vessel for drum drying, stress and strain calculation, fatigue  <b>Unit 3:</b> Performance characteristics and selection of fans, blowers, ejector compressors and vacuum pumps, performance characteristics and selection of centrifugal and positive displacement sanitary pumps, design of fluid conveyance system; pipe, sanitary pipe fitting and valves  <b>Unit 4:</b> Design of heat exchange equipment-plate, scraped surface and extended surface for heating and cooling of gas and liquid, design of evaporator calandria, vapor separator and condenser  <b>Unit 5:</b> Design considerations for location of food plant, equipment layout and ventilation in food process plants
<b>References</b>  1. Albert, I., and G.V. Barbosa-Canovas. 2002. <i>Unit Operations in Food Engineering</i> . CRC Press, New York.  2. Geankoplish, C.J. 2000. <i>Transport Processes and Unit Operations</i> . Prentice Hall of India Pvt. Ltd., New Delhi.  3. Kenneth J. V., Enrique R., and Singh, R.P. 1997. <i>Handbook of Food Engineering Practice</i> .

CRC Press, New York.

4. Oberg, E., Jones, F.D., Horton, H.L., and Ryffel, H.H. 2008. *Machinery's Handbook*. Industrial Press.
5. Singh, R.P., and Heldman, D.R. 2004. *Introduction to Food Process Engineering*. Academic Press. New York.
6. Zacharias B.M. and Saravacos, G.D. 2005. *Food Process Design*. CRC Press, New York.

### 1AE216, Non-thermal Food Processing Technologies

#### Teaching Scheme

Lectures: 3 hours/week

#### Course Objectives

To acquaint with the methods that do not use heat to retain quality attributes of food while ensuring food safety and functionality of the product. The course deals with key concepts and industrial applications of emerging non-thermal food processing technologies such as high hydrostatic pressure, ultrasound, magnetic electric field, gamma irradiation, and pulsed light. It also provide hands-on practice in operating representative equipment used in non-thermal food processing as well as collecting, analysing and interpreting actual food engineering data.

#### Syllabus Contents

**Unit 1:** Introduction to non-thermal processing, comparison of thermal and non-thermal processing, advantages and disadvantages of non-thermal processing

**Unit 2:** Pulse Electric Filed (PEF) processing of foods, general principles, microbial inactivation kinetics by PEF, changes in enzyme activity, protein conformation, vitamin and flavor stability, PEF assisted juice exertion

**Unit 3:** High Pressure Processing (HPP) of foods, general principles, type of HPP systems, applications -inactivation of micro-organisms and enzymes, milk and milk products, egg, meat and fish products, fruits and vegetable products, high pressure assisted freezing and thawing

**Unit 4:** Food irradiation, ultraviolet light microbial inactivation by ultrasound, magnetic field

**Unit 5:** Non-thermal technology combination with thermal technologies, packaging requirements for non-thermal processed foods, food safety and regulations of non-thermal processed foods.

#### References

1. Barbosa-Canovas, G. and Zhang, Q. 2001. *Pulsed Electric Fields in Food Processing*:

*Fundamental Aspects and Applications*. Technomic: Lancaster, PA.

2. Barbosa-Canovas, G.V., Pothakamury, U.R., Palou, E. and Swanson, B.G. 1989. *Non-thermal Preservation of Food*. Mercel Dekker, New York.
3. Barbosa-Canovas, G.V., Tapia, M. S. and Cano, M.P. 2005. *Novel-thermal Food Processing Technologies*. CRC Press, New York.
4. Gould, G.W. 1995a. *New Methods of Food Preservation*. Blackie Academic and Professional, Glasgow, UK.
5. Lozano, J., Anon, M.C., Parada-Arias, E., and Barbosa-Canovas, G.V. 2000. *Advances in Food Engineering*. Technomic Publishing Co., Lancaster, PA.

### **1AE217, Advance refrigeration and air conditioning system**

#### **Teaching Scheme**

Lectures: 3 hours/week

#### **Course Objectives**

To learn about the principle and different components of refrigeration system. Design of cold storage and calculation of their cooling load for different food products.

#### **Syllabus Contents**

**Unit 1:** Vapour compression refrigeration systems with multiple evaporators and compressors: System components: compressor, Evaporators, Condensers & Expansion Devices and their functional aspects. Methods for improving COP, multiload system with single compressor, complex systems, dual compression system, system calculations, system balancing & controls, installation charging testing and maintenance of refrigeration and air conditioning

**Unit 2:** Vapour absorption refrigeration system: Ammonia-Water system, Li-Br system, Vapour absorption refrigeration cycle and its representation on enthalpy composition diagram; Absorption system calculations. Heat Pumps: different 'heat pump circuits', analysis of heat pump cycle, Use of heat pumps in plant for energy conservation.

**Unit 3:** Non-conventional refrigeration systems: Steam jet refrigeration, Thermo electric refrigeration, vortex tube, cooling by adiabatic demagnetization, air refrigeration cycles. Design elements of Refrigeration equipments: compressor condenser, evaporator, cooling tower, spray pond etc. Balancing of different components.

**Unit 4:** Design of cold storage and air-conditioning systems: types of cooling loads and their calculation, design of cold storage for food products, construction of cold storage, equipment selection, insulating materials, vapour barriers, Ice bank tank.

**Unit 5:**Control and maintenance of a commercial refrigeration plant: Pressure regulating valves, Thermostatic valves, LP/ HP cutouts, high to low side bypass valve, condenser water regulating valve, capacity control devices, pump down control, defrosting methods, liquid charging; General preventive maintenance of refrigeration plant. Transport air conditioning system: Introduction, components of different automobile air conditioning systems.

### References

1. Andrew D Althouse & Carl H. Turnquist 1958. *Modern Refrigeration and Air-conditioning*. Good Heart Wilcox Co.
2. Arora CP. 2000. *Refrigeration and Air-conditioning*. Tata McGraw Hill.
3. Carrier Air-conditioning. 1965. *Handbook of Air-conditioning System Design*. McGraw Hill.
4. Domkundwar S. 1980. *A Course in Refrigeration and Air-conditioning*. Dhanpat Rai & Sons.
5. Gunther Raymond C. 1957. *Refrigeration and Air-conditioning and Cold Storage*. Chilton Co.
6. Jordan RC & Priester GB. 1971. *Refrigeration and Air conditioning*. Prentice Hall of India.
7. Langley BC. 1978. *Refrigeration and Air-conditioning*. Reston Publ.
8. New-Comer JL. 1981. *Refrigeration and Air-conditioning*. Venus Trading Co.
9. Ananta Krishnan CP & Simha NN. 1987. *Technology and Engineering of Dairy Plant Operation*. Luxmi Publ.

## 2AE218, Technology of meat, poultry and fish processing

### Teaching Scheme

Lectures: 3 hours/week

### Course Objectives

To provide an understanding of the technology for handling, processing, preservation and by-product utilization of meat, poultry and fish products processing.

### Syllabus Contents

**Unit 1:** Meat composition from different sources; muscle structure and compositions; post-

mortem muscle chemistry; meat colour and flavours; meat microbiology and safety.

**Unit 2:** Modern abattoirs, typical layout and features, ante-mortem handling and design of handling facilities; hoisting rail and traveling pulley system; stunning methods; steps in slaughtering and dressing; offal handling and inspection; inedible by-products; operational factors affecting meat quality; effects of processing on meat tenderization; abattoir equipment and utilities

**Unit 3:** Modern abattoirs, typical layout and features, ante-mortem handling and design of handling facilities; hoisting rail and traveling pulley system; stunning methods; steps in slaughtering and dressing; offal handling and inspection; inedible by-products; operational factors affecting meat quality; effects of processing on meat tenderization; abattoir equipment and utilities

**Unit 4:** Poultry industry in India, measuring the yields and quality characteristics of poultry products, microbiology of poultry meat, spoilage factors; lay-out and design of poultry processing plants, plant sanitation; poultry meat processing operations, equipment used – defeathering, bleeding, scalding etc.; packaging of poultry products, refrigerated storage of poultry meat, by products – eggs, egg products, whole egg powder, egg yolk products, their manufacture, packaging and storage.

**Unit 5:** Commercially important marine products from India; product export and its sustenance; basic biochemistry and microbiology; preservation of postharvest fish freshness; transportation in refrigerated vehicles; deodorization of transport systems; design of refrigerated and insulated trucks; grading and preservation of shell fish; pickling and preparation of fish protein concentrate, fish oil and other by products.

## References

1. Forrest, J.C. 1975. *Principles of Meat Science*. Freeman. Govindan,
2. T.K. 1985. *Fish Processing Technology*. Oxford & IBH. Hui, Y.H.
3. 2001. *Meat Science and Applications*. Marcel Dekker. Kerry, J. *et al*.
4. 2002. *Meat Processing*. Woodhead Publ. CRC Press. Levie, A. 1984.
5. *Meat Hand Book*. 4th Ed. AVI Publ.
6. Mead, M. 2004. *Poultry Meat Processing and Quality*. Woodhead Publ.

**Teaching Scheme**

Lectures: 3 hours/week

**Course Objectives**

To impart knowledge to the students about extrusion technology, principle of working, classification of extruders according to process and construction, extruded products and their processing.

**Syllabus Contents**

**Unit 1:** Extrusion: definition, introduction to extruders and their principles, types of extruders, Extruders in the food industry: History and uses of extruders in the food industry

**Unit 2:** Single screw extruder: principle of working, net flow, factors affecting extrusion process, Twin screw extruder: counter rotating and co-rotating twin screw extruder, Process characteristics of the twin screw extruder : feeding, screw design, screw speed, screw configurations, die design, Twin screw extruder: Barrel temperature and heat transfer, adiabatic operation, heat transfer operations and energy balances, Problems associated with twin screw extruder

**Unit 3:** Pre-conditioning of raw materials used in extrusion process, Pre conditioning operations and benefits of pre-conditioning and devolatilization, Interpreted-flight expanders - extruders, dry extruders, Chemical and nutritional changes in food during extrusion, pre-extrusion processes, cooker extruder Profiling, Practical considerations in extrusion processing: Addition and subtraction of materials, shaping and forming at the die, post extrusion processes

**Unit 4:** Breakfast cereals: introduction, type of cooking - High shear cooking process, steam cookers, low shear, low pressure cookers and continuous steam pre-cooking, available brands, Breakfast cereal processes: traditional and extrusion methods, classification of breakfast cereals - flaked cereals, oven puffed cereals, gun puffed cereals, shredded products

**Unit 5:** Texturized vegetable protein: Definition, processing techniques, and foods, Snack food extrusion: Direct expanded (DX) and third generation (3G) Snacks: types, available brands, co-extruded snacks and indirect-expanded products

**References**

1. Fast R.B. and Caldwell E.F. *Breakfast Cereals and How they are made.*(2000) American Association of Cereal Chemists., St. Paul, Minnesota.
2. Frame N.D. *The Technology of Extrusion Cooking.* (1994) Blackie Academic & Professional, New York.
3. Guy R. *Extrusion Cooking, Technologies and Applications.* Wood head Publishing Limited, Abington, Cambridge.



4. Harper J.M. *Extrusion of Foods*. Vol. 1&2 (1991) CRC Press, Inc; Boca Raton, Florida.
5. O'Connor C. *Extrusion Technology for the Food Industry*. (1987) Elsevier Applied Science, New York.
6. Richardson P. *Thermal Technologies in Food Processing*. Wood head Publishers, Cambridge

<b>2AE220, Fruit and Vegetable Processing</b>	
<b>Teaching Scheme</b>	Lectures: 3 hours/week
<b>Course Objectives</b>	To acquaint with principles and methods of preservation of fruits and vegetables into various value added products
<b>Syllabus Contents</b>	<p><b>Unit 1:</b> Production and processing scenario of Fruits and vegetables in India and world, scope of fruit and vegetable processing industry in India- present status, constraints and prospective. Principles of preservation- Drying, dehydration, pretreatments required, factors affecting rate of dehydration, Reconstitution -coefficient of rehydration</p> <p><b>Unit 2:</b> Freezing process, type of freezing, changes during freezing, thawing, principle and process of canning, type of concentration, changes during concentration, chemical preservation, hurdle concept, irradiation,</p> <p><b>Unit 3:</b> Jam – ingredients and their role, processing of jam, Pectin and its sources, functional properties of pectin, Jelly and marmalades, processing of jelly and marmalades, fruit preserves and candied fruit, preparation of fruits preserves and candied, glazed &amp; crystallized fruit preparation.</p> <p><b>Unit 4:</b> Chutneys and its preparation, pickles, type of pickling, sauerkraut, problems in pickle making, sauces and ketchups,</p>
<b>References</b>	<ol style="list-style-type: none"> <li>1. Barret DM, Somogyi LP &amp; Ramaswamy H. 2005. <i>Processing of Fruits</i>. CRC Press</li> <li>2. FAO. 2007. <i>Handling and Preservation of Fruits and Vegetables by Combined Methods for Rural Areas- Technical Manual</i>. FAO Agr.Ser. Bull., 149.</li> </ol>

3. Fellows P. 2007. *Guidelines for Small-Scale Fruit and Vegetables Processors*. FAO Agr. Ser. Bull., 127.
4. Lal G, Siddappa GS & Tandon GL. 1998. *Preservation of Fruits and Vegetables*. ICAR.
5. Salunkhe DK & Kadam SS. 1995. *Handbook of Vegetables Science & Technology: Production, Composition, Storage and Processing*. Marcel Dekker.
6. Salunkhe DK & Kadam SS. 1995. *Handbook of Fruit Science & Technology: Production, Composition and Processing*. Marcel Dekker.
7. Somogyi LP. et al. 1996. *Processing Fruits - Science and Technology*. Vols I, II. Technomic Publ.
8. Srivastava RP & Kumar S. 2003. *Fruit and Vegetable Preservation - Principles and Practices*. International Book Distributors.
9. Verma LR & Joshi VK. 2000. *Post Harvest Technology of Fruits and Vegetables*. Indus Publ.

### **2AE221, Food Handling and Packaging**

#### **Teaching Scheme**

Lectures: 3 hours/week

#### **Course Objectives**

To provide knowledge about different conveying systems and development of food packaging materials and technologies aiming at assuring the safety and quality of foodstuffs in order to design an optimized package which satisfies all legislative, marketing and functional requirements sufficiently, and fulfils environmental, cost and consumer demands as well as possible.

#### **Syllabus Contents**

**Unit 1:** Overview of material handling system and devices in food processing plants, design of screw, bucket, belt, oscillating and vibratory conveyors

**Unit 2:** Packaging materials, their characteristics and properties, manufacture of plastic films, foils, laminates, retortable pouches, rigid plastic container paper and corrugated fibre board, design of shipping cartons and containers, rigid packaging using tin plate and aluminium

**Unit 3:** Design of aerosol container, metal tubes, glass containers and closures, labels and printing in packages, packaging requirement for different processed and unprocessed foods, e.g., cereal grains, baked foods, milk and dairy products, fish and meat, fresh fruits and vegetables

**Unit 4:** Principles of working of various type fillers: form- fill-seal machine, gas packaging and modified atmosphere package design, shelf life prediction of foods in packages, quality control

in food packaging, product safety and packaging regulations.

**Unit 5:** Novel packaging technologies – edible packaging, smart packaging, active packaging, anti-microbial packaging, CA and MA packaging, nano-packaging

### References

1. Ahvenainen, R. 2003. *Novel Food Packaging Techniques*. CRC Press, Boca Raton, FL, New York.
2. Brady, A.L. 1989. *Controlled/Modified Atmosphere/Vacuum Packaging of Foods*. 2<sup>nd</sup> Edn. Food and Nutrition Press, Trumbull, CT.
3. Coles, R., McDowell, D., Kirwan, M. J. 2003. *Food Packaging Technology*. CRC Press, Blackwell Publishing.
4. Karel, M. and Lund, D.B. 2003. *Protective Packaging, Physical Principles of Food Preservation*, 2<sup>nd</sup> Ed. Marcel Dekker, New York.
5. Kilcast, D., and Subramaniam, P. 2000. *The Stability and Shelf life of Food*. CRC Press, Boca Raton, FL, New York.
6. Robertson, G.L. 2006. *Food Packaging: Principle and Practice*. Taylor and Francis, New York.
7. Rockland, L.B. and Beuchat, L.R. 1987. *Water Activity: Theory and Applications to Food*. Marcel Dekker, New York

## 2AE222, Food Safety and Quality Management

### Teaching Scheme

Lectures: 3 hours/week

### Course Objectives

To acquaint with food quality parameters and control system and also impart knowledge about various national and international standards for different food. Students will be able to know about various acts, rules, regulations, laws and orders related to food articles governing their manufacture, import, export, storage, sale and distributions.

### Syllabus Contents

**Unit-1:** Quality and Assurance: Definition, scope, importance and difference, Total quality control and (TQC) Total quality management (TQM), Statistical quality controls. Definition, importance, scope and difference between food quality and food safety.

**Unit-2:** Sensory Evaluation: Selection of panel of judges, Prerequisite for sensory analysis, application of consumer tests; control of factors affecting of sensory verdict, Instrumental measurements of sensory attribute of foods sensory characteristics of foods, types of tests, Texture profile analysis. Correlation between instrumental and Sensory analysis of food quality attributes.

**Unit-3:** Food standards and laws: International – Concept of Codex Alimentarius, HACCP, GMP, GHP, USFDA, ISO 9000, ISO 22000, ISO 14000. Export Quality Control and Inspection act (1963), Environment Protection Act (1986), WTO & GATT, etc. GMP, GHP. National – Compulsory and voluntary trade and Company standards. Consumer Protection Act (1986), BIS/IS, Food Safety and standards – 2006, FPO, MPO, MMPO, Agmark. GMP, GHP.

**Unit-4:** Raw materials & Finished product quality: Quality parameters and evaluation procedures: appearance, color, texture, viscosity, consistency, flavour etc. Quality Certification & Accrediation: Introduction and procedure

**Unit-5:** Prevention of food adulteration Act: Food Adulteration: definition, common adulterants in different foods, contamination, method of detection, Food additives and legislation; PFA specification for food products, Nutritional labeling. Risk and Hazard associated with Food: Food hazards, sources of hazard, classification, Food safety; prevention and control, Statistical quality control. HACCP, Quality costs.

## References

1. Early R.1995.*Guide to Quality Management Systems for Food Industries*. Blackie Academic.
2. FSSAI (2011). Food safety and standards (Food product standards and Food Additives) regulation
3. Furia TE.1980. *Regulatory status of Direct Food Additives*. CRC Press.
4. Jellinek G. 1985. *Sensory Evaluation of Food - Theory and Practice*. Ellis Horwood.
5. Krammer A & Twigg BA.1973. *Quality Control in Food Industry*. Vol. I, II. AVI Publ.
6. Naomi Rees. David Watson. 2000. International standards for food safety, Aspen Publications.
7. Ranganna S. 2001. *Handbook of Analysis and Quality Control for Fruit and Vegetable Products*. 2nd Ed. Tata-McGraw-Hill.

2AE223, Processing of Cereal, Pulse and Oilseed
<b>Teaching Scheme</b> Lectures: 3 hours/week
<b>Course Objectives</b> To acquaint with production and consumption trends, structure, composition, quality evaluation, and processing technologies for product development and value addition of various cereals, pulses and oilseeds.
<b>Syllabus Contents</b>  <b>Unit 1:</b> Objectives and requirements of processing; raw grain characteristics and quality.  <b>Unit 2:</b> Wheat milling - products and by-products; roller flour milling; separation of milled products; manufacture of bakery products, pasta products and various processed cereal-based foods; manufacture of whole wheat <i>atta</i> , blended flour and fortified flour.  <b>Unit 3:</b> Rice milling technology; by-products of rice milling and their utilization; parboiling of rice- technology and effect on quality characteristics; processed products based on rice  <b>Unit 4:</b> Corn: Types and nutritive value; dry and wet milling, manufacture of value-added products; processing of barley, oats, sorghum and millets.  <b>Unit 5:</b> Legumes and oilseeds: composition, anti-nutritional factors, processing and storage; processing of oilseeds, construction and working mechanism of different extraction equipments like single stage extraction, multiple stage static bed system, bellman extractor, Hildebrandt extractor; assessment of processed product quality; packaging of processed products .
<b>References</b> <ol style="list-style-type: none"> <li>1. A. Chakravarty et al 2003. Handbook of Post Harvest Technology Marcel Dekker.</li> <li>2. Araullo, E.V., dePadna, D.B. and Graham, Michael. 1976. Rice Post Harvest Technology. International Development Res. Centre, Ottawa, Canada</li> <li>3. Dendy, D.A.V. and Dobraszczyk, B.J. 2001. <i>Cereal and Cereal Products</i>. Aspen.</li> <li>4. Lorenz, K.L. 1991. <i>Handbook of Cereal Science and Technology</i>. Marcel Dekker.</li> <li>5. Marshall, W.E. and Wadsworth, J.I. 1994. <i>Rice Science and Technology</i>. Marcel Dekker.</li> <li>6. Mathews, R.H. 1989. <i>Legumes Chemistry, Technology and Human Nutrition</i>. Marcel Dekker.</li> </ol>

<b>3AE224, Food Process Modelling</b>	
<b>Teaching Scheme</b> Lectures: 3 hours/week	
<b>Course Objectives</b> The students would be exposed to concepts of Design of Experiments so as to enable them to understand the concepts involved in planning, designing their experiments and analysis of experimental data.	
<b>Syllabus Contents</b>  <b>Unit 1:</b> Identification of design, operating and performance parameters in mechanical, thermal and mass transfer operations carried out in food processing such as; particulate size reduction, homogenization, centrifugation, packaging, mixing, conveying, extrusion, storage, heating, cooling, freezing, puffing, frying, distillation, extraction, concentration and drying.  <b>Unit 2:</b> Developing mathematical relationship between the independent and dependent variables affecting the food processing operations by using physical and chemical principles governing the processes.  <b>Unit 3:</b> Factorial, fractional factorial and rotatable central composite experimental design.  <b>Unit 4:</b> Developing empirical equations using experimental data. Developing predictive model using Neural network.  <b>Unit 5:</b> Optimization of processing parameters using Genetic algorithms. Application of Fuzzy logic to sensory evaluation and ranking of foods.	
<b>References</b> <ol style="list-style-type: none"> <li>1. Dominic, F. 2012. <i>Recent Advances in Sustainable Process Design and Optimization</i>. World Scientific Publishing.</li> <li>2. Das, H.2005. <i>Food Processing Operations Analysis</i>. Asian Book Publications, New Delhi.</li> <li>3. Soojin J. and J. Irudayaraj. 2008. <i>Food Processing Operations Modeling: Design and Analysis</i>. CRC Press, New York.</li> </ol>	

<b>3AE225, Research methodology</b>
<b>Teaching Scheme</b>

Lectures: 3 hours/week
<b>Course Objectives</b> To conduct applied research in a scientific manner. Students will learn to develop practical knowledge and skills to design, undertake and report research projects in a systematic way using statistical methods for the qualitative/quantitative analysis of data.
<b>Syllabus Contents</b>  <b>Unit 1:</b> Introduction of research methodology, Statistical analysis, Research Design: Need, Problem Definition, variables, research design concepts, Literature survey and review, Research design process, Errors in research; Research Modeling: Types of Models, Model building and stages, Data consideration and testing, Report Writing: Pre writing considerations, Thesis writing, Formats of report writing, formats of publications in Research journals.  <b>Unit 2 &amp; 3:</b> Design of experiments : objectives, strategies, Factorial experimental design, Designing engineering experiments, basic principles-replication, randomization, blocking, Guidelines for design of experiments, Two factor Factorial Design, Basic definitions and principles, main effect and interaction, General arrangement for a two factor factorial design. Application of Rotatable central composite design (RCCD) and fractional factorial design  <b>Unit 4:</b> Analysis of Variance components (ANOVA) for fixed effect model; Total, treatment and error of squares, Degrees of freedom, Confidence interval; One way ANOVA and two way ANOVA ,Chi square test and its application.  <b>Unit 5:</b> Hypothesis testing : Z test, T test, P test, Application of fuzzy logic, Model fitting, application of curve fitting tool, ANN modeling .
<b>References</b> <ol style="list-style-type: none"> <li>1. Kothari, C.K. Research Methodology_ Methods and Techniques, (New Age International, 2004).</li> <li>2. Krishnaswamy, K.N., Sivakumar, A. I. and Mathiranjani, M. Management Research Methodology; Integration of <i>Principles, Methods and Techniques</i> (Pearson Education, 2006)</li> <li>3. Montgomery, D. C. and Runger, G. C. <i>Applied Statistics &amp; Probability for Engineers</i>, (Wiley India, 2007)</li> <li>4. Montgomery, D. C. <i>Design and Analysis of Experiments</i>, (Wiley India, 2007)</li> </ol>

**Teaching Scheme**

Lectures: 3 hours/week

**Course Objectives**

To acquaint with techniques and technologies of testing and processing of milk into various products and by products.

**Syllabus Contents**

**Unit 1:** Present status of milk & milk products in India and Abroad; market of milk, composition of milk of various species, quality evaluation and testing of milk, procurement, transportation and processing of market milk, cleaning & sanitization of dairy equipments. Special milks such as flavoured, sterilized, recombined & reconstituted toned & double toned.

**Unit 2:** Condensed milk- definition, methods of manufacture, evaluation of condensed & evaporated milk; dried milk- methods of manufacture of skim & whole milk powder, instantiation, physiochemical properties, evaluation, defects in dried milk powder.

**Unit 3:** Cream: Definition, classification, composition, cream separation, sampling, neutralization, sterilization, pasteurization & cooling of cream, evaluation, defects in cream; butter- definition, composition, classification, methods of manufacture, theories of churning, evaluation, defects in butter.

**Unit 4:** Ice cream: Definition, composition and standards, nutritive value, classification, methods of manufacture, evaluation, defects in ice cream and technology aspects of softy manufacture.

**Unit 5:** Cheese: Definition, composition, classification, methods of manufacture, cheddar, Gouda, cottage and processed cheese, evaluation, defects in cheese. Indigenous milk products, present status, method of manufacture of *yoghurt, dahi, khoa, burfi, kalakand, gulabjamun, rosogolla, srikhand, chhana, paneer, ghee, lassi* etc; probiotic milk products.

**References**

1. Aneja, R.P., Mathur, B.N., Chandan, R.C. and Banerjee, A.K. 2002. *Technology of Indian Milk Products*. Dairy India Publ.
2. De, S.1980. *Outlines of Dairy Technology*. Oxford Univ. Press. Henderson, J.L. 1971. *Fluid Milk Industry*. AVI Publ.
3. Spreer, E. 1993. *Milk and Dairy Products*. Marcel Dekker. Walstra, P. 1999. *Dairy Technology*. Marcel Dekker.
4. Walstra, P. (Ed.). 2006. *Dairy Science and Technology*. 2nd Ed. Taylor & Francis.



**DEPARTMENT OF AGRICULTURAL  
ENGINEERING**

**ASSAM UNIVERSITY: SILCHAR**

**COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL  
ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)**

**SUMMARY OF CONTACT HOURS AND CREDITS FOR THE COURSE OF MASTER OF  
TECHNOLOGY IN WATER RESOURCES DEVELOPMENT AND MANAGEMENT OF  
AGRICULTURAL ENGINEERING**

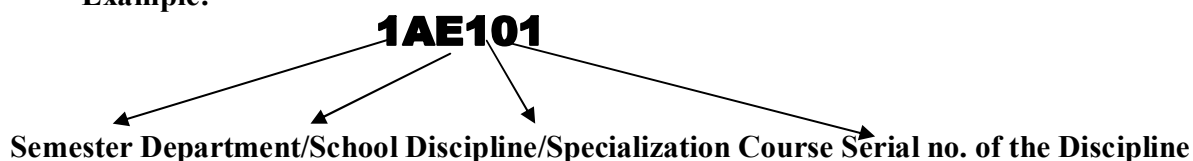
Year	Semester	Credits/ Contact Hour	Semester Wise Course Distribution					Semester Total
			Core Course	Elective (Discipline)	Elective (Open)	Audit Course	Dissertation	
I	1st	Credits	10	6	2	-	-	18
		Contact Hour	14	6	2	2	-	24
	2 <sup>nd</sup>	Credits	10	6	2	-	-	18
		Contact Hour	14	6	2	2	-	24
II	3 <sup>rd</sup>	Credits	-	3	3	-	10	16
		Contact Hour	-	3	3	-	20	26
	4 <sup>th</sup>	Credits	-	-	-	-	16	16
		Contact Hour	-	-	-	-	32	32
Course Total		Credits	20	15	7	-	26	68
Course Total		Contact Hour	28	15	7	4	52	106

**Coding System**

All subjects have unique codes of alphanumeric values that follow the rules below.

- ✓ Code starts with number followed by two or three characters and three numbers.
- ✓ The first number after the characters denotes the semester of the discipline/specialization (viz. 1: 1<sup>st</sup> semester; 2: 2<sup>nd</sup> Semester, 3: 3<sup>rd</sup> Semester; 4: 4<sup>th</sup> Semester and so on).
- ✓ Two/Three characters after number defines the name of the Department or the School under which it is being undertaken (viz. (AE: Agricultural Engineering; ASH: Applied Science and Humanities; ECE: Electronics and Communication Engineering; CSE: Computer Science and Engineering; ST: School of Technology; and so on)
- ✓ Number at starting portion after characters defines the code for name of the Discipline/Specialization of the Department under which it is being undertaken (viz. 1: Water Resources Development and Management; 2: Food Process Engineering, 3: Farm Machinery and Power Engineering; and 4. Aquacultural Engineering and so on).
- ✓ The second and third number altogether after the 1<sup>st</sup> number denotes the status (Serial .No.) of the subjects in that discipline as (viz. 01: 1<sup>st</sup> Course; 02: 2<sup>nd</sup> Course; ad 03; 3<sup>rd</sup> course and so on).

**Example:**



**COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL  
ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)**

**A. COURSE STRUCTURE FOR M. TECH. IN WATER RESOURCES  
DEVELOPMENT AND MANAGEMENT OF AGRICULTURAL ENGINEERING**

**SEMESTER I**

Sl. No	Course Code	Course Name	Teaching Scheme			Credits
			L	T	P	
1.	1AE101	Hydrology & Water Resources Engineering	3	0	0	3
2.	1AE102	On-Farm Irrigation and Drainage Engineering	3	0	0	3
3.	1AE1xx	Programme Elective – I	3	0	0	3
4.	1AE1xx	Programme Elective – II	3	0	0	3
5.	1ST101	Research Methodology and IPR	2	0	0	2
6.	1ST1xx	Audit Course – 1	2	0	0	0
7.	1AE103	Hydrology and Water Resources Engineering Lab	0	0	4	2
8.	1AE104	On-Farm Irrigation and Drainage Engineering Lab	0	0	4	2
<b>Total</b>			<b>16</b>	<b>0</b>	<b>8</b>	<b>18</b>

**SEMESTER II**

Sl. No	Course Code	Course Name	Teaching Scheme			Credits
			L	T	P	
1.	2AE105	Water Well and Pump Engineering	3	0	0	3
2.	2AE106	Land Husbandry and Watershed Management	3	0	0	3
3.	2AE1xx	Programme Elective – III	3	0	0	3
4.	2AE1xx	Programme Elective – IV	3	0	0	3
5.	2ST1xx	Audit Course – 2	2	0	0	0
6.	2AE107	Water Well and Pump Engineering Lab	0	0	4	2
7.	2AE108	Land and Water Management Lab	0	0	4	2
8.	2AE109	Mini Project	0	0	4	2
<b>Total</b>			<b>14</b>	<b>0</b>	<b>12</b>	<b>18</b>

**SEMESTER III**

Sl. No	Course Code	Course Name	Teaching Scheme			Credits
			L	T	P	
1.	3AE1xx	Programme Elective – V	3	0	0	3
2.	3ST2xx	Open Elective	3	0	0	3
3.	3AE110	Dissertation Phase – I	0	0	20	10
<b>Total</b>			<b>6</b>	<b>0</b>	<b>20</b>	<b>16</b>

**SEMESTER IV**

Sl. No	Course Code	Course Name	Teaching Scheme			Credits
			L	T	P	
1.	4AE111	Dissertation Phase – II	0	0	32	16
<b>Total</b>			<b>0</b>	<b>0</b>	<b>32</b>	<b>16</b>

## COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)

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### **SEMESTER I: Programme Elective – I**

1AE112	Computational Methods
1AE113	Soil Water and Crop Environmental Engineering
1AE114	Advanced Groundwater Hydrology

### **SEMESTER I: Programme Elective – II**

1AE115	Aquacultural Engineering
1AE116	Water Resources System Engineering
1AE117	Soil and Water Systems' Simulation and Modelling

### **SEMESTER II: Programme Elective – III**

2AE118	Soil and Water Conservation Structural Engineering
2AE119	Open Channel Hydraulics and Coastal Engineering
2AE120	Environmental Engineering Fundamentals

### **SEMESTER I: Programme Elective – IV**

2AE121	Modelling of Aquaculture and Fisheries Systems
2AE122	Water Quality Management
2AE123	Statistical Methods in Agriculture

### **SEMESTER I and SEMESTER II: Audit Courses 1 & 2**

1ST102	English for Research Paper Writing
1ST103	Disaster Management
1ST104	Sanskrit for Technical Knowledge
1ST105	Value Education
2ST106	Constitution of India
2ST107	Pedagogy Studies
2ST108	Stress Management by Yoga
2ST109	Personality Development through Life Enlightenment Skills.

### **SEMESTER III: Programme Elective – V**

3AE124	Water and Wastewater Treatment Engineering
3AE125	GIS and RS–Principles and Application in Land and Water Resources
3AE126	Design of Pumps for Irrigation and Drainage

### **SEMESTER III: Open Elective Courses**

3ST201	Business Analytics
3ST202	Industrial Safety
3ST203	Operations Research
3ST204	Cost Management of Engineering Projects
3ST205	Composite Materials
3ST206	Waste to Energy

**COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL  
ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)**

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**B. DETAILED COURSEWISE SYLLABUS FOR M. TECH IN WATER RESOURCES  
DEVELOPMENT AND MANAGEMENT OF AGRICULTURAL ENGINEERING**

**SEMESTER I : CORE COURSES**

<b>Course No. and Name: 1AE101, Hydrology and Water Resources Engineering</b>
<b>Teaching Scheme;</b> Lectures: 3 hours/week
<b>Course Outcomes:</b> At the end of this course, students will be able to <ul style="list-style-type: none"> <li>• Familiarize with the global and regional water scenario and issues in water resources management.</li> <li>• Conceptualize the different forms of water and hydrologic cycle.</li> <li>• Analyze and interpret hydrological data through frequency distribution, probability and hydrological model application.</li> <li>• Quantify the rainfall, runoff and base flow and analyse using models of runoff hydrograph.</li> <li>• Estimate water yield from catchment and plan for design of water resources storage structures</li> </ul>
<b>Syllabus Contents</b>  <b>Unit I:</b> Need for sustainable water management, hydrologic processes, global water scenario, water budget in India, irrigation development, major issues in land and water resources management  <b>Unit II:</b> Frequency analysis of hydrologic events, frequency distribution models, rainfall intensity-duration and frequency relationships.  <b>Unit III:</b> Model structure for time series, structural analysis, stationary series, non-stationary series analysis,  <b>Unit IV:</b> Hydrographs, flood routing, system models, conceptual and dynamic models of runoff hydrograph.  <b>Unit V:</b> Types of storage structures, water yield from catchments, runoff diversion, ponds and reservoirs, reservoirs and planning for dam reservoirs, earthen embankments and dams.
<b>References</b> <ol style="list-style-type: none"> <li>1. Subramanyam, K. Engineering Hydrology, Tata McGraw Hill Publication Co., New Delhi</li> <li>2. Sharma, R. K. Hydrology and Water Resources Engineering, Dhanpat Rai and Sons,</li> <li>3. Chow, V. T. Handbook of Applied Hydrology. McGraw Hill Book Co., USA</li> <li>4. Garg, S.K. Hydrology and Water Resources Engineering, Khanna Publishers, ND.</li> <li>5. Das, Ghanashyam. Hydrology and Soil Conservation Engineering, Prentice Hall of India, Pvt. Ltd, New Delhi</li> </ol>

**COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL  
ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)**

<b>1AE102, On-Farm Irrigation and Drainage Engineering</b>
<b>Teaching Scheme</b> Lectures: 3 hours/week
<b>Course Outcomes</b> At the end of this course, students will be able to <ul style="list-style-type: none"> <li>• Define irrigation and drainage terminology used for on farm water application and management.</li> <li>• Identify the irrigation and drainage related issues of various agro-climatic regions.</li> <li>• Outline the concept and methods of irrigation and drainage system for enhancing soil and crop environment.</li> <li>• Design and evaluation of irrigation and drainage system to address the pertinent issues.</li> <li>• Familiar with the automated and integrated irrigation and drainage system case studies.</li> </ul>
<b>Syllabus Contents</b> <b>Unit I:</b> Sources of irrigation distribution system, Irrigation water measurement, Plant-soil-water interaction: Scheduling of irrigation.  <b>Unit II:</b> Design and evaluation of surface and sub-surface systems-sprinkler and drip systems, Role of plastics in irrigation water management.  <b>Unit III:</b> Irrigation pumps, automation in irrigation, planning and economics of integrated irrigation system-case studies.  <b>Unit IV:</b> Drainage problems of various agro-climatic regions, determination of saturated hydraulic conductivity, steady and un-steady flow equations in sub-surface drainage system, sub-surface drainage systems design.  <b>Unit V:</b> Surface drainage systems design, drainage of rice fields, influence of irrigation on drainage, analysis of water balance, salinity control, agricultural drainage criteria, standard mathematical models used in agricultural drainage design.
<b>References</b> <ol style="list-style-type: none"> <li>1. Michael, A. M. Irrigation Theory and Practice, Vikas Publication. New Delhi</li> <li>2. James, L. G. Principles of Farm Irrigation System Design, John Wiley and Sons, USA</li> <li>3. Walker, W.R. and Skogerboe, Q. V. Surface Irrigation: Theory and Practice, Prentice Hall Inc. New Jersey, USA</li> <li>4. FAO. Drainage Machinery. Irrigation and Drainage Paper No. 15. Food and Agricultural Organisation, Rome.</li> <li>5. ISO. UPVC Pipes and fittings for use in subsoil drainage Specifications. Publication No. ISO/TC 138 WGIN431. ISO Din Deutsches Institut fur Normurig C.V. Ber-Jin 30.</li> <li>6. Garg, S. K. Hydrology and Water Resources Engineering. Khana Publishers, New Delhi</li> <li>7. Suresh, R. Watershed Hydrology. Standard Publishers, and Distributors, New Delhi</li> </ol>

**COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL  
ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)**

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<b>1AE103, Hydrology and Water Resources Engineering Lab</b>
<b>Teaching Scheme</b> Lectures: 4 hours/week
<b>Course Outcomes</b> At the end of this course, students will be able to <ul style="list-style-type: none"> <li>• Identify and specify the hydrological instruments and their use for measurement of climatic parameters.</li> <li>• Meticulous in handling and operation of hydrological instruments with highest accuracy level.</li> <li>• Have comprehensive knowledge of theory and procedure for measurement, computation and analysis of hydrological data and events.</li> <li>• Perceive the different mathematical equations and hydrological models used for analysis of hydrological events.</li> </ul>
<b>Syllabus Contents</b> The lab practice consists of the experiments and tutorials as decided by the course supervisor of the course, Hydrology and Water Resources Engineering Lab. It includes but not restricted to the following: <ol style="list-style-type: none"> <li>1. Study of hydrological instruments used for monitoring climatic parameters.</li> <li>2. Study of different types of instrument and methods used for quantification of precipitation.</li> <li>3. Study of different types of instrument and methods used for prediction of surface runoff.</li> <li>4. Study of different methods and instrument used for measurement and analysis of evaporation and transpiration.</li> <li>5. Standard procedure for planning and setting up of meteorological observatories.</li> <li>6. Design of rainfall and stream gauging networks.</li> <li>7. Study of different methods and instrument used for measurement and computation of stream flow and sediment transport.</li> <li>8. Study of different methods and instrument used for water quality characteristics.</li> <li>9. Study of mathematical equations and hydrological models used for analysis of hydrological events.</li> <li>10. Study of water budgeting and frequency analysis of hydrologic events.</li> </ol>
<b>References</b> <ol style="list-style-type: none"> <li>1. Subramanyam, K.. Engineering Hydrology, Tata McGraw Hill Publication Co., New Delhi</li> <li>2. Sharma, R. K. Hydrology and Water Resources Engineering, Dhanpat Rai and Sons,</li> <li>3. Chow, V. T. Handbook of Applied Hydrology. McGraw Hill Book Co., USA</li> <li>4. Garg, S.K. Hydrology and Water Resources Engineering, Khanna Publishers, ND.</li> <li>5. Das, Ghanashyam. Hydrology and Soil Conservation Engineering, Prentice Hall of India, Pvt. Ltd, New Delhi</li> <li>6. Suresh, R. Watershed Hydrology. Standard Publishers, and Distributors, New Delhi</li> </ol>

**COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL  
ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)**

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<b>1AE104, On-Farm Irrigation and Drainage Engineering Lab</b>
<b>Teaching Scheme</b> Lectures: 4 hours/week
<b>Course Outcomes</b> At the end of this course, students will be able to <ul style="list-style-type: none"> <li>• Identify and specify the hydrological instruments and their use for measurement of climatic parameters.</li> <li>• Meticulous in handling and operation of hydrological instruments with highest accuracy level.</li> <li>• Have comprehensive knowledge of theory and procedure for measurement, computation and analysis of hydrological data and events.</li> <li>• Perceive the different mathematical equations and hydrological models used for analysis of hydrological events.</li> </ul>
<b>Syllabus Contents</b> <p>The lab practice consists of the experiments and tutorials as decided by the course supervisor of the course, On-Farm Irrigation and Drainage Engineering Lab. It includes but not restricted to the following:</p> <ol style="list-style-type: none"> <li>1. Identify and study the different irrigation instrument and setup used for application and distribution of water to the crop.</li> <li>2. Study of different types of instrument and methods used for quantification of irrigation water.</li> <li>3. Study of different types of instrument and methods used for determination of infiltration characteristics of soil.</li> <li>4. Study of different types of instrument and methods used for estimation of irrigation water requirement.</li> <li>5. Identify and quantify the sources of water used for different irrigation methods.</li> <li>6. Study of standard procedure for planning and design of irrigation tanks and wells.</li> <li>7. Study of different methods and instrument used for measurement and analysis of water quality parameters.</li> <li>8. Study of standard procedure for design and evaluation of micro irrigation.</li> <li>9. Study of standard procedure for land grading and land levelling for lay out irrigation system.</li> <li>10. Study of standard procedure for design of surface and sub-surface drainage system.</li> </ol>
<b>References</b> <ol style="list-style-type: none"> <li>1. Michael, A. M. Irrigation Theory and Practice, Vikas Publication. New Delhi</li> <li>2. James, L. G. Principles of Farm Irrigation System Design, John Wiley and Sons, USA</li> <li>3. Walker, W.R. and Skogerboe, Q. V. Surface Irrigation: Theory and Practice, Prentice Hall Inc. New Jersey, USA</li> <li>4. FAO. Drainage Machinery. Irrigation and Drainage Paper No. 15. Food and Agricultural Organisation, Rome.</li> </ol>

## COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)

5. ISO. UPVC Pipes and fittings for use in subsoil drainage Specifications. Publication No. ISO/TC 138 WGIN431. ISO Din Deutsches Institut fur Normung C.V. Ber-Jin 30.
6. Garg, S. K. Hydrology and Water Resources Engineering. Khana Publishers, New Delhi

### 2AE105, Water Well and Pump Engineering

#### Teaching Scheme

Lectures: 3 hours/week

#### Course Outcomes

At the end of this course, students will be able to

- Have comprehensive concept of water well and pump engineering.
- Methodical explanation of aquifers-well hydraulics in exploration and sustainability of groundwater.
- Have meticulous knowledge for the well design and groundwater recharge.
- Have exhaustive concept for analysis of flow into aquifer and different water resources boundaries.
- Perceive the different aquifer parameters and interference of water quality parameters
- Be competent to select, design and different water lifting devices (pumps) for different purposes.

#### Syllabus Contents

**Unit I:** Aquifers - hydraulic characteristics of aquifers. Basic principles of ground water flow, ground water investigation.

**Unit II:** Well hydraulics. Steady and unsteady flow through fully penetrating and partially penetrating wells in confined, semi-confined and unconfined aquifers. Flow through non-penetrating wells, determination of aquifer parameters by pumping test data analysis.

**Unit III:** Well design, groundwater recharge basins and injection wells, multiple well and interference between wells, flow into aquifer with different boundaries, groundwater quality management.

**Unit IV:** Study of indigenous water lifts. Operating principles of hydraulic ram. Principles of positive displacement, jet and air-lift pumps. Design of reciprocating pump. Design of centrifugal pump-impeller and casing.

**Unit-V:** Pump characteristics, selection of size and type of pump, optimization of pump efficiencies, pump testing and modification, pump installation, operation and maintenance, pump troubles and remedies. Pumps in series and parallel. Special operating conditions. Design of farm irrigation system network, installation and its optimization. Economics of alternative pumping plant design.

#### References

1. Michael, A. M. Irrigation Theory and Practice, Vikas Publication. New Delhi
2. Michael, A. M. and Khepar S.D. Water Well and Pump Engineering, Tata McGraw Hill



**COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL  
ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)**

Publication Co., New Delhi
3. Church, A. H. and Jagdish Lal. Centrifugal Pumps and Blowers. Metropolitan Book Co. Pvt. Ltd. New Delhi
4. Bansal, R. K. A text book of Fluid Mechanics and Hydraulic Machine. Laxmi Publications, New Delhi.

<b>2AE106, Land Husbandry and Watershed Management</b>
<b>Teaching Scheme</b> Lectures: 3 hours/week
<b>Course Outcomes</b> At the end of this course, students will be able to <ul style="list-style-type: none"> <li>• Familiarize with the concept and issues of land husbandry and watershed management.</li> <li>• Acquainted with the different watershed development plans and their objectives.</li> <li>• Classify the land based on land capability classification and land use in different climatic regions.</li> <li>• Strengthen the knowledge to identify the problem of soil erosion and conservation in watershed management.</li> <li>• Identify the causes and effect of soil erosion and application of soil conservation techniques.</li> <li>• Analyze and interpret soil fertility and role of different fertilizers and their management for sustainable farming system.</li> </ul>
<b>Syllabus Contents</b>  <b>Unit I:</b> The concept of watershed, objectives, characteristics, delineation and coding of watershed, importance of land husbandry in watershed management.  <b>Unit II:</b> Watershed development plan, programmes in retrospect, NWDPRA, the hariayali programe, common guide lines.  <b>Unit III:</b> The problem of soil erosion and conservation, agronomic measures in watershed management, Land preparation and planting methods for conservation  <b>Unit IV:</b> Land capability classification and land use in the humid tropics, more crops per drop: importance of water management  <b>Unit V:</b> Maintenance of soil fertility, Organic Recycling: Role of manures, composts and bio fertilizers, fertilizers and their management, diversity farming system for sustainability.
<b>References</b> <ol style="list-style-type: none"> <li>1. Suresh, R. Soil and Water Conservation Engineering. Standard Publishers, and Distributors, New Delhi</li> <li>2. Schwab, G. O., Fangeir, D. D., Edminister, W. T., and Frevert, R.K. Soil and Water Conservation Engineering, John Wiley and Sons.</li> <li>3. Murty, V.V.N. and Jha, M. K. Land and Water Management Engineering. Kalyani Publisher, Ludhiana, India</li> </ol>

**COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL  
ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)**

4. Tideman, E.M. Watershed Management (Guidelines for Indian Conditions) Omega Scientific Publishers, New Delhi.
5. Sing, Rajvir. Watershed Planning and Management. Yash Publishing House, Bikaner.
6. Dhruvanarayan, V.V. Sastry, G., Patnaik, V. S. Watershed Management. Publ. And Inf. Div. ICAR, New Delhi.

**2AE107, Water Well and Pump Engineering Lab**

**Teaching Scheme**

Lectures: 4 hours/week

**Course Outcomes**

At the end of this course, students will be able to

- Have comprehensive concept of exploration of water resources and it's characteristics.
- Methodical explanation of design of different well and it's characteristics.
- Methodical explanation of design of different pumps and it's characteristics.
- Have meticulous knowledge for the well development and pumping test analysis.
- Be competent to select, design and different water lifting devices (pumps) for different purposes.

**Syllabus Contents**

The lab practice consists of the tutorials and experiments as decided by the course supervisor of the course, Water Well and Pump Engineering Lab. It includes but not restricted to the following:

1. Identify and study the different equipments and accessories and technique for construction of water wells.
2. Study of different types of equipments and accessories and methods for analysis of well logs.
3. Study of standard procedure for the design of different wells.
4. Study of standard procedure for the determination of well capacity by pumping test.
5. Study of different types of water lifts and pumps-calibration.
6. Study of standard procedure for the development of performance characteristic curves of a pump using a test rig.
7. Study of standard procedure for the design of design of centrifugal pump-impeller and casing.
8. Study of standard procedure for pumping test in an aquifer.

**References**

1. Michael, A. M. Irrigation Theory and Practice, Vikas Publication. New Delhi
2. Michael, A. M. and Khepar S.D. Water Well and Pump Engineering, Tata McGraw Hill Publication Co., New Delhi
3. Church, A. H. and Jagdish Lal. Centrifugal Pumps and Blowers. Metropolitan Book Co. Pvt. Ltd. New Delhi
4. Bansal, R. K. A text book of Fluid Mechanics and Hydraulic Machine. Laxmi

**COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL  
ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)**

Publications, New Delhi.

**2AE108, Land and Water Management Lab.**

**Teaching Scheme**

Lectures: 4 hours/week

**Course Outcomes**

At the end of this course, students will be able to

- Identify and specify the equipments and accessories and their use for land topographical survey, soil, water and crop parameters analysis.
- Have Meticulous in handling and operation of instruments with highest accuracy level.
- Have proficiency in design of soil and water conservation structure.
- Have comprehensive knowledge of theory and procedure for measurement, computation, analysis and management of land and water.

**Syllabus Contents**

The lab practice consists of the tutorials and experiments as decided by the course supervisor of the course, Land and Water Management Lab. It includes but not restricted to the following:

1. Identify and study the different equipments and accessories and methods for topographical survey and delineation of watershed.
2. Study of different types of equipments and accessories and methods for analysis of soil physic-chemical parameter analysis.
3. Study of different types of equipments and accessories and methods for analysis of crop physic-chemical parameter analysis.
4. Study of different types of equipments and accessories and methods for analysis of water quality parameter analysis.
5. Study of standard procedure for planning and design of soil conservation structures.
6. Study of standard procedure for planning and design of water harvesting structures.
7. Study of standard procedure for planning and design of irrigation tanks and wells.
8. Study of standard procedure for design of protective and precision farming structure.

**References**

1. Suresh, R. Soil and Water Conservation Engineering. Standard Publishers, and Distributors, New Delhi
2. Schwab, G. O., Fangeir, D. D., Edminister, W. T., and Frevert, R.K. Soil and Water Conservation Engineering, John Wiley and Sons.
3. Murty, V.V.N. and Jha, M. K. Land and Water Management Engineering. Kalyani Publisher, Ludhiana, India
4. Tideman, E.M. Watershed Management (Guidelines for Indian Conditions) Omega Scientific Publishers, New Delhi.
5. Sing, Rajvir. Watershed Planning and Management. Yash Publishing House, Bikaner.
6. Dhruvanarayan, V.V. Sastry, G., Patnaik, V. S. Watershed Management. Publ. And Inf. Div. ICAR, New Delhi.

**COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL  
ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)**

7. T.P. Kanetkar & S.V. Kulkarni. Surveying and Levelling. (Part I & II). Griha Prakashan.

<b>2AE109: Mini Project</b>
<b>Teaching Scheme</b> Lectures: 4 hours/week
<b>Course Outcomes</b> At the end of this course, students will be able to <ul style="list-style-type: none"> <li>• Solve a live problem using software/analytical/computational tools.</li> <li>• Learn to write technical reports.</li> <li>• Develop skills to present and defend their work in front of technically qualified audience.</li> </ul>
<b>Syllabus Contents</b> Students can take up small problems in the field of design and development or design refinement of farm machines or computer application in tractor and farm machinery design as mini project. It can be related to solution to an engineering problem, verification and analysis of experimental data available, comparative performance of various farm equipment, conducting experiments on various engineering subjects, studying a software tool for the solution of an engineering problem etc.
<b>3AE110, Dissertation Phase – I</b>
<b>Teaching Scheme</b> Lectures: 20 hours/week
<b>Course Outcomes</b> At the end of this course, students will be able to <ul style="list-style-type: none"> <li>• Expose to self-learning various topics.</li> <li>• Survey the literature such as books, national/international refereed journals and contact resource persons for the selected topic of research.</li> <li>• Learn to write technical reports.</li> <li>• Develop oral and written communication skills to present and defend their work in front of technically qualified audience.</li> </ul>
<b>Guidelines</b> The Project Work will start in semester III and should preferably be a problem with research potential and should involve scientific research, design, generation/collection and analysis of data, determining solution and must preferably bring out the individual contribution. Seminar should be based on the area in which the candidate has undertaken the dissertation work as per the common instructions for all branches of M. Tech. The examination shall consist of the preparation of report consisting of a detailed problem statement and a literature review. The preliminary results (if available) of the problem may also be discussed in the report. The work has to be presented in front of the examiners panel set by Head and PG coordinator. The candidate has to be in regular contact with his guide and the topic of dissertation must be mutually decided by the guide and student.
<b>4AE111, Dissertation Phase – II</b>
<b>Teaching Scheme</b> Lectures: 32 hours/week
<b>Course Outcomes</b>

## COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)

At the end of this course, students will be able to

- Use different experimental techniques.
- Use different software/ computational/analytical tools.
- Design and develop an experimental set up/ equipment/test rig.
- Conduct tests on existing set ups/equipments and draw logical conclusions from the results after analyzing them.
- Work in a research environment or in an industrial environment.
- Conversant with technical report writing.
- Present and convince their topic of study to the engineering community.

### Guidelines

It is a continuation of Project work started in semester III. He has to submit the report in prescribed format and also present a seminar. The dissertation should be presented in standard format as provided by the department. The candidate has to prepare a detailed project report consisting of introduction of the problem, problem statement, literature review, objectives of the work, methodology (experimental set up or numerical details as the case may be) of solution and results and discussion. The report must bring out the conclusions of the work and future scope for the study. The work has to be presented in front of the examiners panel consisting of an approved external examiner, an internal examiner and a guide, co-guide etc. as decided by the Head and PG coordinator. The candidate has to be in regular contact with his guide.

## PROGRAMME ELECTIVES – I

<b>1AE112, Computational Methods</b>
<b>Teaching Scheme</b> Lectures: 3 hours/week
<b>Course Outcomes</b> At the end of this course, students will be able to <ul style="list-style-type: none"> <li>• Acquaint with comprehensive concept of differentiation and standard integration.</li> <li>• Methodical explanation of Numerical integration, Area under and between the curves, volume of solids, centroids of simple shapes.</li> <li>• Have meticulous knowledge for the presentation of statistical data and presentation into arguments from scale, graphical methods and stochastic models.</li> </ul>
<b>Syllabus Contents</b>  <b>Unit I:</b> Introduction to differentiation, Functional notation, Gradient of a curve, Differentiation from first principles, Methods of differentiation, Some applications of differentiation, , Integration using algebraic substitutions, trigonometric substitutions and partial fractions.  <b>Unit II:</b> Numerical integration, Area under and between the curves, Mean and root square values, Volume of solids, Centroids of simple shapes.  <b>Unit III:</b> First order differential equations, First-order linear differential equations, Linear equations of second order with constant coefficients, First-order separable equations, Euler's method, Systems and equations of higher order, Comparison of the methods.

**COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL  
ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)**

**Unit IV:** Presentation of statistical data, Measures of central tendency and dispersion, Probability, Binomial and Poisson distribution, Normal distribution, Linear Correlation, Linear regression, Sampling and estimation theories.

**Unit V:** Introduction, Arguments from scale, Graphical methods, Approaches to differential equations, Quantitative differential equations, Stochastic models.

**References**

1. Edward A. Bender. An Introduction to Mathematical Modeling. John Wiley & Sons. Fourth edition
2. Steven C. Chapra. Applied Numerical Methods with MATLAB for Engineering and Science. 2nd Ed.
3. John Bird. Engineering Mathematics. Newnes Publication. Fourth Edition.
4. Joe D. Hoffman. Numerical Methods for Engineers and Scientists. Marcel Dekker, Inc. New York. Second Edition.

**1AE113, Soil Water and Crop Environmental Engineering**

**Teaching Scheme**

Lectures: 3 hours/week

**Course Outcomes**

At the end of this course, students will be able to

- Acquaint and equip with the process of soil-water plant relationship and their interaction for crop growth.
- Acquaint and equip with the hydraulics and process of water flow in the water bearing formation under saturated as well as unsaturated condition.

**Syllabus Contents**

**Unit I:** Aerial and edaphic environments for plant growth, energy and mass transfer in and above crop growth.

**Unit II:** Climatic changes and plant response to environmental stresses, evapo-transpiration models. Instrumentation and techniques for monitoring plant environments.

**Unit III:** Processes and aspects of growth and development, soil-root interface, root sink functions.

**Unit IV:** Water movement in soil-plant atmosphere continuum, artificial environments and plant behavior. Unsaturated flow theory, Infiltration and capillary rise flux dynamics. Hydro-dynamic dispersion in soil-aquifer system.

**Unit V:** Design and operation of controlled environment facilities and their instrumentation. Crop growth and yield modeling.

**References:**

1. Ghildyal BP & Tripathy RP. 1987. Fundamental of Soil Physics. Wiley Eastern.

**COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL  
ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)**

2. Slaty OP. 1967. Plant Water Relationship. Academic Press.
3. Harr Milton E. 1962. Groundwater and Seepage. McGraw-Hill
4. Jacob Beer 1972. Dynamics of Fluid Flow in Porous Media. Elsevier
5. Muskat M & Wyckoff RD. 1946. The Flow of Homogeneous Fluids through porous Media. JW Edwards.
6. Patrick A Domenico & Schwartz FW. 1998. Physical and Chemical Hydrology. John Willey & Sons.
7. Remson I, Hornberger GM & Moiz Fred J. 1971. Numerical Methods in Subsurface Hydrology. Wiley Interscience.

**1AE114, Advanced Groundwater Hydrology**

**Teaching Scheme**

Lectures: 3 hours/week

**Course Outcomes**

At the end of this course, students will be able to

- Have comprehensive definition of Aquifers and hydraulic characteristics of aquifers.
- Methodical explanation of aquifers-well hydraulics.
- Have meticulous knowledge for the well interference, pumping tests and determination of aquifer parameters.
- Acquaint and equip with the safe yield and basin-wide ground water development.

**Syllabus Contents**

**Unit I:** Basic principles of ground water flow. Ground water investigation. Properties affecting groundwater storage and movement, Groundwater balance studies.

**Unit II:** Well hydraulics. Two dimensional flow, Steady state flow in confined, unconfined and semi-confined aquifers, Partial penetrating wells. Steady and unsteady flow through fully penetrating and partially penetrating wells in confined, semi-confined and unconfined aquifers.

**Unit III:** Well interference, Pumping tests and determination of aquifer parameters. Flow through non-penetrating wells. Determination of aquifer parameters by pumping test data analysis.

**Unit IV:** Well design. Groundwater recharges basins and injection wells. Construction and Development of tube wells.

**Unit V:** Safe yield and basin-wide ground water development, Techniques for groundwater recharge. Groundwater quality management. Ground water models

**References**

1. Boonstra, J. and de Ridder, N.A. 1981. Numerical Modelling of Groundwater Basins. ILRI.
2. Domenico, P.A. 1972. Concept and Models in Groundwater Hydrology. Mc Graw Hill.

## COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)

3. Garg, S.K. 1999. *Irrigation Engineering and Hydraulic Structures*. Khanna Publishers.
4. Hantush, M.S. (Ed.). 1964. *Advances in Hydro Sciences*. Vol. 1, Academic Press.
5. Harr, M.E. 1990. *Ground Water and Seepage*. Wiley Eastern.
6. Huisman, L. 1972. *Groundwater Recovery*. Mc Millan.
7. Michael, A.M., Khepar, S.D. and Sondhi, S.K. 2008. *Water Wells and Pumps*. Tata McGraw-Hill Publishing Co. Ltd.
8. Nagabhushaniah, H.S. 2001. *Groundwater in Hydrosphere*. CBS Publishers and Distributors.
9. Polubarinova Kochina, P. Y. 1962. *Theory of Ground Water Movement*. Princeton University Press.
10. Raghunath, H.M. 1992. *Ground Water*. Wiley Eastern.
11. Todd, D.K. 1997. *Ground Water Hydrology*. Wiley Eastern.

### PROGRAMME ELECTIVES – II

<b>1AE115, Aquacultural Engineering</b>
<b>Teaching Scheme</b> Lectures: 3 hours/week
<b>Course Outcomes</b> At the end of this course, students will be able to <ul style="list-style-type: none"> <li>• Outline the concept and flow types, properties and phenomenon in aquacultural system and quality management.</li> <li>• Acquaint and equip with the selection, planning and process for design of farm, aquacultural system and quality management.</li> </ul>
<b>Syllabus Contents</b>  <b>Unit I:</b> Open channel flow, pipe flow, type of open channel flows, open channel and their properties, velocity distribution in open channels, local phenomenon in open channel flow, Critical flow,  <b>Unit II :</b> Chemical equilibrium, important water quality parameter; pH, carbon dioxide, nitrogenous compounds, nitrogen cycle, phosphorous cycle, BOD, COD, DO, C:N ratio, fertilization and liming of pond.  <b>Unit III :</b> Selection of suitable site for aquacultural project, topography, type of soil and its quality, water supply, drainage, environmental considerations, process of farm design, computations for water requirement, seepage and evaporation, types of ponds and their designs, dykes, pump fed farm, tide fed farm.  <b>Unit IV:</b> Aerator, need of aeration, type of aerators: Diffuser aerators, Propeller-aspirator pump aerator, paddle wheel aerator and cascade aerator, design of surface water aeration system,



**COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL  
ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)**

recirculating aquaculture systems, component of recirculating aquaculture system, advantages and disadvantages of RAS.

**Unit V:** Type of hatchery, component of hatchery, design and construction of carp hatchery, design of commercial freshwater prawn hatchery.

**References**

1. Chow, Ven TE, Open Channel Hydraulics, McGraw-Hill International BOOK Company.
2. Lawson, Thomas B., Fundamental of Aquacultural Engineering, Springer
3. Boyad, C.E. and Toker C.S. Pond Aquaculture Water Quality Management, Springer.
4. Timmons. B. Michal, Recirculating Aquacultural System. Ithaca Publishing Company.

**1AE116: Water Resources System Engineering**

**Teaching Scheme**

Lectures: 3 hours/week

**Course Outcomes**

At the end of this course, students will be able to

- Familiarize with the nature, concepts and significance of optimization of water resources systems.
- Acquaint and equip with techniques for optimization of water resources for achieving maximum output.

**Syllabus Contents**

**Unit I:** The nature of water resources systems: Systems analysis - the jargon used. The methods of systems analysis.

**Unit II:** Concepts and significance of optimization in water resources, objective functions, deterministic and stochastic inputs.

**Unit III:** Mathematical programming techniques, Linear programming models - concept of simplex tableau, its working principles - the two phases of simplex method - revised simplex method - duality, decomposition principle - post optimality analysis. Transportation problem.

**Unit IV:** Non-linear programming of simple cases. Dynamic programming - multi stage decision process - computational procedure in Dynamic programming – Stochastic linear and Dynamic programming

**Unit V:** Development and management including conjunctive use, crop production functions

## COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)

and irrigation optimization. basic concepts of probability - application of systems analysis to water resources systems in particular.

### References

1. Larry WM. 1996. Water Resources Handbook. McGraw-Hill.
2. Loucks DP et al. 1981. Water Resources System Planning and Analysis. Prentice Hall.
3. Rao SS. 1978. Optimization Theory and Applications. Wiley Eastern.

### 1AE117, Soil and Water Systems' Simulation and Modelling

#### Teaching Scheme

Lectures: 3 hours/week

#### Course Outcomes

At the end of this course, students will be able to

- Familiarize with the complexity of resources management process and systems analysis.
- Methodical explanation of flow parameters and capacity simulation in water management system.
- Acquaint and equip the students with the simulation of soil water systems and modeling techniques.

#### Syllabus Contents

**Unit I:** Systems engineering for water management; Complexity of resources management process, systems analysis.

**Unit II:** Rainfall-runoff models - Infiltration models, Simulation methods, structure of a water balance model.

**Unit III:** Channel and calibration – Stream flow statistics, surface water storage requirements.

**Unit IV:** Flood control storage capacity; total reservoir capacity - surface water allocations. Ground water models.

**Unit V:** Design of nodal network, General systems frame work – Description of the model; Irregular boundaries, General –Numerical approaches.

#### References

1. Ramesh, K. 2009. E-book on Experimental Stress Analysis. IIT Madras. [http://apm.iitm.ac.in/smlab/kramesh/book\\_5.htm](http://apm.iitm.ac.in/smlab/kramesh/book_5.htm)
2. Dally, J.W. and Riley, W.F. 1991. Experimental Stress Analysis, McGraw-Hill, New York.
3. Sharpe, W.N. 2008. Handbook of Experimental Solid Mechanics. Springer, Netherlands.
4. Pant, B., Gargsha, G., Lingaiah, K., Ramachandra, K., Srinath, L.S. and Raghavan, M.R. 1984. Experimental Stress Analysis. Tata McGraw Hill, New Delhi.

**COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL  
ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)**

**PROGRAMME ELECTIVES – III**

<b>2AE118, Soil and Water Conservation Structural Engineering</b>
<b>Teaching Scheme</b> Lectures: 3 hours/week
<b>Course Outcomes</b> At the end of this course, students will be able to <ul style="list-style-type: none"> <li>• Acquaint and equip students with the process of degradation soil and water conservation and their remedial measures including design of structures.</li> <li>• Have comprehensive knowledge of theory and procedure for hydrologic, hydraulic and structural design of soil and water conservation structures.</li> </ul>
<b>Syllabus Contents</b>  <b>Unit I:</b> Layout and planning of soil and water conservation measures; Probability and continuous frequency distribution; Fitting empirical distributions.  <b>Unit II:</b> Design principles of soil and water structures including contour bunds and terraces; Gully control measures.  <b>Unit III:</b> Hydraulic jump and energy dissipators for soil conservation structures; hydrologic, hydraulic and structural design of drop structures.  <b>Unit IV:</b> Sediment deposition process. Estimation of sediment load, earthen dams, seepage through dams and stability analysis.  <b>Unit V:</b> Rainwater harvesting, Flood control and stream bank protection measures.
<b>References</b> <ol style="list-style-type: none"> <li>1. Suresh, R. Soil and Water Conservation Engineering. Standard Publishers, and Distributors, New Delhi</li> <li>2. Schwab, G. O., Fangeir, D. D., Edminister, W. T., and Frevert, R.K. Soil and Water Conservation Engineering, John Wiley and Sons.</li> <li>3. Murty, V.V.N. and Jha, M. K. Land and Water Management Engineering. Kalyani Publisher, Ludhiana, India</li> <li>4. Tideman, E.M. Watershed Management (Guidelines for Indian Conditions) Omega Scientific Publishers, New Delhi.</li> <li>5. Sing, Rajvir. Watershed Planning and Management. Yash Publishing House, Bikaner.</li> <li>6. Dhruvanarayan, V.V. Sastry, G., Patnaik, V. S. Watershed Management. Publ. And Inf. Div. ICAR, New Delhi.</li> <li>7. Grade RJ &amp; Ranga Raju KG 1977. Mechanics of Sediment Transport and Alluvial Stream Problems. Weilley Eastern.</li> <li>8. Gurmeh Singh et al. 1994. Manual of Soil and Water Conservation Practices. Oxzford &amp; IBH.</li> <li>9. Hundson N. 1971. Soil Conservation. B.T.Batsford Ltd.</li> </ol>

**COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL  
ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)**

10. USDA .1969. A Manual on Conservation of Soil and Water. Oxford & IBH.

**2AE119: Open Channel Hydraulics and Coastal Engineering**

**Teaching Scheme**

Lectures: 3 hours/week

**Course Outcomes**

At the end of this course, students will be able to

- Acquire insight about the open channel and their properties.
- Acquaint and equip with the hydraulics of surface water flow phenomenon in open channels.
- Capable to analyze flow profile analysis.
- Generate scenarios of protection of coastline- structure and forces acting on them.
- Address the pertinent coastal protection planning for design of aquacultural farm.

**Syllabus Contents**

**Unit I:** Open Channel and their Properties, Energy and Momentum Principle, Critical Flow, Uniform Flow, Design of Channels for Uniform flow.

**Unit II:** Gradually Varied Flow, Flow Profile Analysis, Flow Over Spillway, Hydraulic Jump, Flow Through Non-prismatic Channel, Gradually Varied Unsteady Flow.

**Unit III:** Equilibrium and Dynamic Theory of Tides, Types of Tides and Tidal Theory, Tidal Propagation in the Channel, Estuaries and Coastal Inlets, Tidal Mixing.

**Unit IV:** Properties of Ocean Water, Provinces of Ocean, Generation and Prediction of waves, Propagation and Transformation of Waves, Longshore Currents, Rip Current, Littoral Transport,

**Unit V:** Artificial Protection of Coastline- Structure and forces acting on them, Coastal Protection Planning for Design of Aquacultural Farm.

**References**

1. Chaudhry MH. 1993. Open Channel Flow. Prentice Hall.
2. Chow VT.1959. Open Channel Hydraulics. Mc-Graw Hill.
3. Henederson FM. 1966. Open Channel Flow. Macmillan.
4. Modi, P.N. and S.M.seth. 2000. Hydraulics and Fluid Mechanics, Standard Book House.

**2AE120: Environmental Engineering Fundamentals**

**Teaching Scheme**

Lectures: 3 hours/week

**Course Outcomes**

At the end of this course, students will be able to

- Perceive the different issues, domains and management of environmental engineering
- Have meticulous knowledge for the environmental quality (water and air pollution) and control.

## COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)

### Syllabus Contents

**Unit I:** Introduction to environmental engineering, Domains of environmental engineering, History of environmental engineering, Environmental issues of emerging concern, laws and regulations, Environmental engineering management, Development of environmental regulations, environmental legislation in India, environmental ethics.

**Unit II:** Ecology and the environment, Ecosystems, Nutrient cycles, Biodiversity, Ecology and the environment, Limnology, Water budget, Population growth.

**Unit III:** Overview of chemistry, Mass relationships, Units of measurement, Equilibrium, Acid-base reactions, Solubility reactions, Redox reactions, Chemical reaction rates; Mass balance.

**Unit IV:** Overview of microbiology, Microbes in the environment, Microbes in engineering systems, Microbial energetic, Microbial growth kinetics, Microbial genetics; Microbial diseases.

**Unit V:** Environmental quality, Water pollution (Organic pollutants, Inorganic pollutants, Physical pollutants), Water pollution (Oxygen sag curve), Air pollution (Greenhouse gases; Hazardous gases), Pollution control (Wastewater treatment), Pollution control (Water treatment; Desalination & Membranes; Land-based treatment)

### References

1. Davis M.L., Cornwell D.A., "Introduction to Environmental Engineering", Tata McGraw Hill Education (P) Ltd., New Delhi
2. De A.K., "Environmental Chemistry ", New Age International (P) Ltd., New Delhi.
3. Khopkar S.M., "Environmental Pollution Analysis", New Age International (P) Ltd., New Delhi.
4. Cunningham W.P., Cunningham M.A., "Principles of Environmental Science", Tata McGraw Hill
5. Krishnamoorthy B., "Environmental Management, Text Book and Cases", PHI Learning (P) Ltd.
6. Chandrappa R., Das D.B., "Solid Waste Management: Principals and Practice"
7. Pelczar, M., J.Chan E.C.S. and Krieg, N. R. Microbiology, Tata McGraw Hill, New Delhi.
8. Droste R.L., "Theory and Practice of Water and Wastewater Treatment", Wiley India (P) Ltd.
9. Dara S.S., "A Textbook of Environmental Chemistry and Pollution Control", S. Chand and Company Ltd., New Delhi.

**COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL  
ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)**

**PROGRAMME ELECTIVES – IV**

<b>2AE121, Modelling of Aquaculture &amp; Fisheries Systems</b>
<b>Teaching Scheme</b> Lectures: 3 hours/week
<b>Course Outcomes</b> At the end of this course, students will be able to <ul style="list-style-type: none"> <li>• Acquire insight about the importance of Modelling of Aquaculture and Fisheries System</li> <li>• Acquaint and equip with model parameters and calibration of model – testing and validating of model – simulation and forecasting</li> <li>• Suggest fish growth model – pond ecosystem model.</li> </ul>
<b>Syllabus Contents</b> <b>Unit I:</b> Modelling –Modelling terminology - systems and models – constraints to modelling aquaculture systems.  <b>Unit II:</b> Modelling aquaculture systems – need – tools for theoretical analysis study of interactions, use of mathematics and computers.  <b>Unit III:</b> Empirical modelling – collection and organizing data and calculations, Theoretical models – developing a frame of reference, defining model objectives, determination of model components – relationship between model components –  <b>Unit IV:</b> Estimation of model parameters and calibration of model – testing and validating of model – simulation and forecasting.  <b>Unit V:</b> Application of modelling in Aquaculture – fish growth model – pond ecosystem model – dissolved oxygen model, ammonia model, water temperature model, salinity model, recirculating aquaculture model.
<b>References</b> <ol style="list-style-type: none"> <li>1. Fikret Berkes, Robin Mahon, Patrick mcconney, Richard Pollnac, and Robert Pomeroy. Managing Small-scale Fisheries. International development research centre. New Delhi.</li> <li>2. Bernard A. Megrey l Erlend Moksness Editors. Computers in Fisheries Research. Second Edition. Springer.</li> <li>3. Robert R. Stickney. Aquaculture: An introductory text. CABI Publishers.</li> </ol>

<b>2AE122, Water Quality Management</b>
<b>Teaching Scheme</b> Lectures: 3 hours/week
<b>Course Outcomes</b> At the end of the course, students will be

## COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)

- Aware of the importance and the scope of water quality monitoring and management.
- Able to select water and its characteristics for treatment.
- Acquaint with mathematical interpretation and fundamental expression of pollution transport.

### Syllabus Contents

**Unit I:** Need for water quality data, Water quality monitoring, The most frequent pollutants in a river, Drinking water standards, Regulations and goals, Chemical principles, Sources water composition and watershed protection, Water quality regulations and policy development, Surface water quality sampling and canals, Groundwater sampling, Economic quantity of water: Demand, Prices, Rate structures, Water supply economics.

**Unit II:** Equalisation, Screening, Shredding, Grit removal, Sedimentation, Floatation, Filtration, Membrane filtration, Temperature control, Mixing, Evaporative treatment, Pumping systems.

**Unit III:** Chemical oxidation/reduction, pH control, Metal precipitation, Coagulation and flocculation, Disinfection, Air stripping, Adsorption of aqueous compounds, Ion exchange.

**Unit IV:** The theory of biological treatment, Aerobic biological treatment, Anaerobic biological treatment, Anoxic biological treatment, Constructed wetlands for wastewater treatment, Wastewater microbiology.

**Unit V:** Mathematical interpretation of pollution transport, Fundamental expressions, Dispersion in rivers and streams, The biochemical pollution, Application of the general differential equations, Interpretation in the finite terms, Progress in numerical modeling: The finite difference method, The finite element method.

### References

1. A. P. Sincero and G. A. Sincero. Physical–chemical treatment of water and wastewater. CRC Press.
2. M. L. Davis. Water and Wastewater Engineering: Design Principles and Practice. The McGraw-Hill Companies, Inc.
3. S. D. Lin. Water and Wastewater Calculations Manual. The McGraw-Hill Companies, Inc.
4. Y. Li and K. Migliaccio. Water Quality Concepts, Sampling, and Analyses. CRC Press.
5. F. R. Spellman. Water Treatment Operations: Math Concepts and Calculations. CRC Press.
6. R. S. Ramalho. Introduction to Wastewater Treatment Processes. Academic Press Inc.

### 2AE123, Statistical Methods in Agriculture

#### Teaching Scheme

Lectures: 3 hours/week

## COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)

### Course Outcomes

- Acquaint with comprehensive concept of probability distributions.
- Methodical explanation of tests of hypothesis.
- Have meticulous knowledge for the Design and analysis of experiments
- Outline the concept and methods of experimental data analysis using SPSS, Systat and Statistica etc.

### Syllabus Contents

**Unit I:** Probability, discrete random variables and probability distributions. Continuous random variables and probability distributions.

**Unit II:** Tests of hypothesis for a single sample, statistical influence for two samples.

**Unit III:** Simple linear regression and correlation, multiple linear regression, hypothesis tests.

**Unit IV:** Design and analysis of experiments with single factor and several factors. Analysis of variance, statistical quality controls.

**Unit V:** Introduction to SPSS, Systat and Statistica.

### References

1. Jaggi, S., Varghese, C.V., Batra, P.K. and Sharma, V.K. 2015. Statistical Methods for Agricultural Research. IASRI, New Delhi. [http://www.iasri.res.in/ebook/EB\\_SMAR/](http://www.iasri.res.in/ebook/EB_SMAR/)
2. Bayo, L. 2014. Applied Statistical Methods in Agriculture, Health and Life Sciences. Springer International Publishing Switzerland.
3. Mead, R. Curnow, R.N. and Hasted, A.M. 2002. Statistical Methods in Agriculture and Experimental Biology, 3<sup>rd</sup> Edition. CRC Press, Taylor and Francis Group, New York.
4. Welham, S.J., Gezan, S.A., Clark, S.J. and Mead, A. 2014. Statistical Methods in Biology: Design and Analysis of Experiments and Regression. CRC Press, New York.

## PROGRAMME ELECTIVES – V

<b>3AE124, Water and Wastewater Treatment Engineering</b>
<b>Teaching Scheme</b> Lectures: 3 hours/week
<b>Course Outcomes</b> <ul style="list-style-type: none"> <li>• Aware of the importance and the scope of waste water treatment and management.</li> <li>• Outline the concept and methods of waste water treatment processes.</li> <li>• Acquaint and equip with techniques of water and wastewater treatment and management.</li> </ul>
<b>Syllabus Contents</b> <b>Unit I:</b> Total Water Management - Hydrologic Cycle, Supply and Demand, Regulations, Watershed Management, Ground and Surface Water, Hydrology, Overview of Water Treatment -



**COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL  
ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)**

Supply Water Characteristics, Water Quality, Drinking Water Standards, Water Chemistry, Chemical Reaction and Kinetics, Water Conveyance and Distribution, Hydraulics

**Unit II:** Conventional Water Treatment Processes - Aeration, Sedimentation, Rapid Mixing, Flocculation, Coagulation, Filtration, Disinfection, Fluoridation, Water Softening, Turbidity Removal, Taste and Odor Control, Advanced Water Treatment Processes - Ion Exchange, Ozonation, Adsorption, Ultra Filtration, Membrane Processes, UV Disinfection

**Unit III:** Overview of Wastewater Management - Wastewater Characteristics, Flows and Pollutant Loads, Biochemistry and Microbiology, Sanitary and Stormwater Collection Systems, Effluent Quality Standards, Receiving Stream Quality, Design Standards, Economic Analysis

**Unit IV:** Wastewater Preliminary and Primary Treatment Processes - Screening, Grit Removal, Sedimentation, Secondary Wastewater Treatment Processes - Activated Sludge, Trickling Filters, Rotating Biological Contactors, Stabilization Ponds, Lagoons, Aeration, Clarification, Filtration, Chlorination-Dechlorination

**Unit V:** Advanced Wastewater Treatment Processes - Chemical Coagulation, Carbon Adsorption, Phosphorus Removal, Nitrogen Removal (Nitrification/Denitrification), Media Filtration, UV Disinfection, Solids Handling Processes - Gravity Thickening, Flotation Thickening, Dewatering, Pressure Filtration, Stabilization, Aerobic and Anaerobic Digestion, Composting, Drying, Incineration, Land filling, Land Application

**References**

1. Water, waste water and storm water infrastructure management by Neil S Grigg
2. Water, sanitary and waste services for buildings by a F E Wise and J A Swaffield
3. Handbook of water treatment by Kurita water industries limited, Japan
4. Standard handbook of environmental engineering by Robert A Corbitt
5. Sanitation and water supply handbook by Tony Gage
6. Handbook of water and wastewater treatment technologies by Nicholas P. Cheremisinoff

**3AE125, GIS and RS–Principles and Application in Land and Water Resources**

**Teaching Scheme**

Lectures: 3 hours/week

**Course Outcomes**

- Have comprehensive knowledge of Principles of GIS and Remote Sensing tools, their

**COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL  
ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)**

<p>types and capabilities.</p> <ul style="list-style-type: none"> <li>• Have exhaustive concept and approach to identify and quantitative estimates of hydro-meteorological parameters.</li> <li>• Acquaint and equip with techniques of remote sensing and application of GIS for land and water resources management.</li> </ul>
<p><b>Syllabus Contents</b></p> <p><b>Unit-I</b> Principles of Geographical Information System tools, their types and capabilities, Advantages of GIS over conventional methods. Basic principle of remote sensing, sensor, platforms, data analysis,</p> <p><b>Unit-II</b> Principal remote sensing approach for quantitative estimates of precipitation, runoff, evapotranspiration. visible and infrared techniques, space borne radar, ground based radar, cloud indexing methods, thresh holding methods, life history methods microwave radiometry</p> <p><b>Unit-III</b> General approach for measuring soil moisture, Gamma radiation techniques, visible/near-infrared techniques, thermal, microwave techniques.</p> <p><b>Unit-IV</b> Importance of ground truth establishment, exploration of groundwater with satellite imagery, principles of image analysis, imagery selection, water quality.</p> <p><b>Unit-V</b> GIS and remote sensing for land and water resources data collection, analysis and interpretation, Application of GIS in water and land resource development and management.</p>
<p><b>References</b></p> <ol style="list-style-type: none"> <li>1. Sabins, J.R. Remote Sensing Principles and Interpretations. W. H. Freeman &amp; Co.</li> <li>2. Burrough, P. A. Principles of GIS for Land Resources Assessment</li> <li>3. Shultz, G. A. and Engman, E. T. Remote Sensing in Hydrology and Water Management, Springer, New York.</li> <li>4. Crisman Nicholas. Exploring GIS. John Wiley and Sons.</li> <li>5. Heywood, Ian., Cornelius Sarah and Carver Steve. An Introduction to GIS, Addison-Wesley-Longman.</li> <li>6. Dew Mess MN. 2004. Fundamental of Geographic Information System. John Wiley &amp; Sons.</li> <li>7. Lille Sand T &amp; Kaiffer R. 1987. Remote Sensing and Image Interpretation. John Wiley &amp; Sons.</li> <li>8. Sabbins F. 1987. Remote Sensing Principle and Interpretation. Freeman.</li> </ol>
<p><b>3AE126, Design of Pumps for Irrigation and Drainage</b></p>
<p><b>Teaching Scheme</b> Lectures: 3 hours/week</p>

## COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)

### Course Outcomes

- Acquire insight about the basic hydraulic design of pump.
- Acquaint and equip with requirement of pumps for irrigation and drainage system and their design features.
- Capable to select pertinent parameters and design criteria for pumping systems.
- Analyze techno-economic feasibility of designed pumping system.

### Syllabus Contents

**Unit I:** Basic hydraulic design of centrifugal pump, water hammering problem in centrifugal pump.

**Unit II:** Principle and performance characteristics of vertical turbine pump, submersible pump and axial flow pump.

**Unit III:** Non-conventional energy sources for pumping, wind mills, micro turbines, solar pumps, hydraulic ram – their

**Unit IV:** Selection and design criteria. Energy conservation measures for pumping systems.

**Unit V:** Power requirements in pumping, techno-economic evaluation.

### References

1. Church AH & Jagadish Lal. 1973. *Centrifugal Pumps and Blowers*. Metropolitan Book Co.
2. Michael AM, SD Khepar & SK Sondhi. 2008. *Water Wells and Pumps*. Tata McGraw-Hill Publishing Co. Ltd.
3. Michael AM. 1990. *Irrigation Theory and Practice*. Vikas Publ. House.
4. Modi PN & Seth SM. 2000. *Hydraulics and Fluid Mechanics*. Standard Book House.

## AUDIT COURSES

1ST101, Research Methodology and IPR
<b>Teaching Scheme</b> Lectures: 2 hours/week
<b>Course Outcomes</b> At the end of this course, students will be able to <ul style="list-style-type: none"> <li>• Understand research problem formulation.</li> <li>• Analyze research related information.</li> <li>• Follow research ethics</li> <li>• Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.</li> <li>• Understanding that when IPR would take such important place in growth of individuals &amp; nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general &amp; engineering in particular.</li> <li>• Understand that IPR protection provides an incentive to inventors for further research work</li> </ul>

## COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)

and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.
<p><b>Syllabus Contents</b></p> <p><b>Unit I:</b> Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations.</p> <p><b>Unit II:</b> Effective literature studies approaches, analysis. Plagiarism, Research ethics.</p> <p><b>Unit III:</b> Effective technical writing, how to write report, Paper. Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee</p> <p><b>Unit IV:</b> Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.</p> <p><b>Unit V:</b> Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.</p> <p><b>Unit 6:</b> New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and other institutes.</p> <p><b>References</b></p> <ol style="list-style-type: none"> <li>1. Stuart Melville and Wayne Goddard, "Research methodology: An introduction for science &amp; engineering students"</li> <li>2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"</li> <li>3. Ranjit Kumar, 2<sup>nd</sup> Edition, "Research Methodology: A Step by Step Guide for beginners"</li> <li>4. Halbert, "Resisting Intellectual Property", Taylor &amp; Francis Ltd, 2007.</li> <li>5. Mayall, "Industrial Design", McGraw Hill, 1992.</li> <li>6. Niebel, "Product Design", McGraw Hill, 1974.</li> <li>7. Asimov, "Introduction to Design", Prentice Hall, 1962.</li> <li>8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New Technological Age", 2016.</li> <li>9. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008.</li> </ol>
<b>1ST102, English for Research Paper Writing</b>
<p><b>Teaching Scheme</b> Lectures: 2 hours/week</p>
<p><b>Course Objectives</b> Students will be able to:</p> <ul style="list-style-type: none"> <li>• Understand that how to improve your writing skills and level of readability</li> <li>• Learn about what to write in each section</li> </ul>

## COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)

- Understand the skills needed when writing a Title
- Ensure the good quality of paper at very first-time submission

### Syllabus Contents

**Unit I:** Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

**Unit II:** Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

**Unit III:** Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

**Unit IV:** Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature.

**Unit V:** Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions

**Unit 6:** Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

### Suggested Studies

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book.
4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011.

## 1ST103, Disaster Management

### Teaching Scheme

Lectures: 2 hours/week

### Course Objectives

Students will be able to:

- Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the

**COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL  
ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)**

countries they work in
<p><b>Syllabus Contents</b></p> <p><b>Unit I: Introduction</b> Disaster: Definition, Factors and significance; Difference between hazard and disaster; Natural and manmade disasters: Difference, Nature, Types and magnitude.</p> <p><b>Unit II: Repercussions of Disasters and Hazards:</b> Economic damage, Loss of human and animal life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and famines, Landslides and avalanches, Man-made disaster: Nuclear reactor meltdown, Industrial accidents, Oil slicks and spills, Outbreaks of disease and epidemics, War and conflicts.</p> <p><b>Unit III: Disaster Prone Areas in India</b> Study of seismic zones; Areas prone to floods and droughts, Landslides and avalanches; Areas prone to cyclonic and coastal hazards with special reference to tsunami; Post-disaster diseases and epidemics</p> <p><b>Unit IV: Disaster Preparedness and Management</b> Preparedness: Monitoring of phenomena triggering a disaster or hazard; Evaluation of risk: Application of remote sensing, Data from meteorological and other agencies, Media reports: Governmental and community preparedness.</p> <p><b>Unit V: Risk Assessment</b> Disaster risk: Concept and elements, Disaster risk reduction, Global and national disaster risk situation. Techniques of risk assessment, Global Co-operation in risk assessment and warning, People's participation in risk assessment. Strategies for survival.</p> <p><b>Unit 6: Disaster Mitigation</b> Meaning, Concept and strategies of disaster mitigation, Emerging trends in mitigation. Structural mitigation and non-structural mitigation, Programs of disaster mitigation in India.</p> <p><b>Suggested Readings</b></p> <ol style="list-style-type: none"> <li>1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies", New Royal Book Company.</li> <li>2. Sahni, Pardeep et al. (Eds.), "Disaster Mitigation Experiences And Reflections", Prentice Hall of India, New Delhi.</li> <li>3. Goel S. L. "Disaster Administration And Management Text And Case Studies", Deep &amp; Deep Publication Pvt. Ltd., New Delhi.</li> </ol>

<b>1ST104, Sanskrit for Technical Knowledge</b>
<p><b>Teaching Scheme</b></p> <p>Lectures: 2 hours/week</p> <p><b>Course Objectives</b></p> <ul style="list-style-type: none"> <li>• To get a working knowledge in illustrious Sanskrit, the scientific language in the world</li> <li>• Learning of Sanskrit to improve brain functioning</li> <li>• Learning of Sanskrit to develop the logic in mathematics, science &amp; other subjects enhancing the memory power</li> <li>• The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature</li> </ul> <p><b>Syllabus Contents</b></p>

## COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)

**Unit I:** Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences  
**Unit II:** Order, Introduction of roots, Technical information about Sanskrit Literature  
**Unit III:** Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

### Suggested Readings

1. “Abhyaspustakam” – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi
2. “Teach Yourself Sanskrit” Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. “India’s Glorious Scientific Tradition” Suresh Soni, Ocean books (P) Ltd., New Delhi

### Course Outcomes

Students will be able to

- Understanding basic Sanskrit language
- Ancient Sanskrit literature about science & technology can be understood
- Being a logical language will help to develop logic in students

## 1ST105, Value Education

### Teaching Scheme

Lectures: 2 hours/week

### Course Objectives

Students will be able to

- Understand value of education and self- development
- Imbibe good values in students
- Let the should know about the importance of character

### Syllabus Contents

**Unit I:** Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism.

Moral and non- moral valuation. Standards and principles.

Value judgments

**Unit II:** Importance of cultivation of values.

Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National unity.

Patriotism. Love for nature, Discipline

**Unit III:** Personality and Behavior Development - Soul and scientific attitude. Positive thinking.

Integrity and discipline.

Punctuality, Love and kindness.

Avoid fault Thinking.

Free from anger, Dignity of labour.

Universal brotherhood and religious tolerance.

True friendship.

Happiness Vs suffering, love for truth.

Aware of self-destructive habits.

Association and Cooperation.

Doing best for saving nature

**Unit IV:** Character and Competence –Holy books Vs Blind faith.

Self-management and Good health.

Science of reincarnation.

Equality, Nonviolence, Humility, Role of Women.

## COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)

All religions and same message.  
Mind your Mind, Self-control.  
Honesty, Studying effectively

### **Suggested Readings**

Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi

### **Course Outcomes**

Students will be able to

- Knowledge of self-development
- Learn the importance of Human values
- Developing the overall personality

## **2ST106, Constitution of India**

### **Teaching Scheme**

Lectures: 2 hours/week

### **Course Objectives**

Students will be able to

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

### **Syllabus Contents**

**Unit I: History of Making of the Indian Constitution:** History, Drafting Committee (Composition & Working)

**Unit II: Philosophy of the Indian Constitution:** Preamble, Salient Features

**Unit III: Contours of Constitutional Rights & Duties:**

- Fundamental Rights
- Right to Equality
- Right to Freedom
- Right against Exploitation
- Right to Freedom of Religion
- Cultural and Educational Rights
- Right to Constitutional Remedies
- Directive Principles of State Policy
- Fundamental Duties.

**Unit IV: Organs of Governance:**

- Parliament
- Composition
- Qualifications and Disqualifications
- Powers and Functions
- Executive
- President



## COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)

- Governor
- Council of Ministers
- Judiciary, Appointment and Transfer of Judges, Qualifications
- Powers and Functions

### Unit V: Local Administration:

- District's Administration head: Role and Importance,
- Municipalities: Introduction, Mayor and role of Elected Representative
- CEO of Municipal Corporation.
- Pachayati raj: Introduction, PRI: Zila Pachayat.
- Elected officials and their roles, CEO Zila Pachayat: Position and role.
- Block level: Organizational Hierarchy (Different departments),
- Village level: Role of Elected and Appointed officials.
- Importance of grass root democracy

### Unit 6: Election Commission:

- Election Commission: Role and Functioning.
- Chief Election Commissioner and Election Commissioners.
- State Election Commission: Role and Functioning.
- Institute and Bodies for the welfare of SC/ST/OBC and women.

### Suggested Readings

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

### Course Outcomes

Students will be able to

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
- Discuss the passage of the Hindu Code Bill of 1956.

## 2ST107, Pedagogy Studies

### Teaching Scheme

Lectures: 2 hours/week

### Course Objectives

Students will be able to

- Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
- Identify critical evidence gaps to guide the development.

### Syllabus Contents

#### Unit I: Introduction and Methodology:

- Aims and rationale, Policy background, Conceptual framework and terminology

## COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)

- Theories of learning, Curriculum, Teacher education.
- Conceptual framework, Research questions.
- Overview of methodology and Searching.

### **Unit II: Thematic overview:**

- Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries.
- Curriculum, Teacher education.

### **Unit III: Evidence on the effectiveness of pedagogical practices**

- Methodology for the in depth stage: quality assessment of included studies.
- How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?
- Theory of change.
- Strength and nature of the body of evidence for effective pedagogical practices.
- Pedagogic theory and pedagogical approaches.
- Teachers' attitudes and beliefs and Pedagogic strategies.

### **Unit IV: Professional development: alignment with classroom practices and follow up support**

- Peer support
- Support from the head teacher and the community.
- Curriculum and assessment
- Barriers to learning: limited resources and large class sizes

### **Unit V: Research gaps and future directions**

- Research design
- Contexts
- Pedagogy
- Teacher education
- Curriculum and assessment
- Dissemination and research impact.

### **Suggested Readings**

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272-282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. [www.pratham.org/images/resource%20working%20paper%202.pdf](http://www.pratham.org/images/resource%20working%20paper%202.pdf).

### **Course Outcomes**

Students will be able to understand:

- What pedagogical practices are being used by teachers in formal and informal classrooms

## COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)

<p>in developing countries?</p> <ul style="list-style-type: none"> <li>• What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?</li> <li>• How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?</li> </ul>
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<b>2ST108, Stress Management By Yoga</b>	
<b>Teaching Scheme</b> Lectures: 2 hours/week	
<b>Course Objectives</b> <ul style="list-style-type: none"> <li>• To achieve overall health of body and mind</li> <li>• To overcome stress</li> </ul>	
<b>Syllabus Contents</b>	
<b>Unit I:</b> Definitions of Eight parts of yog. (Ashtanga)	
<b>Unit II:</b> Yam and Niyam. <ul style="list-style-type: none"> <li>• Do's and Don't's in life.</li> <li>• Ahinsa, satya, astheya, bramhacharya and aparigraha Shaucha, santosh, tapa, swadhyay, ishwarpranidhan</li> </ul>	
<b>Unit III:</b> Asan and Pranayam <ul style="list-style-type: none"> <li>• Various yog poses and their benefits for mind &amp; body Regularization of breathing techniques and its effects-Types of pranayam</li> </ul>	
<b>Suggested Readings</b> <ol style="list-style-type: none"> <li>1. "Yogic Asanas for Group Training-Part-I" : Janardan Swami Yogabhyasi Mandal, Nagpur</li> <li>2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata</li> </ol>	
<b>Course Outcomes</b> Students will be able to <ul style="list-style-type: none"> <li>• Develop healthy mind in a healthy body thus improving social health also</li> <li>• Improve efficiency</li> </ul>	

<b>2ST109, Personality Development Through Life Enlightenment Skills</b>	
<b>Teaching Scheme</b> Lectures: 2 hours/week	
<b>Course Objectives</b> <ul style="list-style-type: none"> <li>• To learn to achieve the highest goal happily</li> <li>• To become a person with stable mind, pleasing personality and determination</li> <li>• To awaken wisdom in students</li> </ul>	
<b>Syllabus Contents</b>	<b>Hours</b>
<b>Unit I:</b> Neetisatakam-Holistic development of personality <ul style="list-style-type: none"> <li>• Verses- 19,20,21,22 (wisdom)</li> <li>• Verses- 29,31,32 (pride &amp; heroism)</li> <li>• Verses- 26,28,63,65 (virtue)</li> <li>• Verses- 52,53,59 (don't's)</li> <li>• Verses- 71,73,75,78 (do's)</li> </ul>	8
<b>Unit II:</b> Approach to day to day work and duties.	8

## COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)

<ul style="list-style-type: none"> <li>• Shrimad Bhagwad Geeta : Chapter 2-Verses 41, 47,48,</li> <li>• Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,</li> <li>• Chapter 18-Verses 45, 46, 48.</li> </ul>	
<b>Unit III:</b> Statements of basic knowledge. <ul style="list-style-type: none"> <li>• Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68</li> <li>• Chapter 12 -Verses 13, 14, 15, 16,17, 18</li> <li>• Personality of Role model. Shrimad Bhagwad Geeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42,</li> <li>• Chapter 4-Verses 18, 38,39</li> <li>• Chapter18 – Verses 37, 38, 63</li> </ul>	8
<b>Suggested Readings</b> <ol style="list-style-type: none"> <li>1. “Srimad Bhagavad Gita” by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata</li> <li>2. “Bhartrihari’s Three Satakam (Niti-sringar-vairagya)” by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.</li> </ol>	
<b>Course Outcomes</b> Students will be able to <ul style="list-style-type: none"> <li>• Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life</li> <li>• The person who has studied Geeta will lead the nation and mankind to peace and prosperity</li> <li>• Study of Neetishatakam will help in developing versatile personality of students.</li> </ul>	

### OPEN ELECTIVES

3ST201, Business Analytics	
<b>Teaching Scheme</b> Lectures: 3 hours/week, Total Number of Lectures: 48	
<b>Course Objectives</b> <ul style="list-style-type: none"> <li>• Understand the role of business analytics within an organization.</li> <li>• Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.</li> <li>• To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making.</li> <li>• To become familiar with processes needed to develop, report, and analyze business data.</li> <li>• Use decision-making tools/Operations research techniques.</li> <li>• Manage business process using analytical and management tools.</li> <li>• Analyze and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc.</li> </ul>	
<b>Syllabus Contents</b>  <b>Unit I:</b> Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organisation, competitive advantages of Business Analytics. Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of	<b>No. of lectures</b>  9

## COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)

probability distribution and data modelling, sampling and estimation methods overview.	
<b>Unit II:</b> Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression.	8
Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.	
<b>Unit III:</b> Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes.	9
Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.	
<b>Unit IV:</b> Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models.	10
Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.	
<b>Unit V:</b> Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making.	8
<b>Unit 6:</b> Recent Trends in : Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.	4
<b>Course Outcomes</b> <ul style="list-style-type: none"> <li>Students will demonstrate knowledge of data analytics.</li> <li>Students will demonstrate the ability of think critically in making decisions based on data and deep analytics.</li> <li>Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making.</li> <li>Students will demonstrate the ability to translate data into clear, actionable insights.</li> </ul>	
<b>References</b> <ol style="list-style-type: none"> <li>Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.</li> <li>Business Analytics by James Evans, Pearson Education.</li> </ol>	

3ST202, Industrial Safety
<b>Teaching Scheme</b> Lectures: 3 hours/week
<b>Syllabus Contents</b> <b>Unit-I:</b> Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding,

## COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)

pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

**Unit-II:** Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

**Unit-III:** Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

**Unit-IV:** Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

**Unit-V:** Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance.

### References

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.
3. Pump-hydraulic Compressors, Audels, McGraw Hill Publication.
4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

### 3ST203, Operations Research

#### Teaching Scheme

Lectures: 3 hours/week

#### Course Outcomes

At the end of this course, students will be able to

- Apply the dynamic programming to solve problems of discrete and continuous variables.
- Apply the concept of non-linear programming.
- Carry out sensitivity analysis.
- Model the real world problem and simulate it.

#### Syllabus Contents

**Unit I:** Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models

**Unit II:** Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming

**Unit III:** Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT

## COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)

**Unit IV:** Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

**Unit V:** Competitive Models, Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation.

### References

1. H.A. Taha, Operations Research, An Introduction, PHI, 2008
2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
3. J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008
4. Hitler Libermann Operations Research: McGraw Hill Pub., 2009
5. Pannerselvam, Operations Research: Prentice Hall of India, 2010
6. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India, 2010

### 3ST204, Cost Management of Engineering Projects

#### Teaching Scheme

Lectures: 3 hours/week

#### Syllabus Contents

Introduction and Overview of the Strategic Cost Management Process

Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.

Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and nontechnical activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process

Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis. Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.

Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.

#### References

1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi
2. Charles T. Horngren and George Foster, Advanced Management Accounting
3. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting
4. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A.H. Wheeler publisher
5. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd.

### 3ST205, Composite Materials

#### Teaching Scheme

## COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)

Lectures: 3 hours/week
<b>Syllabus Contents</b> <b>Unit I:</b> Introduction: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance. <b>Unit II:</b> Reinforcements: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions. <b>Unit III:</b> Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications. <b>Unit IV:</b> Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications. <b>Unit V:</b> Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first ply failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.
<b>Text Books</b> <ol style="list-style-type: none"> <li>1. Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany.</li> <li>2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley &amp; Sons, NY, Indian edition, 2007.</li> </ol>
<b>References</b> <ol style="list-style-type: none"> <li>1. Hand Book of Composite Materials-ed-Lubin.</li> <li>2. Composite Materials – K.K.Chawla.</li> <li>3. Composite Materials Science and Applications – Deborah D.L. Chung.</li> <li>4. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W. Tasi.</li> </ol>

<b>3ST206, Waste to Energy</b>
<b>Teaching Scheme</b> Lectures: 3 hours/week
<b>Syllabus Contents</b> <b>Unit I:</b> Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors. <b>Unit II:</b> Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods – Yields and application – Manufacture of pyrolytic oils and gases, yields and applications. <b>Unit III:</b> Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.



**COURSE CURRICULUM FOR MASTER OF TECHNOLOGY IN AGRICULTURAL  
ENGINEERING (WATER RESOURCES DEVELOPMENT AND MANAGEMENT)**

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**Unit IV:** Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.- Design and constructional features - Biomass resources and their classification - Biomass

**Unit V:** Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion – Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

**References**

1. Non Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.
2. Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.
3. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.
4. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.

## DEPARTMENT OF MASS COMMUNICATION

ASSAM UNIVERSITY  
SYLLABUS*Name of the Course: MA in Journalism and Mass Communication*

Last alphabet "C" in Code No---Stand for Core Paper

Last alphabet "O" in Code No ---Stands for Open

Paper Last alphabet "E" in Code No ---Stands for  
Elective Paper***First Semester******A. Theory***

<i>Sl no</i>	<i>Code No</i>	<i>Name of the Paper</i>	<i>Contact</i>			<i>Credit</i>
			<i><u>hours/week</u></i>			
			<i>L</i>	<i>T</i>	<i>P</i>	
1	MJMC 101	<u>Introduction to Journalism &amp; Mass Communication</u>	3	0	0	3
2	MJMC 102	Communication Theory	4	0	0	4
3	MJMC 103	Reporting for Print Media	3	1	0	4
4	MJMC 104	Editing & Design for Print Media	2	1	0	3
5	MJMC 105	Sound & Radio Journalism	4	0	0	4
<b><i>Total of Theory</i></b>			16	2	0	18
<b><i>B. Practical</i></b>						
1.	MJMC 106	Reporting for Print Media--- Practical	0	2	4	4
2.	MJMC 107	Editing & Design for Print Media---Practical	0	2	4	4
3.	MJMC 108	Sound & Radio Journalism---Practical	0	2	4	4
<b><i>Total of Practical</i></b>			0	6	12	12
<b><i>Total of Semester(A+B)</i></b>			16	8	12	30

**Second Semester****A. Theory**

<i>Sl no</i>	<i>Code No</i>	<i>Name of the Paper</i>	<i>Contact</i>			<i>Credit</i>
			<i><u>hours/week</u></i>			
			<i>L</i>	<i>T</i>	<i>P</i>	
1	MJMC 201	Advertising	3	1	0	4
2	MJMC 202	Communication Research	4	0	0	4
3	MJMO 203	Introduction to Media & Communication	4	2	0	6
4	MJMO 204	Writing for Media	4	2	0	6
5	MJMC 205	Public Relations	3	1	0	4
<b><i>Total of Theory</i></b>			18	6	0	24
<b><i>B. Practical</i></b>						
1.	MJMC 206	Advertising	0	1	2	2
2.	MJMC 207	Communication Research Practical	0	1	2	2
3.	MJMC 208	Public Relations	0	1	2	2
<b><i>Total of Practical</i></b>			0	3	6	6
<b><i>Total of Semester(A+B)</i></b>			21	9	6	30

**MJME 404 & 407: Students to exercise option for any one from the following options---**

**A) Advanced Print & Data Journalism**

**B) Corporate Communication & Media Management**

**C) Documentary & Short Film Making**

**Note**

*Paper 306 Dissertation-I shall include choosing a topic, doing the survey of literature, formulating a problem, finding out a proper research method and then writing and presenting a synopsis of the proposal of dissertation within 1000 to 2500 words clearly delineating research question / hypothesis if any, methodology, apart from an introduction to the topic, review of literature etc. Distribution of marks for this paper if required for the purposes of Examination may be 30% coming from the Supervisor/s as CCA, 30% on presentation to be marked by a panel of examiners (teacher/s from the department or other departments including the Supervisors) and 40% on written synopsis of proposal submitted to the department through supervisor to be evaluated by an external and the internal*

*(supervisor/s) and the average as the marks for 40 per cent of written presentation. Non-supervisor Evaluators for all students for 30 % and for 40 % should be same set for each evaluation (except the CCA 30% for which respective supervisor would evaluate).*

*Paper 406 Dissertation-II may be evaluated on the basis of final dissertation on the same topic to be submitted at the end of fourth semester with 70 per cent on the written and typed and bound dissertation submitted in three copies and 30 per cent on public presentation and viva voce to be taken by the external and internal (supervisor/s).*

*Students have to compulsorily opt for a paper MJMC-203 from any other department as the first Optional Paper and students will also have a choice to opt for a second Optional Paper MJMC-204 or a paper of 204 in any other department. Accordingly MJMC-203 and MJMC-204 are framed with students from other department in mind, with a rider that students from Mass Communication as well may opt for the paper MJMC-204.*

*In fourth semester a student has to opt for two specialization papers from the following three sets of options for MJMC 404 (Theory) and MJMC 407 (Practical): A:*

*Advanced Print & Data Journalism; B: Corporate Communication & Media Management; C: Documentary & Short Film Making.*

*MJMC 407 A/B/C would be practical based paper. However, 50 per cent of both CCA and practical evaluation shall be on the basis of performance / students report of Industrial tour / Internship which may be under taken any time after the examinations of 1<sup>st</sup> semester are over at the earliest, and till 30 days after the final examinations are over by the latest. However the students are to undertake this before the start of fourth semester final examinations and any delay after that will require prior permission from the department, failing which the results of the students may be withheld till such requirement is fulfilled to the satisfaction of the department and report is evaluated*

### **MJMC-101: Introduction to Journalism and Mass Communication**

#### **Objective**

The Objectives of the course is to make the students aware of origin and growth of Journalism in India and preliminary ideas on Communication, and Mass Media.

**Unit---1: Introduction to Journalism**

1. *Concept, nature and scope of journalism; Printing Press and First Newspaper, Origin and growth of journalism in India: First Newspaper in India; Nationalism and print media;*
2. *Social transformation and Press in Colonial India- Raja Rammohan Roy, Harish Mukherjee, Mahatma Gandhi; Advent of Press in North East India.*
3. *Different genres of journalism: advocacy, parachute, immersive, interpretative, investigative; citizen journalism.*

**Unit---2: Introduction to Communication**

1. *Definition and characteristics of communication, Types and levels of communication*
2. *Elements of communication and barriers to communication*
3. *Mass Communication – origin and development –meaning and characteristics*

**Unit---3: Mass Media**

1. *Types and functions of mass media*
2. *All India Radio, FM, Doordarshan, Prasar Bharati; Cable & Satellite TV in India*
3. *Media as Industry- convergence & divergence; Conglomeration of Global media: Indian scenario.*

**Unit---4: Traditional / Folk Media**

1. *Meaning, Role and Characteristics of Traditional / Folk Media*
2. *Traditional / Folk media- with special reference to North East India*
3. *Different Traditional Folk Media in India; People's culture and Traditional / Folk Media, Use of traditional folk media in development*

**Unit---5: Introduction to New Media**

1. *Information & Communication Technology (ICT)- Meaning role & characteristics.*
2. *Internet and its application in media; Meaning and concepts of new media;*
3. *Penetration of Internet: digital divide, Media, power and hegemony, e-governance*
  - *The concerned Course Teacher/s will provide reading references to the students before the beginning of the Semester.*

## **MJMC-102: Communication Theories**

*The objective of this course is to provide students an understanding of the different theories of communication and their characteristics.*

### **UNIT 1: Concepts & Models of Communication**

1. *Definition, characteristics, types and levels of communication.*
2. *Elements and barriers of communication. Eastern and Western concepts of communication.*
3. *Nature, Characteristics and functions of Mass Communication; Normative theory.*
4. *Models of Communication: Aristotle, Lasswell, Schramm, Osgood, Berlo, Newcomb, Kincaid, Jo-Harry's Window, Shannon & Weaver.*

### **UNIT 2: Media Effects**

1. *Four phases of media effects research and theory.*
2. *All powerful media theory- Magic Bullet theory; Mass Society theory.*
3. *Two step flow theory; Limited effects theory; Selectivity theory.*
4. *Phenomenistic theory / Reinforcement theory (Joseph Klapper); Cognitive dissonance; Social Learning theory.*

### **UNIT 3: Media: Culture & Society; Content and Audience;**

1. *Critical theory: Marxist theory, Neo-Marxism; Frankfurt School: Ideological State apparatus (Althusser); Hegemony (Gramsci); Political Economy theory.*
2. *McLuhan's theories: Medium is the message; Centripetal and Centrifugal theory; Global village; Technological determinism; Extension of Man.*
3. *Helical theory: Spiral of Silence; Cultivation theory; Dependency theory, Agenda Setting theory.*
4. *Symbolic Interaction; Popular culture.*

### **UNIT 4: Media Structure & Organization**

1. *Media Structure and performance: Cross media ownership;*
2. *Media economics and governance: Ownership and Control (Robert McChesney): Competition & Concentration; audience fragmentation.*
3. *Global media consolidation: Media Monopoly; Cultural imperialism;*
4. *Chomsky-Herman theory*

### **UNIT 5: Semiology & Post---modern theories**

1. *Semiology: Ferdinand Saussure; C S Pierce.*
2. *Leavicism, Theory of Roland Barthes.*
3. *Theory of Ing Seng, Theories of Jacobson, Thompson.*
4. *Theories of Jürgen Habermas, Michel Foucault; Jean Baudrillard, Jacques Derrida-Jean-François Lyotard.*

- The concerned Course Teacher/s will provide reading references to the students before the beginning of the Semester.

### **MJMC-103: Reporting for Print Media**

*The objective of this course is to provide students an understanding of the art and science of reporting for the print media.*

#### **Unit 1: Preliminary Concepts of News Reporting**

1. *Defining news, qualities of news, components of news, news sense*
2. *Structure of News Organisation*
3. *Sources of news: Interview, press release, agency and other sources*
4. *Structure of a news story- concept of different news structures; Lead; meaning, importance, types; justification; body*

#### **UNIT---2: Issues related to Reporting**

1. *Reporter; types, qualities and responsibilities of a reporter*
2. *Issues related to attribution, balance, objectivity, ethics in reporting*
3. *Types of news story- Hard news, soft news: Dealing with feature story*
4. *Agency Reporting*

#### **UNIT---3: Various aspects of Reporting**

1. *Speech reporting*
2. *Covering accidents, disaster and natural calamities*
3. *Social media, Online reporting, news sites*
4. *Differences of reporting for Print, TV, and Radio*

#### **UNIT---4: Specialized Reporting**

1. *Political Reporting*
2. *Crime reporting, Covering court,*
3. *Covering assembly, Covering parliament*
4. *Reporting Sports, culture and entertainment*

#### **UNIT---5: Special skills of Reporting**

1. *Investigative and interpretative stories*

2. *Reporting development issues*
3. *Reporting Conflict, Terrorism, Communal violence*
4. *Business and Economic reporting*

- *The concerned Course Teacher/s will provide reading references to the students before the beginning of the Semester.*

#### **MJMC-104: Editing & Designing for Print Media**

*Objective of this course is to familiarise students with effective editing skills for print media as well as to provide them and understanding of newspaper layout and design and typography.*

#### **Unit---1: Basics of Writing for news: Newsman's English**

1. *Word differences; Grammatical niceties,*
2. *Principles of good writing, Newsman's English,*
3. *Style Book, Gender sensitive editing; Proof-reading*

#### **Unit---2: Editing News**

1. *Structure & function of Newsroom; Role of copy editor;*
2. *Editing news copy- editing principles*
3. *Editing hard, soft, and other stories;*

#### **Unit---3: Headlines and captions**

1. *Writing headlines- types,*
2. *Polishing headlines, Sub-heads.*
3. *Caption writing, Copy fitting.*

#### **Unit---4: Magazine Editing & Designing**

1. *Editing magazines-principles and characteristics, difference between editing magazine and newspaper,*
2. *Magazine headlines- preparing blurbs*
3. *Introduction to typography – Selection criteria of Typography; lines of force, impact & information, ethical aspects*

#### **Unit---5: Magazine Editing & Designing**

1. *Newspaper design- Functions of design: Principles of newspaper design; integration of content and presentation; Identity of a newspaper; broadsheet, tabloid and Berliner size;*
  2. *Page layouts: Reflecting news priorities, reading habits and page design;*
  3. *Kinds of layouts- horizontal, vertical, quadrants and diagonal frame layout, brace layout, circus layout, symmetrical and asymmetrical layout.*
- *The concerned Course Teacher/s will provide reading references to the students before the beginning of the Semester.*



### **MJMC-105: Sound & Radio Journalism**

*The objective of this course is to make students aware of the basics of radio production and the production techniques for different radio programs. The course will also provide grounding on broadcast journalism.*

#### **UNIT 1: Basics of Sound**

1. *Understanding sound, frequency and wavelength*
2. *Radio transmission modes: Amplitude Modulation (AM), Frequency Modulation (FM), Short Wave (SW), Medium Wave (MW)*
3. *Sound: diegetic and non-diegetic sound, technical and operating principles. Sound design, concept and significance of a sound design*
4. *Sound recording for radio, Types of radio programmes, formats, treatment, style, Broadcasting and narrowcasting.*

#### **UNIT 2: Advent of Broadcast Journalism**

1. *Brief History of world broadcast journalism*
2. *Public Service Broadcasting, BBC, BBC standards of broadcast journalism*
3. *Expansion of Radio in third world*
4. *FM, Community Radio, Radio, disaster and conflict*

#### **UNIT 3: Introduction to Broadcast Production**

1. *Conducting interviews for radio programmes, interviewing techniques*
2. *Programme production for radio news magazine and current affairs, phone-ins, radio features.*
3. *Radio equipment (microphones, dictaphone, DAT recorder etc)*
4. *Functions of various departments and personnel in a radio station,*

#### **UNIT 4: Introduction to Broadcast Journalism**

1. *Basic features of radio news; Radio news bulletin structure*
2. *Sources of radio news, qualities and responsibilities of a radio reporter, criteria for selection of radio news; News room set-up in a radio station*
3. *Writing broadcast news, radio features and radio documentary.*
4. *Principles of radio editing; preparing a radio copy (format, names and titles, symbols and numbers, quotations and attributions, correcting copy etc.)*

#### **UNIT 5: All India Radio**

1. *Brief History of broadcast journalism in India: All India Radio*

2. *Structure of All India Radio, News Service Division & GNR/HNR, AIR online*
  3. *AIR Stylebook, Government and AIR*
  4. *AIR Code, Election & AIR*
- *The concerned Course Teacher/s will provide reading references to the students before the beginning of the Semester.*

### **MJMC-106: Reporting for Print Media (Practical)**

UNIT---1: Analysis of news quality & components from various news stories

UNIT---2: Interviewing & Vox pop

UNIT---3: Practicing structures of writing

UNIT---4: Using data and other graphical inputs in news

UNIT---5: Coloring of the news

*Practical Exercises / Assignments: Reporting and writing news on actual events, Interview based story,*

*Developing beat and news sources, authentication, rewriting, feature stories. Writing The Story: Single incident Story, use of Attribution, Identification, byline, credit line. Students will be evaluated on the basis of their Assignments output produced through out the Semester jointly by an External and an Internal Examiner.*

### **MJMC-107: Editing & Designing for Print Media (Practical)**

#### **Unit---1: Design Dimensions**

1. *Page organization; Basic elements: typography (fonts, size, leading, kerning), use of color, column and grid structure, white space, contrast, style palette*
2. *Front page, back page, opinion page and section pages layout, special pages, supplements*

#### **Unit---2: Design Dimensions**

1. *Selecting images– image energy; considerations when selecting image for crime / death / grief stories*
2. *Application of principles of aesthetics- tools design concepts*

### **Unit---3: Print Publication--- Practical**

1. *Conventional methods of composition- monotype- linotype-modern methods – DTP.*
2. *Use of software- Adobe Photoshop- PageMaker*

### **Unit---4: Print Publication--- Practical**

1. *Use of software- Quark Express-*
2. *In-design.*

### **Unit---5: Print Publication--- Practical**

*Practical exercises in editing news copy, other stories, designing newspaper pages and magazines--- comparative analysis of newspaper and magazine vis---à---vis contents--- style--- design and printing will be conducted through a Lab journal.*

### **MJMC-108: Sound & Radio Journalism (Practical)**

*Course Teacher would guide students on Voice culture, pronunciation, pre---production planning including research for production, radio anchoring & production for any one among the following output for final evaluation along with script besides internal assement assignment:*

1. *Researching, scripting and production of a 15-minute radio feature for special audiences like women, youth, farmer, children, industrial worker, etc.*
2. *Production of a 15-minute radio news bulletin*
3. *Production of a 15-minute radio drama/documentary*
4. *Production of a 15-minute radio programme on news and current affairs/ Production of a radio jingle.*

*Marks distribution: 25 for script + 50 for production +25 viva voce to be awarded by the external and internal.*

### **MJMC-201: Advertising**

*Advertising is an ever---expanding allied area of journalism. The objective of the course is to teach different aspects of advertising as a profession.*

#### **Unit---1: Advertising Basics**

- 1. Definition, meaning, role, functions, nature and scope of advertising*
- 2. A brief history of advertising in India and the world*
- 3. Global and Indian advertising business*
- 4. Classification of advertising on the basis of target audience, geographical area, medium, purpose*

#### **Unit---2: Advertising as Communication and marketing tool**

- 1. Advertising as a communication tool, models of advertising communication- AIDA, DAGMAR, Maslow's Hierarchy Model*
- 2. Advertising as a marketing tool- product marketing process, market segmentation process; target marketing process,*
- 3. Advertising and product, price, place, promotion and branding elements.*
- 4. Advertising research: consumer, market and product*

#### **Unit---3: Advertising Creativity**

- 1. Concept of creativity, idea generation, the creative brief.*
- 2. Types of copy preparation ad copy, copy and script writing for various mass media*
- 3. Story board, audio-video copy formats*
- 4. Production process of print copy- thumbnail, roughs, comprehensive, mechanical, role of colours, photography, computer graphics, artwork, appeal in advertising*

#### **Unit---4: Advertising Campaign**

- 1. Advertising campaign- the planning cycle, USP, marketing and advertising objectives*
- 2. Advertising strategy, various stages of advertising campaign*
- 3. Budgeting process- budgeting and appropriation of fund, methods of setting advertising budgets.*
- 4. Product life-cycle, segmentation, brand position, brand equity, Account planning, pitching and presentation preparation*

#### **Unit---5: Organization**

- 1. Ad agency- Role, types, structure and function*

2. *Criteria to select an ad agency*
  3. *Client- agency relationship*
  4. *Leading advertising agencies in India and distribution mechanism of central government advertisements*
- *The concerned Course Teacher/s will provide reading references to the students before the beginning of the Semester.*

### **MJMC-202: Communication Research**

*The objective of this course is to teach basics of research and its application on media and develop skills of different kinds of research methodologies and to make the students conversant with the tools and techniques of research.*

#### **Unit---1: Research--- Concepts and Approaches**

1. *Approaches to knowledge; Characteristics of Scientific method.*
2. *Research- definitions, characteristics, and types: basic- applied- descriptive-analytical- clinical- case study- historical.*
3. *Research process- concepts- definitions- variables- hypotheses, review of literature.*
4. *Ethical aspects of research.*

#### **Unit---2: Research Design**

1. *Research design- meaning, importance, components, types.*
2. *Exploratory, Descriptive & Diagnostic research designs.*
3. *Experimental designs- informal and formal experimental designs- Solomon four group; Posttest only control group test; Quasi Experimental Designs- one-shot case study.*
4. *Longitudinal research; correlational design; trend study.*

#### **Unit---3: Data Collection**

1. *Meaning, types, importance of data; Universe and sample; Sampling- types of sampling- probability- non-probability.*
2. *Measurement- levels of measurement; Tests of validity- reliability; Scaling techniques: arbitrary- Thurstone-Likert-rating-ranking.*
3. *Data collection- observational methods- laboratory experimentation- field experimentation - focus group- simulation.*
4. *Survey research- meaning, types, Poll surveys: pre-poll and exit polls, Census method, Tools of survey research- Questionnaire and interview schedule; importance & construction.*

#### **Unit---4: Data Processing, Analysis and Report Writing**

1. *Processing of data: coding, editing, tabulation, analysis and interpretation; Hypothesis testing.*
2. *Frequency distribution- averages, standard deviation- normal curve- univariate, bivariate, multivariate.*
3. *Writing research reports;*
4. *Bibliography- meaning, importance and different styles of arranging bibliography.*

## **Unit---5: Applications of Research in Media**

1. *Print media research- tools and techniques; Content analysis; Ethnographic research*
  2. *Rating and non-rating research in electronic media*
  3. *Research in Public relations;*
  4. *Research in Advertising*
- *The concerned Course Teacher/s will provide reading references to the students before the beginning of the Semester*

### **MJMC-203: Introduction to Media & Communication (Open Course for students of other disciplines)**

*The objective of this course is to teach basic idea of media and communication to the students of other disciplines.*

#### **UNIT 1 --- General Introduction**

1. *Meaning, type and role of media*
2. *Media, democracy and society*
3. *Mainstream media, alternative media and citizen journalism*
4. *Media for development*
5. *Media and socio-cultural transformation*

#### **UNIT 2 --- Print Media**

1. *Introduction and types of print media*
2. *A brief overview of the history of newspapers in India*
3. *Newspapers; meaning, importance, types, leading newspapers in India*
4. *Magazines- types, importance, Newspaper industry in India*
5. *Newspaper; organization and management*

#### **UNIT 3 --- Electronic Media**

1. *Meaning, importance and types of electronic media.*
2. *Radio as a mass media, role of radio in society.*
3. *Radio; formats, public service broadcasting and commercial broadcasting.*
4. *TV; understanding medium & formats.*
5. *TV news; role, importance, skills.*

#### **UNIT 4 --- Film and Traditional media**

1. *Cinema; meaning, types, importance in the society*
2. *Documentary and short films*
3. *A brief history of Cinema in India*
4. *Traditional media; meaning, types and importance*
5. *Traditional media in the Northeast India*

**UNIT 5 --- New Media and other emerging media forms**

1. *Meaning, importance and emergence of new media, Social media; functions, types and importance*
  2. *Digital Media – Informatization – E Governance.*
  3. *Global imbalance in flow of information: Mass media and New Media; Digital divide*
  4. *Public Relations and New Media, Advertising and New Media*
  5. *A brief overview of media and entertainment industry in India.*
- 
- *The concerned Course Teacher/s will provide reading references to the students before the beginning of the Semester.*

**MJMC-204: Writing for Media (Optional Open Course for students irrespective of their discipline)**

*The objective of this course is to make the students understand the art of effective communication and to train them in writing scripts for different media platforms.*

**Unit---1: Effective Writing**

1. *History of writing*
2. *Basic principles of good writing,*
3. *Structure, common errors*
4. *Syntax- diction- other grammatical aspects*
5. *Readability tests; fog Index-*

**Unit---2: Writing for Print**

1. *Writing for newspapers news- lead- body*
2. *Headline techniques*
3. *Writing features- types- techniques- finer aspects of magazine writing- style-interviews*
4. *Reviews and criticism*
5. *Editorial writing- writing opinion pieces.*

**Unit---3: Words for Radio**

1. *Writing for radio-news*
2. *Writing for radio features*
3. *Writing for radio documentaries*
4. *Special audience programmes*
5. *Style- pronunciation- format.*

**Unit---4: TV Script**

1. *TV scripts- types- format*
2. *TV news*
3. *TV news magazines*
4. *Features- documentaries- interview stories*
5. *Creativity in writing for television.*

**Unit---5: Writing for New Media**

1. *Writing guidelines for new media-*
2. *Online news writing: structure and characteristics*
3. *Blogs*
4. *Technical writing*
5. *Principles and methods*
  - *The concerned Course Teacher/s will provide reading references to the students before the beginning of the Semester.*



### **MJMC-205: Public Relations**

*The objective of the course is to facilitate and understanding of the concept, methods and strategies for public Relations and students for a career in corporate, public and private sector.*

#### **Unit---I: Concept of public relations**

1. *Definition, nature, objectives, elements, scope of Public Relations.*
2. *Growth and development of Public Relations with special reference to India.*
3. *Models of Public Relations; Public Relations as a management discipline*
4. *PR and publicity, PR and advertising, PR and public opinion, persuasion, lobbying marketing etc.*

#### **Unit---II: Public relations process**

1. *Public in public relations; concept of public, dealing with multicultural and divergence public,*
2. *PR campaign-need, importance, steps,*
3. *PR tools-for external and internal communication*
4. *Media relations, community relations and event management*

#### **Unit---III: Role and functions of PR**

1. *Public Relations and the Law*
2. *Role of research in PR*
3. *Public Relations in government sector, private sector, NGO's and political sector*
4. *Structure, function and services of PR agencies, consultancy and qualities of a PRO*

#### **Unit---IV: Organisations, Tools**

1. *Professional PR Organizations and their code of ethics*
2. *PR and Conflict management; dealing with issues, risks, and crisis*
3. *New technologies and PR; Web management and building relationships online*
4. *House journal-need, steps of publication and production/ launching of print or online house journal*

#### **Unit---V: Techniques**

1. *Design, preparation of folder, leaflet, posters, ad copy for PR*
2. *Press conference-need, planning and organizing*
3. *Writing for different media; news release, backgrounders, pitch letters, Media alerts*
4. *Video news release*
  - *The concerned Course Teacher/s will provide reading references to the students before the beginning of the Semester.*

### **MJMC-206: Advertising Practical**

*Course Teacher would guide students to prepare / design / produce advertisements to be evaluated in the form of hard / soft copy of materials/ reports produced / prepared.*

Unit---1: Analysis of select advertisements

Unit---2: Print advertising preparation--- copy writing designing, making posters, handbills

Unit---3: Formulation, planning and design of advertising, campaign based on market and consumer research

Unit---4: Writing radio spots and jingles

Unit---5: Writing TV ads, developing an audio---visual script and storyboard

### **MJMC-207: Communication Research**

1. *Course Teacher would guide students to prepare a book review article within the word limits of 1000 to 2500.*
2. *Course Teacher would guide students to prepare a survey questionnaire on a topic.*
3. *Course teacher would guide students to prepare an article based on review of literature related to certain problem / topic within the word limits of 1000 to 2500.*
- 4.

- Marks distribution: 30+30+30+10 viva voce to be jointly awarded by the external and internal.

### **MJMC-208: Public Relations Practical**

*Course Teacher would guide students to prepare / design / produce tools of public relation, house journal or newsletter, campaigns – publicity or awareness campaign (planning and execution) to be evaluated in the form of hard / soft copy of materials produced / reports prepared.*

Unit---1: Planning and execution of PR campaign

Unit---2: Organizing media tours, preparing media kits

Unit---3: Event planning

Unit---4: Use of research methods for planning, evaluation, feedback and perception analysis

Unit---5: Case studies for crisis management, to create positive image environment

## **MJMC- 301: Visual Communication**

*Visual communication as a subject has acquired importance these days, especially in academic circles. The course explores different dimensions of visual communication that include television and cinema as well.*

### **Unit 1: Introduction to Visual Communication**

1. *Visual Communication-meaning, definition, importance, signs, referents*
2. *Modes of communication-iconic, symbolic, associational*
3. *Elements of visual communication*
4. *The visual image—utilisation of visual modes of communication, visual elements— space, line, form, shape, texture, light and colour, rhythm, movement, balance, harmony, variety and unity.*
5. *Organisation of visual elements.*

### **Unit 2: Visual Literacy**

1. *Visual literacy-visual grammar*
2. *Non-verbal communication- Paralanguage*
3. *Basics of typography, selection and combination of fonts, using coloured fonts, altering fonts for situations, lettering and typography for titles and production credits.*
4. *Cultural transformation of signs-ethnic connotations*
5. *Construction of identity.*

### **Unit 3: Visual Culture**

1. *Visual culture-visual representation*
2. *Visual communication and gender*
3. *Popular culture*
4. *Visual communication vs. language*
5. *Theory and criticism of photography*

### **Unit 4: Dimensions of Art**

1. *Theory and history of art, concept of art: structure, form and meaning of art:*  
  
*Realism, Impressionism, Expressionism, art as commerce: art as commodity, art as human creation of images, relationship between reality and images.*
2. *Visual communication-pre-colonial connotations, post-colonial descriptions*
3. *Basics of composition, technical requirements for photography, elements of an image.*
4. *Corporate visual communication and culture*
5. *Colour in visual communication*

### **Unit 5: Visual Analysis**

1. *Visual analysis: introducing semiotics, visual theories - its application in analyzing visual elements in films/Ad/new media, perspective of analysis, interpretation of visual narratives.*
2. *Visual culture in Asia*
3. *Media culture*
4. *Visual culture in Indian cinema- Semiological interpretations*
5. *Visual culture in digital environment*
- *The concerned Course Teacher/s will provide reading references to the students before the beginning of the Semester.*

### **MJMC-302: Film Studies**

*The Paper is designed to provide an in---depth evaluation of films and their genres.*

#### **Unit---1: Introduction to Film Studies**

1. *Basic Aspects of Film Language and Film Aesthetics*
2. *Mise-en-scene: concept, significance and elements of mis-en-scene*
3. *How camera produces meaning: shot, scene, sequence, shot sizes, composition and camera angles, Editing and meaning*
4. *Aspects of film narrative- textual analysis of film.*

#### **Unit---2: Cinema in Retrospect**

1. *Early history of cinema: Silent Cinema (1895-1930), The Rise of the studio system and Star system in Hollywood; Evolution of Classical Hollywood cinema: The dominant film paradigm.*
2. *World cinema: Iran, Latin America, East-Asia.*
3. *Independent filmmaking, History of the documentary*
4. *Origin, growth and development of cinema in India.*

#### **Unit---3: National Cinema Movements**

*(Any four to be chosen by the course teacher at the beginning of the Semester)*

1. *Soviet Montage Cinema*
2. *German Expressionistic Cinema*
3. *Italian Neo-Realist Cinema*
4. *French New Wave Cinema*
5. *Indian New Wave (Parallel/Art) Cinema*

#### **Unit---4: Film Theories**

1. *Classical film theory (Bazin, Eisenstein Arnheim et al)*
2. *Post-Classical: Auteur theory / Apparatus theory*
3. *Post-colonial approaches*

#### 4. Indian film studies

### Unit---5: Directors and Texts

Four directors/texts from minimum two subunits at the beginning of the Semester would be chosen for discussion every year in terms of: (a) authorial styles, their location within filmic, stylistic, political movement and (b) textual analysis.

1. *Satyajit Ray, Ritwik Ghatak, Mrinal Sen, Adoor Gopalakrishnan, Shyam Benegal*
2. *Indie filmmakers- Jim Jarmusch, Wong Kar Wai, Sodenberg, Lars Von Triers.*
3. *Major filmmakers of world cinema- Louis Bunuel, Jean Jack Godard, Akira Kurosawa, Ingmar Bergman, Bernardo Bertolucci, Abbas Kiarostami, Mazid Mazidi, Yasujiro Ozu, Roman Polanski etc.*
- *The concerned Course Teacher/s will provide reading references to the students before the beginning of the Semester.*

### **MJMC-303: Communication for Development**

*The objective of this course is to provide an understanding of the concept of development and the different paradigms of development and the role of communication in development.*

#### **Unit 1: Development: Concept and Approaches**

1. *Relation of Development and communication; Development – meaning, indicators, theories; Development-concerns and issues. Characteristics of developing societies.*
2. *Colonialism & drain of wealth; The context of formal discussion on development;*
3. *Formation of organized efforts for development: UN family; Marshall Pan; Truman's Four Point Programme; Bilateral & Multilateral ODA.*
4. *Liberation of erstwhile colonies; challenges before 'Third world'; Planning; Cold war and development; Emerging multilateral organisations; World Trade and development.*

#### **Unit 2: Development Communication: Theory and Practice**

1. *Development communication- meaning, concept, definition, process; Key issues.*
2. *Strategies in development communication; Daniel Lerner's modernization model of development, Everett Roger's Diffusion of Innovation model*
3. *Social, cultural and economic barriers – case studies and experience*
4. *Communitarian approach, Libertarian theory, Mass media and Modernisation approach; Social marketing of family planning; Corporatisation of development*

#### **Unit 3: Development Discourse**

1. *Development support communication – constructs, processes and outcomes*
2. *Participatory approach; RRA; PAR; decentralized planning; participatory planning.*
3. *Deconstructing the dominant paradigm of development, biases of the dominant paradigm; religious, gender and environmental biases in the discourse of the dominant paradigm.*

4. *Planning for development: The Indian experience: from colony to planned economy; Challenges of development and development communication in the age of Globalization and Liberalisation. Niti Ayog.*

#### **Unit 4: Development & Development Communication--- Alternative Perspectives**

1. *Alternative meanings of development; Human Development Approach; new indicators*
2. *Development as freedom; Sustainable development;*
3. *Participatory action research to peoples' planning: varieties of participation, strategic interventions*
4. *Development journalism: current trends; Sainath's Rural Reporting: PARI.*

#### **Unit 5: Towards a new paradigm**

1. *Revisiting issues on development and participatory communication.*
  2. *Understanding the community and communication; practices of alternative media.*
  3. *Participatory programming models; Neighbourhood collectives.*
  4. *Media and Millennium Development Goals (MDGs); Print, Electronic Media specially Community radio, New Media and activism.*
- *The concerned Course Teacher/s will provide reading references to the students before the beginning of the Semester.*

### **MJMC-304: Electronic Media Production & TV Journalism**

*Students are expected to acquire a thorough understanding of the basic elements of television production and also gain an in--depth knowledge of the skills required for television journalism.*

#### **Unit---1: Introduction to Television Production**

1. *The Television production process, digital vs. analog technologies, Production elements: camera, lighting, audio, switching, video tape recording,*
2. *Pre-production and post production: editing, special effects;*
3. *The television camera, types of camera, analog vs. digital camera, beam splitter vs. imaging device (CCD), ENG/EFM cameras, lenses: types of lenses, optical characteristics of lenses, operational controls;*

#### **Unit---2: Production basics, Light and Sound**

1. *Production basics: composition (aspect ratio, rule of thirds, 180 degree axis of action, depth of field, perspective, exposure); Types of shot, shot sizes, camera angles and camera movements.*
2. *Types of lighting, source, nature and properties of lighting, reflectors: its uses and applications; Studio lighting, location lighting, Three-point lighting, four point lighting and cross lighting system;*
3. *Understanding basics of sound, characteristics of sound, studio sound, location sound, sound effects, sound editing; Microphone: characteristics of microphone, types of microphone, dynamic and condenser microphone, "pick-up" pattern of microphone; Sound types and aesthetics: contrapuntal, parallel, natural, synchronous and asynchronous sound;*

#### **Unit---3: Editing & TV Journalism**

1. *What is editing? Purpose and function of editing, Basic editing systems, linear and non-linear editing, assembly and insert editing, offline and online editing, Editing procedure, shot selection, shot sequencing, audio sweetening, creating the final edit master tape, operational hints*
2. *Basic transition devices, cut, dissolve, wipe, fade; Major editing principles, continuity editing, complexity editing, context, ethics*
3. *Basic characteristics and elements of television news, Duties, responsibilities and qualities of a TV reporter, elements of a TV news bulletin*

#### **Unit---4: TV Journalism---II**

1. *Writing style for television news*

2. *Interview: types and techniques of TV interview, Multi-camera & live production*
3. *New trends in television news reporting (sting operation, breaking news, news flash, phone-ins)*

#### **Unit---5: TV Documentary**

1. *Genres of TV documentary*
2. *Pre and post production phases of TV documentary: Checklist*
3. *Researching, planning for TV documentary, scripting*
  - *The concerned Course Teacher/s will provide reading references to the students before the beginning of the Semester.*

#### **MJMC-305: Electronic Media Production & TV Journalism Practical**

Assignments for evaluation:

Unit--- 1: Scripting five news stories – three from recording, two from idea.

Unit--- 2: Producing one individual news story in consultation with course teacher to be presented along with final script.

*Marks distribution: 25+50+25 viva voce to be jointly awarded by the external and internal.*

#### **MJMC-306: Dissertation - I**

- *Each student has to choose a topic, do the survey of literature, formulating a problem, finding out a proper research method and then writing and presenting a synopsis of the proposal of dissertation within 1000 to 2500 words clearly delineating research question / hypothesis if any, methodology, apart from an introduction to the topic, review of literature etc. under a teacher – supervisor.*
- *Distribution of marks for this paper for the purposes of Examination may be 30% coming from the Supervisor/s as CCA, 30% on presentation to be marked by a panel of examiners (teacher/s from the department or other departments including the Supervisors) and 40% on written synopsis of proposal submitted to the department through supervisor to be evaluated by an external and the internal (supervisor/s) and the average as the marks for 40 per cent of written presentation. Non-supervisor Evaluators for all students for 30 % and for 40 % should be same set for each evaluation (except the CCA 30% for which respective supervisor would evaluate).*

#### **MJMC-307: Development Journalism Practical**

UNIT 1: Profiling people / area / region

UNIT 2: Profiling environment / health / economy



- *One assignment each for print / radio / TV to be conducted under the supervision of course teacher.*

### **MJMC-401: New Media**

*The course is aimed to make the student familiar with the fundamentals of new media technologies with special emphasis on the web world.*

#### **Unit 1: Introduction to new media**

1. *Characteristics of Computer Mediated Communication (CMC), Computer mediated community*
2. *Definition and characteristics of new media*
3. *New media: forms and structure*
4. *History and development of new media; the main themes of new media theory*

#### **Unit 2: Technology and its uses**

1. *The Internet and the worldwide web- components, history, technology- protocol, structure, governance, uses, accessibility, social impact*
2. *Networking, types- LAN, WAN, MAN, wi-fi, Bluetooth, broadband (coaxial cable, semiconductors, fiber optics), GPRS, dial-up, cable, satellite and digital technologies*
3. *Podcasting, webcasting, streaming media, video conferencing, chat rooms*
4. *Virtual culture, cyber-slacking, pornography, privacy, Ethical dimensions of new media*

#### **Unit 3: New Media Tools**

1. *Different types of New Media tools: types and importance: Tools for pictures, video, audio and screen capture, Tools to measure and track results: monitoring*
2. *Tools to manage content, Blogging tools, Twitter tools, Other social media tools,*
3. *How to Pick the Right New-Media Communications Tools*
4. *Search Engine Optimization Basics*

#### **Unit 4: Social Media**

1. *Social media: meaning, types and characteristics, Development of social media, Social media: attributes and impact*
2. *Social media and communication process, uses, advantages, virtual self*
3. *Social media and construction of social reality*
4. *Social media in Indian context: users, appropriation, and domestication*

#### **Unit 5: New Media & Politics**

1. *New media and popular culture*
2. *New media and political communication: digital democracy, political freedom and new media*

3. *Internet censorship and freedom of expression and speech*
4. *Computational media and recent discussions on post-humanism*
- *The concerned Course Teacher/s will provide reading references to the students before the beginning of the Semester.*

### **MJMC-402: Media Law & Ethics**

*The basic objective of this course is to give an overview of the press and media laws in India as well as the Constitution of the country and also provide the students with the ethical issues related to the mass media.*

#### **Unit---1: Introduction to Media Law and Ethics**

1. *Introduction to the Constitution of India: Preamble and salient features*
2. *Powers and functions of the Executive, Legislature and Judiciary; Fundamental rights, duties of citizens.*
3. *Freedom of the Press and their reasonable restrictions in the Indian Constitution.*
4. *Parliamentary privileges and the Press (Article 105- Parliament and Article 19 (A) - State legislatures)*

#### **Unit---2: Press Laws in India**

1. *History of Press Laws in India.*
2. *Defamation – IPC-499-500; libel, slander –defenses; Contempt of Court Act, 1971*
3. *Official Secrets Act, 1923; Registration of Books and Newspaper Act, 1867 and Copyright Act, 1957;*
4. *Working Journalist Act, 1955 and Wage Boards*

#### **Unit---3: Media Laws in India**

1. *Prasar Bharati Act*
2. *Right to Information Act-2005*
3. *Cable Television Network Regulations Act*
4. *Information Technology Act- 2000 and subsequent amendments; Cyber crime and Cyber Laws in India*

#### **Unit---4: Media Law Institutions and Agencies**

1. *RNI and its duties; Broadcasting Regulatory Authority and I&B Ministry*
2. *Press Commissions and their recommendations*
3. *Press Council of India- formation, composition, role, power, guidelines*
4. *Censor board, Censorship Act and procedures.*

#### **Unit---5: Media Ethics and Social Responsibilities**

1. *Media and pressure groups, social audit, ombudsman*
2. *Guidelines for election coverage; Code of conduct for TV and radio*
3. *Public Relations and Advertising code of conduct (IPRA, PRSI, ASCI & AAAI codes)*

4. *Govt. media units and their code of conduct- DD, AIR, PIB & DAVP, Guidelines for central government publicity*
- *The concerned Course Teacher/s will provide reading references to the students before the beginning of the Semester.*

### **MJMC-403: International Communication, Media and Society**

*The objective of this course is to provide an understanding of the concept of international communication and the issues related with media and society as well as the role of new technologies and their impact on international information flow.*

#### **Unit 1: International Information Flow and Imbalance**

1. *International Relations-Realist Theory, Interdependence Theory, Critical Social Theory,*
2. *Political, economic and cultural dimensions of international communication*
3. *International information flow and imbalance in communication as a human right-UNO's Universal Declaration of Human Rights*
4. *International news agencies and syndicates- their organisational structure and functions*

#### **Unit 2: Alternative Information Distribution System**

1. *A critique of Western news values; UNESCO's efforts in removal of imbalance in news flow*
2. *Debate on New World Information and Communication Order (NWICO) and New International Economic Order (NIEO)*
3. *Mac Bride Commission's Report*
4. *Alternative News Information Distribution System- Non-aligned News Agency Pool (NANAP)- its working, success, failure*

#### **Unit 3: New Technology and International Information Flow**

1. *Impact of new communication technology on news flow; Information super highways, international telecommunication and regulatory organisations*
2. *Satellite communication-its historical background, status, progress and effects*
3. *The globalization of mass media organizations;*
4. *Transnational media ownership and issues of sovereignty and security- cultural imperialism, hegemony*

#### **Unit 4: Global Civil Society and Other Forms of Communication**

1. *Emergence of global civil society, news coverage of war and peace*
2. *Cosmopolitan democracy, global democratic theory, global public sphere*

3. *Transnational advertising, political economy of transnational advertising, issues and debate relating to practice; Message system analysis, social and individual impact of transnational advertising,*
4. *Global advertising agencies, global media corporations*

#### **Unit 5: Media and Society: critical perspectives**

1. *Mass Media and Society; theoretical approaches*
2. *Ideology, culture and opposition in mass media*
3. *Mass media as institution; Social integration, identity, social change and mass media*
4. *Information society and post-industrial society*
  - *The concerned Course Teacher/s will provide reading references to the students before the beginning of the Semester.*

## **MJMC---404.A: Advanced Print & Data Journalism**

### **UNIT 1--- Journalism: Advanced Concepts**

1. *Journalism and democratic society; Basic principles; truth, accuracy, independence, impartiality, humanity, accountability*
2. *Popular press and elite press*
3. *Different departments of a newspaper, Economics of newspapers*
4. *Ownership patterns, impact of ownership on the newspapers*

### **UNIT 2--- Journalism Skills**

1. *News reporting; understanding the trade, expectations from the society and industry*
2. *Developing news stories; source, gate keeping and balance, interviewing, verification, exclusive and scoops, researching the subject*
3. *Writing news story; principles, basic and emerging structures; News agency journalism;*
4. *Writing feature and soft stories, news analysis and reportage; Writing news for online newspapers*

### **UNIT 3--- Editorial responsibilities, layout and designing**

1. *Structure and management of newsroom, News fall and managing News fall.*
2. *Developing page; design elements, balance of contents and visuals; planning ahead.*
3. *Page layouts; basic principles and scope for experiments*
4. *Visuals in newspapers; photographs, graphics and caricatures*

### **UNIT 4--- Data Journalism**

1. *What is Data Journalism, Data Journalism at BBC: Make It Personal, Simple Tools, Mining The Data, Understanding An Issue*
2. *Data Fundamentals, A Gentle Introduction to Data Cleaning, Introduction into Exploring Data, Introduction into Extracting Data,*
3. *Introduction to Mapping, Geocoding, Working with Budgets and Spending Data*

### **UNIT 5--- Working with Indian Data**

1. *Data of Central, State & Constitutional Authorities*
2. *Working with Indian Population, Election Data*
3. *Economic Census & Other Government Data*

- *The concerned Course Teacher/s will provide reading references to the students before the beginning of the Semester.*

## **MJMC-404.B: Corporate Communication and Media Management**

### **Unit---1: Understanding Corporate Communication (CC)**

1. *Definitions, concept, scope and trends; Difference and similarities between PR and CC, Ethics in CC*
2. *Publics in CC/- Financial publics, media, opinion makers, government, elected representatives,*
3. *Role of research in CC*

### **Unit---2: Corporate Communication Tools**

1. *Lobbying, Sponsorship, Corporate social responsibility,*
2. *Corporate identity, Corporate reputation*
3. *CC Campaign- planning and execution, CC and Crisis management*

### **Unit---3: Media Management: Basic Principles**

1. *Management: meaning, definitions, skills and functions*
2. *Meaning, nature and principles of media management*
3. *Media business and media markets*

### **Unit---4: Industry dynamics & Print**

1. *Mergers, acquisitions, and take overs in media business; Media ownership: types and impact, Strategy processes in media houses- branding, positioning, segmentation, integration, programming and scheduling strategies*
2. *Types of newspaper organizations in India, circulation and promotion.*
3. *Newspaper organization and management, principles of newspaper business, divisions, operations.*

### **Unit---5: Media Industry**

1. *Newspaper ownership: types of newspaper ownership in India.*
2. *Ownership patterns and Organizational structure of television, radio houses*
3. *The Economics of online media; Market model and public sphere model of the media*

- *The concerned Course Teacher/s will provide reading references to the students before the beginning of the Semester.*
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## **MJMC-404.B: Documentary & Short Film Making**

**UNIT 1--- Basic Concepts**

1. *Documentary Films; meaning, characteristics and importance;*
2. *Short Film; meaning, forms, importance*
3. *Grammar of Filmmaking: shots, sequences, story telling- narrative.*

**UNIT 2--- Basic Concepts**

1. *Types of documentaries.*
2. *A brief overview of the development of documentary films in the world and in India*
3. *A brief overview of the development of documentary films in India*

**UNIT 3--- Writing for Documentary & Production**

1. *Consideration for telling a good story; structure*
2. *Idea generation; Writing visually;*
3. *Writing a script; different formats; Writing movies that don't need script*

**UNIT 4--- Pre---Production & Production**

1. *Choosing a camera- digital or analog, image quality, Lens, Audio and other features; Sound; types of microphones, headphones; Lights; lighting kits, reflectors and bounce cards*
2. *Pre-production: Planning; making lists, location, script breakdown; Scheduling and budgeting, shots and coverage, storyboarding, Preparation for shooting: Composition and framing; Storyboarding and screenplay; The language of film*
3. *Editing basics: structure; Analysis of documentaries*

**UNIT 5 –Documentary production & selected Directors / Documentaries**

1. *Land Without Bread, Histoire(s) du Cinéma, Nanook of the North, Night and Fog, Balibo*
2. *Documentaries of Satyajit Ray and Shyam Benegal*
3. *Contemporary Indian Documentarists: Works of Anand Patwardhan, Paranjay Guhathakurta and Rakesh Sharma*
- *The concerned Course Teacher/s will provide reading references to the students before the beginning of the Semester.*

**MJMC-405: New Media Practical**

Course Teacher would teach and supervise the following practical units – outputs will be evaluated after the Semester.

**Unit 1: Practical Exercise---I**

1. *Online newspapers: analysis and components*

2. *Writing HTML, Web designing – elements of a web page, creating a home page, providing links through text, visuals etc., navigation principles*

#### **Unit 2: Practical Exercise---II**

3. *Analysis of social media*
4. *Creating, maintaining and promoting a Website/blog*

#### **MJMC-406: Dissertation - II**

- *Paper 406 Dissertation-II will be the final thesis in continuation of Paper 306, and it may be evaluated on the basis of final dissertation on the same topic to be submitted at the end of fourth semester with 70 per cent on the written and typed and bound dissertation submitted in three copies and 30 per cent on public presentation and viva voce to be taken by the external and internal (supervisor/s).*

#### **MJMC---407/A : Advanced Print & Data Journalism**

*Unit 1: Final evaluation: one interview based, one research based as mentioned vide 1 below, and one from 2 or 3, under the supervision of Course Teacher:*

1. *Assignments based on the interview and research*
2. *Developing news blog/news website*
3. *Production of the newspaper/magazine (hard/soft copy)*

*Unit---2: Media Tour Report / Portfolio / Internship Report*

- *Distribution of Marks: 60+20+10 viva voce to be taken by the external and internal.*



### **MJMC---407/B : Corporate Communication & Media Management**

*Unit---1: Practical Exercises--I: Course Teacher should assign specific assignments in the beginning of the semester itself. Based on those assignments students should prepare Workbook on (1) and (2) and 30 seconds to 2 minutes promo as per (3) below.*

1. *Organizing/ evaluating CC activities: Internal communication- various tools of internal communication- house journal,*
  2. *Media writing- various kinds writing for media- press releases, press rejoinders, press communiqué*
  3. *Preparing promo video/ video clips*
- Unit--2: Media tour / Case study / Internship Report

### **MJMC-407/C : Documentary & Short Film Making**

1. *Documentary / short film planning, scripting, shooting and post-production: Practical Assignment*
  2. *Media related tour / Case study / Internship Report*
- Distribution of Marks: 60+20+10 viva voce to be taken by the external and internal.

**DEPARTMENT OF COMMERCE  
ASSAM UNIVERSITY, SILCHAR**

**MANAGEMENT THOUGHT AND ORGANISATION BEHAVIOUR [MC-101]**

M.Com Semester-1  
Full Marks- 100  
Course No. MC-101  
Sessional-30  
Credit Hour-50  
Semester End-70  
Total Credit -6

**Objective:** The objective of the course is to develop a theoretical understanding among students about the structure and behaviour of organization as it develops over time. The course will also make them capable of realizing the competitiveness for firms.

**Unit I:** Concept, Definition, Nature, Importance, Process of Management, Management and Administration. Development of Management thought: Emergence of Scientific Management, Contribution of Taylor, Fayol, Bernard, Simon, Drucker and Mayo. Human Relations Movement: Hawthorne Experiments. System and contingency approach.

**Unit II:** Concept, Definition, Principles, Process and Importance of Organisation: Types of Organisation: Formal- Informal, Project Organisation, Matrix Organisation, Organisation Structure and Design; Delegation and Decentralisation, Span of Control. Concept, Nature, Scope, Background, significance and Foundation/ Emergence of Organisational Behaviour, Relationship between Management and Organisational Behaviour.

**Unit III:** Nature of Human Behaviour, Individual Decision making and problem Solving: Personality, Perception, Learning, Attitude and values. Transactional Analysis: Ego States, Transactions and life script.  
Group Behaviour: Definition, Types Characteristics of Group, Reasons of Formation of Groups, Theories of group Formation, Stages of Group Development, Group Behaviour, Group Norms, Group Cohesion, Group Role, Inter Group Behaviour, Group decision making, group Performance Factors.

**Unit IV:** Motivation – Definition , Types of Motivation; Theories of Motivation- Abraham Maslow's Need Hierarchy Theory, Alderfer's ERG Theory, Fredrick Herzberg's Two Factor Theory, Vroom's Expectancy Theory, Stacy Adam's Equity Theory.

**Unit V:** Leadership, Concept, Nature, Qualities, Techniques, Need of Leadership; Approaches or Theories of Leadership- Trait Theory, Behaviour Theory, Fiedler's Contingency Theory, Paul; Hersey and Kenneth H. Blanchard's Situational Theory, Path- Goal Model of Leadership; Power and politics: Definition, Sources of power, Organisational Politics, Reasons for Organisational politics, Management of Organisational Politics.  
Organisational Conflict: Concept, Types and Sources of Conflict; issues involved in Conflict, Positive (Functional) and Negative (Dysfunctional) Aspects of Conflict- Traditional Versus Modern Approach, Measuring Conflict, Conflict Resolution.

**Suggested Reading:**

1. Business Management: R. Ritwik Haldar, Himalaya Publishing House, New Delhi
2. Management: James A.F. Stoner and Adwars Freedom, Prentice Hall of India, Pvt. Ltd New Delhi.
3. Management and Organisational Behaviour: Jayantee(Mukharjee) Saha, Excel Books, New Delhi
4. Management and Organisational Behaviour: P. Subha Rao, Himalaya Publishing House.
5. Management – Principles and Prentice: Dr. M. Sakthivel Murugan, New Age International Publishers.
6. Management Process and organizational Behaviour: L. M Prasad, S. Chand & Company.
7. Organisational Behaviour: S.S Khanka, S. Chand & Company.

**Business Statistics [MC - 102]**

M.Com Semester-1	Full Marks- 100
Course No. MC-102	Sessional-30
Credit Hour-50	Semester End-70
Total Credit -6	

**Objective:** The objective of the course is to acquaint students with some of the important statistical techniques for managerial decision making .The emphasis will be on their applications to business and economic situations.

**UNIT-I:** Probability theory & distribution: Concept, Theorems, Rules of Event operations. Definition of probability: (Three approaches). Basic Postulates, Probability Rules, Bayesian probability rule. Discrete probability distribution: Binomial distribution, Poison distribution and normal distribution: Basic concept, characteristics and applications.

**UNIT-II:** Sampling methods and techniques, sampling distribution, estimation of sampling mean and variance, Central limit theorem, sampling error

Testing of hypotheses: Type-I & Type –II errors, one tailed & two tailed test, standard normal tests: z-test, t-test, F test

**UNIT-III:** Non Parametric Tests: Concepts, Utility,

Comparison with parametric tests, conditions for Applications of Non-Parametric Tests.

Spearman Rank Test, Chi Square test, Sign Test, Run Test, Wilcoxon Signed- Rank Test, Kruskal – Wallis Test (Application only).

**UNIT-IV:** Partial and multiple correlation & regression, concept and Applications of Partial and multiple correlation & regression.

Time series Analysis: Components of time series and methods of analyzing time series data: Moving average method, method of least square, exponential trend.

**UNIT-V:** Statistical Quality Control: causes of variation in quality, quality control charts-construction of a control charts- computing the control limits, process of chart making, warning limits, control chart for attributes

Reference:

Fundamentals of statistics-S.C. Gupta, Himalaya Publication, New Delhi

Business Statistics –B.L. Agarwal, New Age International Ltd.

Statistics for management, - Levin Richard & S Rubin David, Prentice Hall of India

Krishnaswami O.R.: Methodology of Research in Social Science, Himalaya publishing house.

Kothari , C.R. : Research Methodology- Methods & Techniques, New Age International Publication

Denzin, N.: The Research Act, Prentice Hall International, London

Srivastava, S.C.: Foundation of Social Research & Econometric Techniques, Himalaya Publishing House.

Courtis J.K. (ed) Research Methodology in Accounting and Financial Management 1980.

Chou Ya Lub: Statistical Analysis with Business and Economics Applications, Ind Eds, New York, Hold Rinehart & Wrinston 1974.

### **MANAGERIAL ECONOMICS [MC – 104]**

M.Com Semester-1	Full Marks- 100
Course No. MC-104	Sessional-30
Credit Hour-50	Semester End-70
Total Credit -6	

**Objective:** The objective of the course is to acquaint students with the concepts of micro-economic theory and their use in business decision making. The effort is to make them capable of using various concepts to deal with business problems in a globalised economic environment.

**UNIT-I:** Demand analysis: individual and market demand function, law of demand determinants of demand. Elasticity of demand-its meaning and importance, price elasticity, income elasticity and cross elasticity, use of elasticity in managerial decision making.

Theory of consumer choice: cardinal utility approach, indifference approach, revealed preference theorem and theory of consumer choice under risk, demand estimation for major consumer durable and non durable products, demand forecasting techniques

**UNIT-II :** Production theory; production firm, production with one & two variable inputs, stages of production, economies of scale, estimation of production function , cost theory and estimation , economic value analysis, short and long run cost function , their nature, shape and interrelationship, law of variable proportion, law of returns to scale

**UNIT-III:** Market and Price determination under different market conditions; characteristics of different market structures, price determination and firms equilibrium in short run & long run under perfect competition, monopoly, monopolistic competition, oligopoly & monopsony

Pricing practices: methods of price determination in practice, pricing of multiple products, price determination, international price discrimination and dumping, transfer pricing

**UNIT-IV:** Business cycle: nature and phases of business cycle, theories of business cycle, psychological, monetary, innovation, cobwebs, Samuelson and Hicks theories.

Inflation, deflation, characteristics and types, inflation in terms of demand pull and cost push factors, effects of inflation, remedial measures.

**UNIT-V:** Development Finance of Government Policies

Source of development finance, deficit financing, foreign capital, surplus from public undertaking, Consequences of various sources of revenue.

Finance Commissions in India, Recommendations of the latest finance Commission in India, Budget analysis of the latest budget of India.

References:

1. Koutsyiannis, A., Modern Microeconomics, Macmillan Press Ltd. (1998 Reprint).
2. Varian, Micro-Economic Analysis (ed. 3), Norton, 1992.
3. Pindyck Robert S. and Daniel L. Rubinfeld, Micro Economics, Third Edition, Prentice Hall of India, New Delhi, 1996.
4. Madala G.S. and Ellen Miller, Micro Economics, Theory and Applications, McGraw Hill, Book Company, New York.
5. Gould, John P., Edward P. Lazear, Micro-Economic Theory, Richard D. Irwin, Inc., Homewood Illinois.
6. Sen Anindya, Micro-Economics: Theory and Applications, Oxford University Press, New Delhi, 1999.
7. Tirole J., The Theory of Industrial Organisation, Cambridge MIT Press, 1988.

### **BUSINESS ENVIRONMENT [MC-105]**

M.Com Semester-1  
Course No. MC-105  
Credit Hour-50  
Total Credit -6

Full Marks- 100  
Sessional-30  
Semester End-70

#### **Objective:**

The objective of the course is to give a basic idea about the contemporary Indian business environment.

#### **UNIT-I**

Business Environment - Meaning, Nature and scope of Environment-Macro environment, Environment – Various Components: Economic, Political, Technological, Legal, Social and Cultural.

#### **UNIT-II**

State and Business, Different roles of Government, Role of Public Sector in India, Privatization, Liberalization of Indian Economy.

**UNIT-III**

Business Environment in India after independence, Rationale of Globalization of Indian Economy and its impact on Indian Business Environment in 21st century.

**UNIT-IV**

Foreign Direct Investment in India, Impact of Multinational Corporations on Indian Economy, Make in India Campaign, Impact of Goods and Service Tax on Traders and Consumers

**UNIT-V**

Regional Disparities in India, Unemployment in India, Sickness of Indian Industries, Black money. Impact of Demonetization in India

**Suggested Readings:**

1. Aswathappa, K, Business Environment for Strategic Management, Himalaya Publishing House, Mumbai.
2. Misra & Puri, Economic Environment of Business, Himalaya, Mumbai.
3. Cherunilam, F, Business Environment, Himalaya, Mumbai.
4. Adhikary, Economic Environment of Business, Sultan Chand, New Delhi.
5. Sengupta: Government and Business in India, Vikas, New Delhi.
6. Bagchi, A.K, WTO and India, Eastern Law Book, Kolkata.
7. Global Economy and Business Environment Francis Text & Cases (Ed 2001) Cheranilan Himalaya Publishing house)
8. Indian Economy by Dutta and Sundharam, S Chand & Co. New Delhi.
9. Economic and Political Weekly, Yojana, Survey of Indian Industries and Economic Survey (various issues)

**Financial Management [MC - 201]**

M.Com Semester-II

Full Marks- 100

Course No. MC-201

Sessional-30

Credit Hour-50

Semester End-70

Total Credit -6

**Objective:**

The objective of the course is to acquaint the students with the basic analytical techniques and methods of financial management of business firms. The course also provides students the exposure to certain sophisticated and analytical techniques that are used for taking financial policy decisions.

**UNIT: 1**

Financial Management – Meaning, Nature & Scope of Finance – Financial goal, Profit Vs Wealth Maximization – Investment, financing & dividend decision –Risk, Return- Risk Return trade off Meaning & Significance of Cost of Capital, Calculation of Cost of Debt. Preference Capital & Retained Earnings; Combined Cost of Capital (weighted).

**UNIT: II**

Capital Budgeting: Investment Evaluation Criteria – Net present value, Internal Rate of return, Profitability Index, Payback period, Accounting Rate of return, NPV & IRR Comparison;

**UNIT: III**

Leverages – Meaning & type of leverages, degree of leverage, measurement of leverages; Effects of operating & financial leverage on profit; capital structure theories; capital structure & policy – EPS, EBIT, EPS, Analysis in practice.

**UNIT: IV**

Dividend theories; Determinants of Dividend policy, Dividend policy in practice; Forms of Dividends; Stability in Dividend policy. Mutual Fund, Concept, Nature and Types.

**UNIT: V**

Working capital management – meaning significance & types of working capital requirements, sources of working capital, Factoring, Determining working capital requirements – Dimensions of working capital management of cash, receivables & inventory.

**Suggested Reference:**

Chandra Prasanna – Financial management: Tata Mc Graw Hill, Delhi.

Pandey, IM: Financial management, Vikash Publishing House, Delhi.

Khan MY, Jain PK: Financial management, Tata Mc Graw Hill, Delhi.

Sarma & Gupta: Financial management, Kalyani Publishing House, New Delhi.

Bhattacharya Hrishikesh: Working capital management Strategies & techniques, Prentice Hall, New Delhi.

Van Horne, James C: Financial Management & Policy, Prentice Hall, Delhi.

Balla V.K. Financial Management, Anmol Publication.

Levy & Sarnat: Capital Investment & Financial Decision.

**BUSINESS ETHICS AND CORPORATE GOVERNANCE [MC - 202]**

M.Com Semester-II

Full Marks- 100

Course No. MC-202

Sessional-30

Credit Hour-50

Semester End-70

Total Credit -6

**Objective:**

The objective of the course is to give a basic idea about the principles of Business Ethics and Corporate Governance.

**UNIT: 1**

Business Ethics: Concept, Characteristics & Importance of Business Ethics, Influencing Business Ethics, Roots of Unethical Behavior, Sources of Business Ethics, Relevance of values in Management.

**Unit 2:**

Ethical Vision of Management: Lessons from Gita on Work, The Law of Karma, Contribution of Vivekananda and Gandhiji on ethics, Ethical Issues in General Management.

**Unit 3:**

Teleological and Deontological theories of Business Ethics; ethics in functional areas of management

Corporate Social Responsibilities: Arguments for and Against, Various dimensions of CSR.

**Unit 4:**

Concept, Objectives and Constituents of Corporate Governance, Advantages & Disadvantages of Corporate Governance. Agency Theory and Stakeholder Theory. Cadbury Report, OECD Principles of Corporate Governance.

**Unit 5:**

CSR and environmental concerns, Designing CSR Policy- Factors influencing CSR Policy, Role of HR Professionals in CSR, Global Recognitions of CSR- ISO- 14000-SA 8000 – AA 1000 – Codes formulated by UN Global Compact – UNDP, Global Reporting Initiative; major codes on CSR., CSR and Sustainable Development , CSR through Triple Bottom Line in Business

**Suggested Readings:**

- Andrew Crane and Dirk Matten, Business Ethics: Managing Corporate Citizenship and Sustainability in the Age of Globalization, Oxford University Press.
- Andrew C. Wicks and R. Edward Freeman, Business Ethics: A Managerial Approach Pearson Education.
- Manuel G. Velasquez, Business Ethics: Concepts and Cases Pearson.
- Boatright, J.R., Ethics and the Conduct of Business, Pearson Education.
- Crane, A, and Matten, D. Business Ethics; Oxford University Press.
- A.C.Fernando Corporate Governance : Principles, Policies and Practices, Pearson
- A.G.Robert, Monks and Neil Minow, Corporate Governance, Wiley.

**ENTREPRENEURSHIP AND SMALL BUSINESS MANAGAEMENT [ MC - 204 ]****OPEN COURSE**

M.Com Semester-II  
Course No. MC-203  
Credit Hour-50  
Total Credit -6

Full Marks- 100  
Sessional-30\*  
Semester End-70

\*15 marks for Sessional test,, 5 marks for case studies, and 10 marks for field visit report in lieu of Group Discussion and home assignment



**Objective:**

The objective of the course is to give a basic concept of Entrepreneurship and. to make student aware of the various issues in Small Business Management.

**Unit I:**

Concept of Entrepreneurship: Definition, Nature and Characteristics of Entrepreneurship; Types of Entrepreneurship: Corporate Entrepreneurship, Social Entrepreneurship, Destructive Entrepreneurship; Entrepreneurship and Management; Entrepreneurship and Innovation; Role of Entrepreneurship in Economic Development. Case studies on type of entrepreneurship.

**Unit II**

Theories of Entrepreneurship: Innovation theory, Economic Forces theory, Resource Based theory, Systematic Entrepreneurship theory; Emergence of Entrepreneurship In India, Features of Indian Entrepreneurship. Entrepreneurship Environment in India.

**Unit III**

Entrepreneur: Definitions, functions and role of Entrepreneur in Economic growth, types of entrepreneur; entrepreneurs vs intrapreneur, entrepreneurs vs administrators, Entrepreneurial Decision Making; Entrepreneurial leadership; Entrepreneurial attributes and characteristics; Case studies on Traits of successful Entrepreneurs;. Social Responsibility of Entrepreneurs; EDP.

**Unit IV**

Small Business Management: concept of MSME, Start up India, Registration of Small Business in India; Project Planning and Conducting Feasibility Studies; Project Report Preparation: Specimen of Project Report; Product protection of Small Business Enterprises: Patents, Trademarks and Copyrights; Potential crisis areas for Small Business; Success and failure factors of small business enterprises in India; Challenges & Opportunities of Small Business Development in North-East India

Case Studies on Small Business Enterprises in North East India

**Unit V**

Role of Promotional Agencies in Small Business Development in India: Role of Government, Financial institutions, MUDRA, DIC, and other specialized institutions; policies of small business development in North-East India; Industrial Visit.

**Suggested Reading**

1. Kumar, Arya, Entrepreneurship : Creating and Leading an Entrepreneurial Organisation, Pearson , India.
2. Drucker Peter F, Innovation and Entrepreneurship, Harper New York
3. Holt, David H, Entrepreneurship New Venture Creation PHI, India
4. Vasant, Desai, Small- Scale Industries and Entrepreneurship , Himalaya Publication, India.
5. Khanka, SS, Entrepreneurial Development
6. Kuratko, D.F., and T.V.Rao, Entrepreneurship: A South – Asian Perspective, Cengage Learning

## **MARKETING MANAGEMENT [MC –205]**

M.Com. Semester II

Full Marks: 100

Course No: MC – 205

Sessional: 30

Credit Hour – 50

Semester End: 70

Total Credit – 6

### **Objective:**

The objective of the course is to familiarize the students with the concepts of marketing to develop their conceptual and analytical skills to be able to manage marketing operations of a business firm.

### **Unit 1**

Concepts, Definition, Nature, Scope & Importance of marketing; Types of marketing; Evolution of Marketing Concept; Modern concept of Marketing; Strategic Planning and Marketing Process, Marketing Environment- Macro and Micro components & their impact on marketing decisions.

### **Unit-II**

Concept of Product; classification of products; Major product decision: Product Mix; Product Life Cycle: Strategies & implications; New product development, Branding & packaging.

Pricing: Objective of Pricing, Factors affecting price determination; pricing policies & strategies.

### **Unit-III**

Concept of market segmentation, Based and procedure for segmenting a consumer market; Criteria for effective market segmentation; Target market selection and strategies; Concept, based and process of market Positioning.

Marketing Mix: elements of marketing mix, Promotion mix, Distribution Mix: Channel of distribution and Physical distribution;

### **Unit-IV**

Green Marketing, Rural Marketing, Ethics in Marketing, Digital marketing, Social media Marketing, Legal issues in Marketing in Indian context.

### **UNIT-V**

Meaning & scope of International marketing; Complexities in International Marketing; International Marketing Environment- Geographical, demographic, Economic, legal political and Socio- Cultural Environment. Foreign Market Selection and entry Strategies, Market coverage strategies.

### **Suggested Readings**

Czinkota, M.R.: International Marketing, Dryden Press Boston.

Jain, S.C.: International Marketing, Prentice Hall, New Delhi.

Keegan, Warden J.: The Essence of International Marketing, Prentice Hall, New Delhi.

Paliwoda, Stanley J.: The Essence of International Marketing, Prentice Hall, New Delhi.

Vasudeva, P.K.: International Marketing, Excel Books, New Delhi.  
 Cherunilam, F. : International Marketing ( Text and Cases) Himalaya Publishing House, ND  
 Ramaswamy, V.S. and Namakumari, S. Marketing Management.

### **INDIAN FINANCIAL SYSTEM [MC – 301]**

M.Com Semester-III

Course No. MC-301

Credit Hour-50

Total Credit -6

Full Marks- 100

Sessional-30

Semester End-70

#### **Objective of the Paper**

The purpose of the course is to provide a sound information and knowledge of broad framework of Financial System in India and its constituents. The course will provide the students an understanding of the inter-linkages and regulatory frame-work within which the system operates in India.

#### **Unit-I: Financial System and Economic Growth**

Components of the formal financial system,. nature & functions of financial system., relationship between the financial system and economic growth. Structure of Indian financial system, recent changes in Indian financial system

#### **Unit-II : Financial Markets in India I**

Money Market : composition, participants, Instruments; recent developments in Indian money market.

Case studies; Regulations of money market in India: Regulatory framework of money market and Reserve Bank of India

#### **Unit-II : Financial Markets in India II**

Capital market: composition, participants, instruments; Primary and secondary market, Stock market, Government securities market, Derivative market, foreign Exchange market in India : role, functions, instruments. Capital Market reforms in India. Regulations of Capital Market in India: The regulatory function of the Securities and Exchange Board of India

#### **Unit-IV : Financial Institutions in India**

Growth of financial Institutions in India; Commercial banks: Structure and Functions of commercial banks. Reforms in the banking sector. Management of nonperforming assets by banks. Investment institutions in India: Insurance, Mutual funds. Development Financial Institutions: role and functions, The non- Banking Finance Companies: types of NBFCs, regulatory norms of NBFCs as per the RBI Act, latest RBI's policy directives to NBFCs. Housing Finance Institutions in India, Micro Finance Institutions.

#### **Unit- V : Financial Services**

Investment banking : Functions and services- Merchant banking . The Depositories and custodians: The National Securities Depository Limited, the Central Depository Services (India) Limited . The Stock Holding Corporation of India limited, Credit rating: CRISIL, ICRA, Factoring , forfeiting , Lease financing, hire purchase, Installment purchase.

**References:**

1. M.Y Khan- Indian Financial System- Vikash Publishing House.
2. Desai Vasata- Banking & Financial System- HPH.
3. Bhole. L. M. – Financial Market & Institution, Tata McGraw Hill, New Delhi
4. Varshney, P.N- Indian Financial System, Sultan Chand & Sons- New Delhi.
5. R.B.I- Various Report.
6. Ghosh. D- Banking Policy in India, Allied Publication, New Delhi.
7. B.M. Bhotra- New Issue Market in India- Von Publishing .
8. Bharti Pathak (2014), Indian Financial System, Pearson, 14<sup>th</sup> Edition.

**302: HUMAN RESOURCE PLANNING AND DEVELOPMENT**

M.Com Semester-III

Full Marks- 100

Course No. MC-302

Sessional-30

Credit Hour-50

Semester End-70

Total Credit -6

**Objective:**

The objective of the course is to acquaint students with the techniques and principles to manage human resource of an organisation. This knowledge would make the students capable of employing these techniques to harness the best of each individual working in the organisation.

**Unit 1-** Introduction to Human Resource Management: Introduction, Concept of Human Resource Management, Scope of Human Resource Management, History of Human Resource Management, Function of Human Resource Management.

HRM in India: Introduction, Changing Role of Human Resource in India, Globalization and Its Impact on HR

Emerging Trends in HRM: Competency Mapping, Business Process Outsourcing, Right Sizing of Workforce, Flexi time, Talent Management, Employee Engagement

**Unit 2-** Human Resource Planning: Process of Human Resource Planning, Need for Human Resource Planning, HR Forecasting Techniques.

Recruitment and Selection: Concept of Recruitment, Factors Affecting Recruitment, Sources of Recruitment, Recruitment Policy, Selection, Selection Process, Selection Test, Interviews, Evaluation, Placement, Induction.

**Unit 3-** Training and Management Development: Meaning of Training, Area of Training, Methods of Training, Concept of Management Development, Management Development Methods, Differences Between Training and Development, Evaluation of Training and Management Development

Employee Career Planning and Growth: Concept of Employee Growth, Managing Career Planning, Elements of a Career Planning Programme, Succession Planning

Performance Appraisal: Concept and Need for Performance, Reviews, Overview of Performance Appraisal, Types of Appraisal Methods, Benefits and Limitations.

**Unit 4-** Compensation Management: Wage and Salary Administration, Managing Wages, Concept of Rewards and Incentives, Types of Incentive systems- methods.

Job Evaluation: Concept of Job Evaluation, Objectives, Techniques, Advantages and Limitations. Concept of Job Analysis and Design, Process and method of Job Analysis and Design.

Human Resource Information System: Introduction, Concept, Components, Types, Application, Implementation, Benefits, Impact

**Unit 5-** Employee Misconduct and Disciplinary Procedure: Meaning and Objectives of Discipline, Principles for Maintenance of Discipline, Disciplinary Action – Penalties, Procedure for Disciplinary Action

Grievance and Grievance Procedure: Concept of Grievance, Causes of Grievances, Forms and Effects of Grievance, the Grievance Handling Procedure, Need for Grievance Redressal Procedure.

Employee Welfare and Working Conditions: Concept of Employee Welfare, Welfare Measures, Types, Employee Welfare Responsibility, Workers Participation in Management, Collective Bargaining.

#### **References:**

1. Personnel Management – Dr. C.B. Mamoria and Dr. Satish Mamoria, Himalaya Publishing House.
2. Human Resource Management – Biswajeet Pattanayak, Prentice Hall of India Pvt. Ltd.
3. Personnel Management – Arun Monappa and Mirja Saiyadain, Tata McGraw Hill Publishing Co. Ltd.
4. Human Resource Management – K. Ahswathappa, Tata McGraw Hill Publishing Company Ltd.
5. Personnel Management – Edwin B. Flippo, McGraw Book Company, New Delhi.
6. Human Resource Management – Dr. L.M. Prasad, S. Chand and Company.
7. Human Resource Management – Sorab Sadri, Himalaya Publishing House.
8. Strategic Human Resource Management – Srinivas R. Kandula, Prentice Hall of India.
9. Human Resource Management and Human Relations – V.P. Michael, Himalaya Publishing House.
10. Strategic Human Resource Management – Rajib Lochan Dhar, Excel Books.
11. Human Resource Management – Dipak Kumar Bhattacharya, Excel Books.
12. Personnel Management and Industrial Relations-P.C.Tripathi

#### **INTERNATIONAL FINANCIAL MANAGEMENT [MC-304 FM]**

M.Com Semester-III

Course No. MC-304 FM

Credit Hour-50

Total Credit -6

Full Marks- 100

Sessional-30

Semester End-70

#### **OBJECTIVE:**

The objective of the course is to acquaint the students with financial management problems of multinational corporations and prepare them to tackle these problems.

#### **UNIT: I**

International Financial Management: Meaning, importance, nature, scope, finance function in a global corporation. Factors leading to fast growing international finance and rational of globalization of finance. Analysis-Balance of Payment of India- Structure, trend of current account and capital account transactions, consequences of disequilibrium in BOP and measures for corrections.

## **UNIT: II**

International Financial System: Developments in International Monetary system- exchange rate regime; International financial institutions: Monetary Fund, International Bank for Reconstruction and Development, International finance corporation, International Development Association, Asian Development Bank; International financial markets: segments- foreign exchange market, International Bond market, International equity market, International money market and International credit market; International financial instruments: ADRs, GDRs, foreign bonds, Euro bonds, global Bonds, straight bonds, floating rate notes, convertible bonds, Euro notes, Euro commercial paper.

## **UNIT: III**

Foreign Exchange Market and Exchange Rate Mechanism

Foreign exchange market-distinctive features, major participants, spot market and forward market; Exchange rate mechanism: exchange rate quotations, Nominal, Real and Effective exchange rates, factors influencing exchange rate,; Theories of exchange rate: PPP,IRP, expectation theory and balance of payment theory.

## **UNIT: IV**

Foreign Exchange Exposure Management

Need for exchange rate forecasts, technique of forecasting, forecast in a controlled exchange rate regime.; Foreign exchange exposure-concept, type-Transaction, Real operating and translation exposure- nature and Measurement; Management of foreign exchange exposure- need for hedging, hedging of transaction and real operating exposure, managing translation exposure

## **UNIT: V**

International Capital Budgeting and Cross Border Financing

International capital budgeting: evaluation criteria, computation of cash flow, cost of capital, financial and non-financial factors influences in international capital budgeting decision; Cross border trade: export finance- Pre-shipment and Post-shipment. Buyers credit and suppliers credit.

## **Reference:**

- O.P. Agarwal (2014): International Financial Management, Himalaya Publishing House. 3<sup>rd</sup> .  
 P.G. Apte- International Management, Tata McGraw Hill.  
 Sikidar, S. Bhorali D- International Financial Institutions and Monetary Management, Kalyani Publishers.  
 P.K. Jain- International Financial Management.  
 Sharma V- International Financial Management, Prentice Hall of India New Delhi.  
 V.A. Avahadni International Finance, Himalaya Publishing House.  
 Shapiro- Multinational Financial Management, Prentice Hall of India.

## **ORGANISATIONAL CHANGE DEVELOPMENT AND EFFECTIVENESS [MC – 304 HR]**

M.Com. Semester III

Full Marks: 100

Course No: MC – 304 HR

Sessional: 30

Credit Hour – 50

Semester End: 70

Total Credit – 5

### **Objective:**

The objective of the course is to give a basic idea about the Organisational Change Development and Effectiveness.

### **Unit – I: Organisational Change and Development**

Diagnosing the environment: Environmental and Situational variables; Change-Introduction, Forces, Managerial response to pressure for change, Models of change – Systems Model, Lewin's Force - Field Model, The Continuous Change Process Model; Change and Transition Management: Impact of Change, Acceptance, Indifference and Resistance to Change. Sources of resistance to Change, Overcoming Resistance to Change, Approaches to Planned Change;

Organisational Development: Definition, Characteristics, Goal, Types, Assumptions; Action Research Model, Conditions necessary for a successful OD Program, OD Interventions (Techniques), Evaluating OD.

### **Unit – II: Organisational Climate, Culture and Effectiveness**

Organisational Ethos, Organisational Climate; Concept, Definition and features of Organisational Culture, Characteristics and determinants of Organisational Culture, Approaches to Organisational Culture Sustaining and Changing Organisational Culture, Strong Vs Weak Culture, How employees learn culture. Changing Organisational Culture;

Definition and Nature of Organisational Effectiveness, Effectiveness vs. Efficiency, Approaches to O.E., Factors determining O.E., Integration of Goals and Effectiveness, Participation and Effectiveness, style and Effectiveness, Problems of Survival, Growth and Capacity to Adapt to and Manage Change.

### **Unit – III: Creativity and Innovation**

The Landscape of Creativity, Need and Importance; Individual and Group Creativity; The Creative Process, The Creative Personality, The Creative Intelligence, The Creative Environment, The Creative Encounters and Creative Teams, Creative Organisation, How to improve Creativity, Stimulating Innovation, Creating Climate for Organisational Creativity; Techniques of Creative Problem Solving – Brainstorming, Synectics, Attribute Listing; Management of Innovation.

### **Unit: – IV: Frustration, Stress and Burnout**

Heuristics and Biases in Decision Making, Improving the Effectiveness of Problem Solving and Decision Making; Frustration: Definition and Dynamics of Frustration, Circularity of Frustration, Coping Behaviour, Aggression, Regression, Flight and Exploration, Life Stress, Role Stress, Managing Frustration.

Stress: Definition, Sources, Individual, Group and Organisational, Anxiety & Tension, Signs of Stress, Approaches to Stress, Consequences of Stress, Managing with Stress, Coping with Stress, Self Role

Distance, Role Expectation Conflict, Role Stagnation, Inter Role Distance, Role Ambiguity, Role Overload, Role Isolation, Role Erosion. Fight vs. Flight; Ethics in Management: The Game of Prisoner's Dilemma.

### **Unit – V: Organisational Effectiveness through Excellence**

Nature of Organisation, Transition from Traditionalism to modernity, Turnaround of Sick Enterprises; Organisational Excellence, Concept, Forms, Passion for Organisational Excellence: Core Value, Organisational Missions, Vision for Organisational Excellence; Excellence through Management styles – Professional, Bureaucratic, Organic, Authoritarian, Participatory, Intuitive, Familial, Altruistic; Management of Different Kinds of Excellence – Competitive, Rejuvenatory, Institutional, Creative, Missionary and Versatile;

Excellence through Goals Policies and Domains – Goals of Growth, Goal of Organisational Capability Development, Goal of Greater Operating Efficiency, Goal of Greater Financial Strength, Goal of Greater Support of Stakeholders.

Excellence through improving Structures and Systems: Infrastructures, Folk vs. Sophisticated Management Systems;

Excellence through Revitalisation – Behavioural Science Approaches to Organisational Renewal, Revitalisation through Leadership, Credibility Building and Organisational Mobilisation.

### **Reference**

Management: James A.F. Stoner and R. Edward Freeman, Prentice Hall of India  
 Organisational Designs for Excellence: P.N. Khandwala, Tata Mc Graw Hill Publishing Co. Ltd.  
 Effective Enterprise and Change Management: A.H. Anderson and D. Marker on Blackwell Publisher Ltd.  
 Organisation Development: W.E. French and C.H. Bell, Prentice Hall of India  
 Effective Organisation and Social Values: S.R. Kao, Sage Publication New Delhi  
 Principles and Practise of Management: L.M. Prasad-S. Chand and Company  
 Management of Organisational Behaviour: Paul Hersey and Kenneth H. Blanchard, Prentice Hall of India Pvt. Ltd.  
 Fourth Eye- Excellence Through Creativity: P.N. Khandwala, Wheeler Publishing House, New Delhi  
 Management and Organisational Behaviour: P. Subha Rao, Himalaya Publishing House, New Delhi  
 Organisational Change and Development: Kavita Singh, Excel Books  
 Organisation Behaviour: VSP Rao, Excel Books  
 Understanding Organisation Behaviour: K. Ashwathapa, Himalaya Publishing House  
 Understanding Organisation Behaviour : Udai Pareek, Oxford University Press  
 Organisational Behaviour : P G Aquinas, Excel Books  
 Organisational Designs for Excellence: P.N. Khandwala, Tata McGraw Hill Publishing Co. Ltd

### **MANAGEMENT ACCOUNTING [MC- 305]**

M.Com Semester-III	Full Marks- 100
Course No. MC-305	Sessional-30
Credit Hour-50	Semester End-70
Total Credit -6	



**Objective:**

The objective of the course is to enable students to acquire sound Knowledge of concepts, methods and techniques of management accounting and to make the students develop competence with their usage in managerial decision making and control.

**UNIT: I**

Introduction: Management Accounting as an area of Accounting, Objectives, Nature and Scope of Financial Accounting and Management Accounting; Management Accounting and Managerial decisions; Management Accountants Position, Role and Responsibilities. Management Accounting vs Cost Accounting vs Financial Accounting.

**UNIT: II**

Budgeting & Budgetary Control: Concept of budget and budgetary control, types of budgets, Control ratios, ZBB, Performance Budgeting, Preliminaries for the adoption of a system of budgetary control.

Accounting Plan and Responsibility Centers: Meaning and Significance of Responsibilities Accounting; Responsibility Centre- Cost centre, Profit Centre and Investment Centre; Problems in Transfer Pricing; Objectives and Determinants of Responsibility Centre.

**UNIT: III**

Marginal Costing and Break-even Analysis: Concept of Marginal cost; Marginal Costing and Absorption Costing; Marginal Costing vs Direct Costing. Cost Volume Profit Analysis; Break even analysis, assumption and practical applications of break-even analysis: decision regarding sales mix, make or buy decisions, discontinuation of product line, export vs local sale decision, expand or contract decision, sell or further process decision, marketing decisions etc.

**UNIT: IV**

Standard Costing and Variance Analysis: Standard Costing as a control technique, setting of standards and their revision; Variance Analysis meaning and importance, kinds of variances and their uses- material, labour and overhead variances, Disposal of variances, relevance of variance analysis and standard costing.

**UNIT: V**

Contemporary Issues in Management Reporting: Value chain analysis; Activity- based costing, Quality costing; Target and life cycle costing. Meaning and objective of reporting, Financial forecasting and balance score card.

**Reference:**

Anthony, Robert: Management Accounting, Taraporewala, Mumbai.

Pandey, I. M : Management Accounting, Vai Publications Delhi.

Lall. B.M and I.C Jain: Cost Accounting, Principles and Practice, Prentice Hall, Delhi.

Sikdar, S: Financial Statement Analysis.

Horngran, C. T. Gary, Sundem and William O. Stratton: Introduction to Management Accounting, Prentice Hall, Delhi.

### **SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT [MC-403-FM]**

M.Com Semester-IV  
Course No. MC-403 FM  
Credit Hour-50  
Total Credit -6

Full Marks- 100  
Sessional-30  
Semester End-70

#### **Objective:**

The objective of the course is to establish a conceptual frame work for the study of Security analysis and portfolio management. This course will provide the student the ability to understand and utilise the skill of optimising returns. The focus at different places is to build models and discuss their validity and application to practical situations.

**UNIT: I:** Investment: Nature and Scope of Investment Analysis, Elements of Investment, Avenues of Investment, Approaches of Investment Analysis, Concept of Return and Risk, Security Returns and Risk Analysis, Measurement of Return and Risk, Financial Assets: Types and their Characteristics, Sources of Financial Information.

**UNIT: II:** Fundamental Analysis: Meaning, Economy-Industry- Company Analysis Framework, Economy Analysis, Industry Analysis, Company Analysis.

Technical Analysis: Meaning, Dow theory-Bulish Trend, Bearish Trend, Basic principles of Technical Analysis, Chart Pattern Trend analysis, Elliot Wave Theory, Mathematical Indicators- Moving Averages, Simple Moving Averages, Exponential Moving Average, Oscillators, Rate of change indicators, Relative strength index, Moving Average Convergence and Divergence, Market indicators- Breadth of the market, Short interest, odd-lot index, Mutual fund cash ratio, Technical Analysis Vs Fundamental Analysis.

**UNIT: III:** Valuation of Securities- Equity Shares, Preference Shares, Bond

Share Valuation- Concept, Share Valuation Model - One Year Holding Period, Multiple-Years Holding Period, Constant Growth Model, Multiple Growth Model, Discount Rate, Multiple Approach to Share Valuation - Regression Model.

Bond Valuation- Concept, Bond Returns- Coupon Rate, Current Yield, Spot Interest Rate, Yield to Maturity (YTM), Yield to Call (YTC), Bond Prices, Bond Pricing Theorems, Bond Risk - Default Risk, Interest Rate Risk, Bond Duration.

**UNIT: IV:** Efficient Market theories: Weak, semi strong and market and testing.

Portfolio Analysis: Portfolio with two securities – Estimating return and Risk, Risk reduction through diversification; Portfolio with more than two securities - Estimating return and Risk

Portfolio Selection: Markowitz Risk-return optimization, Feasibility Set of Portfolio, Efficient set of portfolio, Selection of the optimal Portfolio, Single Index Model -

Portfolio market risk and unique risk, simple Sharpe's optimization solution, Multi-Index Model.

**UNIT: V:** Capital Asset Pricing Theory: CAPM, assumptions, efficient frontier with riskless lending and borrowing, Capital market line, Security Market Line, Pricing of securities with CAPM.

Portfolio Revision: meaning, need for revisions, constraints in revision, Portfolio Revision Strategies- Formula Plans, Constant Rupee Value Plan, constant Ratio Plan, dollar Cost Averaging

Portfolio Performance Evaluation: need for evaluation, Evaluation Perspective, Measuring Portfolio Return, Risk adjusted returns- Sharpe Ratio, Treynor Ratio, Differential Return, Decomposition of Performance.

### References:

Fisher and Jordan: Security analysis and portfolio management (Pearson Education)  
 Prasanna, Chandra: Investment analysis and portfolio management (Tata McGraw Hill)  
 V.K.Bhalla: Investment Management (S.Chand)  
 Pandian: Security Analysis and portfolio management (Vikas Publishing House)  
 Harington Modern Portfolio, Theory (Prentic Hall of India)  
 Robert Strong: Portfolio Construction (Wiley Publishing)

### Department of Commerce Coursework Syllabus, 2017 (M.Phil and Ph.D)

#### 501 - Research Methodology (4 Credit)

##### Unit-I

- 1.1 Commonsense and Technical Research
- 1.2 Methods of Acquiring Knowledge
- 1.3 Meaning and Role of Assumption, Hypothesis, Propositions and Conceptual Abstracts
- 1.4 Meaning of Postulate, theory, Principle of Law

##### Unit-II

- 2.1 Schedule versus Questionnaires
- 2.2 Scaling Technique - Likert, Thurston
- 2.3 Pre-testing and collection of Data

##### Unit-III

- 3.1 Methods of collection of Data and information
- 3.2 Sampling : Design and Types
- 3.3 Sampling versus Survey Method
- 3.4 Data filtering and Tabulation

##### Unit-IV

- 4.1 Research Problem, Research Gap, Objective of Research
- 4.2 Hypotheses versus Research Questions
- 4.3 Review of Literature and Methods of Referencing
- 4.4 Synopsis Preparation and Design: Conceptual and Analytical

##### References:

1. Chawla, Deepak and Sondhi, Neena Research Methodology, concept and Cases, vikash Publishing House Pvt. Ltd.
2. Krishnaswamy, OR and Rangnatham, M Methodology of Research in Social Sciences, Himalaya publication House, 2005, ISBN:8184880936
3. Kothati, CR, Research Methodology: Methods and Techniques New Age International Publisher, ISBN:81-224-1522-9
4. Fisher R. A., Statistical Methods for Research Workers Cosmo Publications, New Delhi ISBN:81-307-0128-6

**502-Statistical Tools and computer Application**  
**Departmental Level**  
**M.Phil/ Ph.D**

**Unit: I**

- 1.1 Measures of Central Tendency & Dispersion
- 1.2 Correlation Analysis-Concept, Assumption and Type of Correlation Coefficient
- 1.3 Regression Analysis-Concept, Assumption, Simple (Linear and Exponential only) & Multiple Regression.
- 1.4 Time Series Analysis: Concepts, Measurements and Trends

**Unit:II**

- 2.1 Probability : Additive and Multiplicative law and their applications, independence and conditional probability, application of Bayes theorem;
- 2.2 Poisson and Binomial Distribution : Applications
- 2.3 Normal Distribution: Concept, properties and applications
- 2.4 Index Number: Chain based and fixed based Index numbers, consumer Price Index and their applications

**Unit: 3**

- 3.1 Hypothesis formulation - type I, type II errors, One tailed & Two Tailed test
- 3.2 Parametric Test-concept, conditions and applications of t, F & Z test
- 3.3 Non Parametric test-Concept, Utility and Application of Chi-square, Run Test, Mann Whitney test.
- 3.4 ANOVA: Concept and Applications for both one way and two way and Kruskal wallis test.]

**Unit:4**

- 4.1 Introduction to Computer and Internet Technology
- 4.2 Use of Excel and SPSS for analysis of data
- 4.3 Factor analysis
- 4.4 Cluster analysis

**Reference:**

5. Fundamentals of Statistics-S.C.Gupta, Himalaya Publication, New Delhi, latest edition
6. Statistics for Management, - Levin Richard & S Rubin David, Prentice Hall of India
7. Kothari, C.R.: Research Methodology- Methods & Techniques, New Age International Publication.
8. Srivastava, T N Rego, Shailaja; Statistics for Management, McGraw Hill Publishing Company Limited.
9. Norton Peter, Introduction to Computer Tata McGraw Hill Publishing Company Limited.
10. Ajai S. Gaue and Sanjaya S. Gaur Statistical Methods for Practice and Research A guide to data analysis using SPSS (Second edition) Response books Business books from SAGE B1/I-1 Mohan Cooperative Industrial Area Mathura Road, New Delhi 110 044, India
11. Sarma, KVS Statistics made simple Do it yourself on PC PHI Learning Pvt. Ltd.

**DEPARTMENT OF URDU**  
**ASSAM UNIVERSITY: SILCHAR.**

**Course: UR-102**

**History of Urdu Languages & Literature**

**Unit - I**

1. Hindustan me aryon ke amad se qabl ki lisani wa tahzibi surate hal. astrak aur dravidi goumen aru unki zubanen
2. Hindustan me aryon ki amad aur hind aryai ka irteqa.

### 3. Hind aryai ke mukhtalif aswar.

ahde qadeem: vaidik Sanskrit aur klassiki sanskrit, Sanskrit ke elaqaai bolian (udichia, prachia aur Madhya disha) ka mukhtasar taarud.

Ahde usta: Prakriton aur upa bhransho ka irteqa

Ahde Jadid: Jadid hind aryai zubanon ka agaz-siasi wa tahzibi surate hal. Jadid hin aryai zubanon ki garoh bandi.

### Unit - II

1. Maghrebi hindi aur uski bolian
2. Satragwi sadi tak shemali hind ki lesani surate hal: Amir Khusru, digar sufia aur unke malfuzat. Khari, burj, Haryani, Punjabi wagartah ke mile jule asarat-Afzal ka barah masah.
3. urdu zuban ke aghaz o irteqa se mutallem mukhtalif nazariat (Mahmud Shirani aur Hussain Khan ke gawale se)

### Unit- III

1. Shemali zuban ka janub ki taraf safar. Ahde Tughlaq me Dehli se inteqal e abadi Bahmani dour ki lesani wa adabi surat e hal.
2. Dakani Urdu ki lesani khosusiaat.

### Uniy-IV

1. Degli me islage zuban ki koshish. Iham goi ki mukhalefat. Mirza Mazhar aur shah Hatem ki Khidmat-Dicane zada ke dibache ki tarikhi wa lesani ahmiat.
2. Lakhnaow me islahe zuban ka amal. Nasekh aur uske shagirdon ki kaweshen.

### Unit-V

1. Qutub shahi daur me ek nai mushtarak tahzib ka garon aur uski adabi rawayat.
2. Azadi ke baad Udu ke lesani wa adabi surate hal.

### Prescribed books for study:

- |                                    |   |
|------------------------------------|---|
| 1. Hind aryai aur hindi:           | Suniti kumar chatarjee (tarjama : Atiq ahmad Siddiqi) |
| 2. Muqaddema tarikhe zubane Urdu:  | Masud Hussain khan                                    |
| 3. Panjab me Urdu                  | Mahmud Shirani  |
| 4. Dastane zubane Urdu             | Shaukat Sabzwari                                      |
| 5. Tarikhe Adabe Urdu              | Jamil Jalebi  |
| 6. Tarikhe adabe Urdu              | Nurul Hasan Naqwi                                     |
| 7. Urdu ki lesani tashkil          | Mirza Khalil Ahmad Beg                                |
| 8. Lesani Mutalea                  | Gyan Chand Jain                                       |
| 9. Hindustani lesaniat             | Sayd Mohiuddin Qaderi Zor                             |
| 10. Urdu e Muala (Lesaniat number) | Shobae Urdu Dehli University.                         |

**Course: UR-304: Journalism****Unit-I**

1. Sudu Sahafat: Zaban, Technique aur Tanazur

**Unit-II**

1. Meaning, Origin and Development of Mass Media

**Unit-III**

1. Print Media (News, column writing, Feature writing, Editorial and Interviews etc)

**Unit-IV**

1. Electronic Media (Radio, Television, film, Documentary, Drama Scripts, etc)

**Unit-V**

1. Urdu Radio aur Television mein Tarseel o Ablag.

**Recommended Books:**

1. Awami Zarai-e-Tarseel: Ashafaq Mohammad Khan
2. Ablaghiyaat: Mohammad Shahid Husain
3. Rahbar-e-Akhbar Navesi: Syed Iqbal Qadri
4. Urdu Radio aur Television mein Tarseel-o-Ablagh: Kamal Ahmad Siddiqi
5. Urdu Sahafat: Zaban, Technique, Tanazur: Mushtaq Sadaf
6. Broadcasting : Riffat Sirosh
7. Rooh-e-Sahafat: Imad Sabri
8. Khbar nigari: Shafey Qidwai
9. Television Nashriyaat: Tareekh, Taheer, Technique
10. Radio Drame ka Fun: Akhlaq Asar.

**Course: UR-205****Essay & Translation****Unit:I****Essay Writing**

1. Naya Shwala (Iqbal)
2. Kashmir (Darga Sahae Sarwar)

**Unit:II****Essay Writing:**

3. Udis sw anewala bata (Akhter Shirani)
4. Ahde Wafa (Akhterul Imaan)

**Unit:III****Translation**

1. Theory and Principles of translation]
2. Literary Translation

#### **Unit: IV**

Translation:

1. Technical Translation: Science, Commerce & Economics
2. Technical Translation: Journalistic, Legal, Politics & Sports

#### **Unit-V**

Translation:

1. Translation of Terminologies from different fields.

Prescribed books for study

- |  |                   |
|--|-------------------|
| 1. Urdu Shaeri ka fanni Irteqaa        | Farman Fathe Puri |
| 2. Urdu nasr ka fanni irteqaa          | Farman fathe Puri |
| 3. Urdu mein Tarjuma ka Fun:           | Qamar Rais        |
| 4. Fun-e-Tarjuma Nigari                | Khaliq Anjum      |
| 5. Waza-e-Istalahaat                   | Wahiduddin Saleem |
| 6. Maghribi Adabiyaat ke Urdu Tarajim: | Meer Hasan.       |

**DEPARTMENT OF URDU  
ASSAM UNIVERSITY: SILCHAR.**

**Course: UR-102**

**History of Urdu Languages & Literature**

**Unit - I**

1. Hindustan me aryon ke amad se qabl ki lisani wa tahzibi surate hal. astrak aur dravidi qoumen aru unki zubanen

2. Hindustan me aryon ki amad aur hind aryai ka irteqa.

3. Hind aryai ke mukhtalif aswar.

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Ahde usta: Prakriton aur upa bhransho ka irteqa

Ahde Jadid: Jadid hind aryai zubanon ka agaz-siasi wa tahzibi surate hal. Jadid hin aryai zubanon ki garoh bandi.

**Unit - II**

1. Maghrebi hindi aur uski bolian

2. Satragwi sadi tak shemali hind ki lesani surate hal: Amir Khusru, digar sufia aur unke malfuzat. Khari, burj, Haryani, Punjabi wagartah ke mile jule asarat-Afzal ka barah masah.

3. urdu zuban ke aghaz o irteqa se mutallem mukhtalif nazariat (Mahmud Shirani aur Hussain Khan ke gawale se)

**Unit- III**

1. Shemali zuban ka janub ki taraf safar. Ahde Tughlaq me Dehli se inteqal e abadi Bahmani dour ki lesani wa adabi surat e hal.

2. Dakani Urdu ki lesani khosusiaat.

**Unit-IV**

1. Degli me islage zuban ki koshish. Iham goi ki mukhalefat. Mirza Mazhar aur shah Hatem ki Khidmat-Diean zada ke dibache ki tarikhi wa lesani ahmiyat.

2. Lakhnaow me islahe zuban ka amal. Nasekh aur uske shagirdon ki kaweshen.

**Unit-V**

1. Qutub shahi daur me ek nai mushtarak tahzib ka garon aur uski adabi rawayat.

2. Azadi ke baad Udu ke lesani wa adabi surate hal.

**Prescribed books for study:**

- |                                   |   |
|-----------------------------------|---|
| 1. Hind aryai aur hindi:          | Suniti kumar chatarjee (tarjama : Atiq ahmad Siddiqi) |
| 2. Muqaddema tarikhe zubane Urdu: | Masud Hussain khan                                    |
| 3. Panjab me Urdu                 | Mahmud Shirani  |
| 4. Dastane zubane Urdu            | Shaukat Sabzwari                                      |



5. Tarikhe Adabe Urdu	Jamil Jalebi
6. Tarikhe adabe Urdu	Nurul Hasan Naqwi
7. Urdu ki lesani tashkil	Mirza Khalil Ahmad Beg
8. Lesani Mutalea	Gyan Chand Jain
9. Hindustani lesaniat	Sayd Mohiuddin Qaderi Zor
10. Urdu e Muala (Lesaniat number)	Shobae Urdu Dehli University.

### **Course: UR-304: Journalism**

#### **Unit-I**

1. Sudu Sahafat: Zaban, Technique aur Tanazur

#### **Unit-II**

1. Meaning, Origin and Development of Mass Media

#### **Unit-III**

1. Print Media (News, colum writing, Feature writing, Editorial and Interviews etc)

#### **Unit-IV**

1. Electronic Media (Radio, Television, film, Documentary, Drama Scripts, etc)

#### **Unit-V**

1. Urdu Radio aur Television mein Tarseel o Ablag.

Recommended Books:

1. Awami Zarai-e-Tarseel: Ashafaq Mohammad Khan
2. Ablaghiyaat: Mohammad Shahid Husain
3. Rahbar-e-Akhbar Navesi: Syed Iqbal Qadri
4. Urdu Radio aur Television mein Tarseel-o-Ablagh: Kamal Ahmad Siddiqi
5. Urdu Sahafat: Zaban, Technique, Tanazur: Mushtaq Sadaf
6. Broadcasting : Riffat Sirosch
7. Rooh-e-Sahafat: Imad Sabri
8. Khbar nigari: Shafey Qidwai
9. Television Nashriyaat: Tareekh, Taheer, Technique
10. Radio Drame ka Fun: Akhlaq Asar.

### **Course: UR-205**

#### **Essay & Translation**

#### **Unit:I**

Essay Writing

1. Naya Shwala (Iqbal)

2. Kashmir (Darga Sahae Sarwar)

### **Unit:II**

Essay Writing:

3. Udis sw anewala bata (Akhter Shirani)

4. Ahde Wafa (Akhterul Imaan)

### **Unit:III**

Translation

1. Theory and Principles of translation]

2. Literary Translation

### **Unit: IV**

Translation:

1. Technical Translation: Science, Commerce & Economics

2. Technical Translation: Journalistic, Legal, Politics & Sports

### **Unit-V**

Translation:

1. Translation of Terminologies from different fields.

Prescribed books for study

1. Urdu Shaeri ka fanni Irteqaa	Farman Fathe Puri
2. Urdu nasr ka fanni irteqaa	Farman fathe Puri
3. Urdu mein Tarjuma ka Fun:	Qamar Rais
4. Fun-e-Tarjuma Nigari	Khaliq Anjum
5. Waza-e-Istalahaat	Wahiduddin Saleem
6. Maghribi Adabiyaat ke Urdu Tarajim:	Meer Hasan.

**DEPARTMENT OF ANTHROPOLOGY**  
**ASSAM UNIVERSITY: DIPHU CAMPUS**

**COURSE STRUCTURE**

**SEMESTER- I**

**ALL CORE COURSES**

<b>Course No.</b>	<b>Course Title</b>	<b>Marks</b>
ANT 101	Introduction to Anthropology	100
ANT 102	Biological Anthropology	100
ANT 103	Social and Cultural Anthropology	100
ANT 104	Prehistoric Archaeology	100
ANT 105	Practicals	100

**SEMESTER- II**

**THREE CORE COURSES (ANT 201, ANT 202 & ANT 205) AND TWO OPEN COURSE (ANT 203 & ANT 204)**

<b>Course No.</b>	<b>Course Title</b>	<b>Marks</b>
ANT 201	Anthropology of North-East India	100
ANT 202	Anthropological Demography	100
ANT 203	Fundamental Anthropology (Open Course)	100
ANT 204	Tribes in the Indian Context (Open Course)	100
ANT 205	Kinship, Family and Marriage	100

**SEMESTER- III**

**FOUR CORE COURSES (ANT 301, ANT 302, ANT 303 and ANT 305) ONE ELECTIVE COURSE (ANT 304.1, ANT 304.2 OR ANT 304.3)**

<b>Course No.</b>	<b>Course Title</b>	<b>Marks</b>
ANT 301	Anthropological Theories	100
ANT 302	Economic Anthropology	100
ANT 303	Ecology and Development	100
ANT 304.1	Anthropology of Religion (Elective Course)	100
	OR	
ANT 304.2	Human Growth and Development (Elective Course)	100
	OR	
ANT 304.3	Methods and Principles of Archaeology (Elective Course)	100
ANT 305	Research Methodology	100

**SEMESTER- IV**

**FOUR CORE COURSES (ANT 401, ANT 402, ANT 403 and ANT 405) AND ONE ELECTIVE COURSE (ANT 404.1 OR ANT 404.2 OR 404.3)**

<b>Course No.</b>	<b>Course Title</b>	<b>Marks</b>
ANT 401	Anthropological Theories	100
ANT 402	Medical Anthropology	100
ANT 403	Anthropology of Gender	100
ANT 404.1	Nutritional Anthropology (Elective Course)	100
	OR	
ANT 404.2	Anthropology of Communication (Elective Course)	100
	OR	
ANT 404.3	Archaeology of India (Elective Course)	100

ANT 405

Dissertation

100

Total Marks of Semester I =  $100 \times 5 = 500$ Total Marks of Semester II =  $100 \times 5 = 500$ Total Marks of Semester III =  $100 \times 5 = 500$ Total Marks of Semester IV =  $100 \times 5 = 500$ **Total Marks of Four Semester =  $500 \times 4 = 2000$** 

Marks for Internal Assessment in Each Course = 30 (30% of the Full Marks)

Pass Marks for Internal Assessment in Each Course = 12 (40% of 30 Marks)

Marks for External Assessment in Each Course = 70 (70% of the Full Marks)

Pass Marks for External Assessment in Each Course = 28 (40% of 70 Marks)

Each of the Five Units carries One point two Credit

Each Course carries Six Credits

*(Except Dissertation paper ANT-405 which carries 12 Credits)*

Total Number of Credits for Each Semester is 30

*(Except Semester –IV which carries 36 Credits)*

Total Number of Credits for 20 Courses of Four Semesters = 126

**SEMESTER I****ANT 101: INTRODUCTION TO ANTHROPOLOGY****(Core Course)**

Full Marks: 100

Pass Marks: 40

No. of Lectures: 60

Credits: 6

**OBJECTIVE**

This course introduces the students to scope, development, subject matter, branches, and relation with other disciplines, applications, and founders of Indian anthropology so that they get overall acquaintance with Anthropology as a discipline.

**CONTENTS****UNIT I**

Scope and development of Anthropology: A historical review. Subject matter of Anthropology, ethnology and the comparative method, ethnography and field work, holistic study, cultural relativism and cross cultural approach.

**UNIT II**

Different branches of Anthropology and their relevance. Physical/Biological Anthropology, Social and Cultural Anthropology, Archaeology and Prehistoric Anthropology, Linguistic Anthropology.

**UNIT III**

Relations between different branches of Anthropology, Anthropology and other related disciplines.

**UNIT IV**

Applications of Anthropology and its contemporary relevance in policy making, health and development issues, advocacy and evaluation.

**UNIT V**

Founders of Indian Anthropology and their contributions: A. Aiyappan, B.S. Guha, D.N. Majumdar, N.K.Bose, Iravati Karve, L.P. Vidyarthi, S.C. Dube and M.N. Srinivas.

**READINGS**

Peter MetCalfe (2005) Anthropology: The Basics; Routledge

Huntel and Whitten (1979) Anthropology: Contemporary Perspectives, Little Brown and Co.

Barnard G. Cambell (1998) Human Evolution, Aldine

Ember and Ember Anthropology, Pearson

Bhattacharjee, D.K. (1998) Indian Archaeology, Prakashan.

Nandini Sunder, Patricia Oberoi & Satish Deshpande (2008) Anthropology in the East.

Medhi, Dilip K (1993) Man and Environment in Northeast India. Vol. I. Guwahati & Delhi: Omson publication.

Medhi, Dilip K (2002) Man and Environment in Northeast India. Vol. II. Guwahati & Delhi: Omson publication.

Medhi, Dilip K (2002) Man and Environment in Northeast India. Vol. III. Guwahati: Eastern Book House.

**ANT 102: BIOLOGICAL ANTHROPOLOGY**

**(Core Course)**

Full Marks: 100

Pass Marks: 40

No. of Lectures: 60

Credits: 5

**OBJECTIVE**

This course introduces the students with development and relevance as well as applications of biological anthropology and basic processes of human life constituting its elementary subject matter.

**CONTENTS****UNIT I**

Development of Biological Anthropology and its contemporary relevance.

**UNIT II**

Principles of Evolution and Paleoanthropology: Convergence, Divergence, Lamarckism, Darwinian, mutation theory and synthetic theory. Fossil primates and Fossil man.

**UNIT III**

Biological basis of life and basic concepts of genetics: Cell, cell division, cell structure, chromosome, D.N.A., Models and laws.

**UNIT IV**

Human variation and adaptation. Problem of Race, UNESCO statement, genetic polymorphism, hemoglobin, multiple allelism.

**UNIT V**

Applications of Biological Anthropology. Family welfare, genetic counselling, applications in industry, medico-legal problems, defence sciences, public health and nutrition.

**READINGS**

Ashley Montagu, M.F. (1961) An Introduction to Physical Anthropology; Illinois, Charles C. Thomas.

Das, B.M. (1997) Outline of Physical Anthropology, Allahabad, Kitab Mahal.

Laskar, G.W. (1976) Physical Anthropology, New York, Rinehart and Kiston.

Weiner and Lourie (1981) Practicals in Human Biology, London, Academic Press.

Medhi, Dilip K (1993) Man and Environment in Northeast India. Vol. I. Guwahati & Delhi: Omson publication.

Medhi, Dilip K (2002) Man and Environment in Northeast India. Vol. II. Guwahati & Delhi: Omson publication.

Medhi, Dilip K (2002) Man and Environment in Northeast India. Vol. III. Guwahati: Eastern Book House.

**ANT 103: SOCIAL/CULTURAL ANTHROPOLOGY****(Core Course)**

Full Marks: 100

Pass Marks: 40

No. of Lectures: 60

Credits: 6

**OBJECTIVE**

This course introduces the students to the nature, scope, branches, development, basic concepts and applications of social/cultural anthropology as well as social/cultural institutions as a general component of its subject matter.

**CONTENTS****UNIT I**

Introduction: Aim, scope and historical development of social and cultural anthropology, relation with other branches of anthropology and with linguistics, history, psychology and sociology.

**UNIT II**

Concepts: Society, Institution, Function, structure, organization, culture, structure of culture, cultural relativism, cultural diversity, multiculturalism and syncretism..

**UNIT III**

Family and marriage: Definition, types and functions of family, the joint family in India; definition, types and rules of marriage, marriage payment and recent changes in family and marriage. 6

#### **UNIT IV**

Kinship: Definition, Kinship terminology, terms of reference and address, descent, inheritance and succession, kinship behaviour, theoretical debates in kinship- Morgan, Levi Strauss, Leach, Needham and Schneider- recent changes in kinship system.

#### **UNIT V**

Applications of Social/ Cultural Anthropology: Action Anthropology, Policy making, NGOs.

#### **READINGS**

Auge, M. (1998) *A Sense of the Other*; Cambridge: University Press.

Auge, M. (1999) *An Anthropology for Contemporary Worlds*; Cambridge: University Press.

Beatle, J. (1966) *Other Culture*, London: RKP.

Doshi, S.L. (2001) *Understanding Change: Anthropological and Sociological Perspectives*, New Delhi: Vikas.

Ember, C.R. and M. Ember (1981) *Cultural Anthropology*, New Jersey: Prentice Hall.

Fox, R. (1967) *Kinship and Marriage: An Anthropological Perspective*; Harmondsworth: Penguin Books.

Gough, K. (1959) 'Nayars and the definition of Marriage', in *Journal of Royal Anthropological Institute*: 89:23-24

Keesing, Felix (1958) *Cultural Anthropology*, New York: Rinehart.

Kuper, A. (1988) *Culture: The Invention of Primitive Society: Transformation of an Illusion*. London: Routledge.

Kuper, A. (1999) *Culture: The Anthropologist's Account*. London: Harvard University Press.

Leach, E.R (1986) *Social Anthropology*. Glasgow: Fontana Press.

Leach, E.R (1961) *Rethinking Anthropology*. London: Athlone Press.

Lewis, I.M. (1990) *Social Anthropology in Perspective*. Cambridge: University Press.

Medhi, Dilip K. (Ed.) (1993) *Man and Environment in Northeast India*. Vol. I. (Introductory). Guwahati: Western Book Depot.

Medhi, Dilip K. (Ed.) (2002) *Man and Environment in Northeast India*. Vol. II. *Essays in Archaeology and Anthropology*.

- Medhi, Dilip K. (Ed.) (2002) Man and Environment in Northeast India. Vol. III. Heritage Issue.
- Needham, R. (1962) Structure and Sentiments. Chicago: University Press.
- Parkin, R. And L.Stone (2004) Kinship and Family: An Anthropological Reader; Oxford: Blackwell Publishers.
- Rapport, Nigel and J. Overing (2000) Social and Cultural Anthropology: The Key Concepts. London: Routledge.
- Schneider, D. And K. Gough (1961) Matrilineal Kinship. Berkeley: University of California Press.
- Uberoi, P. (Ed.) (1993) Family, Kinship and Marriage in India. Delhi: OUP. Publishers.
- Williams, R. (1990) Cultural Anthropology. New Jersey: Prentice Hall.

### **ANT 104: PREHISTORIC ARCHAEOLOGY**

#### **(Core Course)**

Full Marks: 100

Pass Marks: 40

No. of Lectures: 60

Credits: 6

#### **OBJECTIVE**

This course introduces the students to development, branches and approaches, methods and techniques in prehistoric archaeology and gives basic understanding of archaeological anthropology.

#### **CONTENTS**

##### **UNIT I**

Historical development of pre-historic archaeological anthropology Pre-Darwinian and Post-Darwinian phases, Different branches of Archaeology.

##### **UNIT II**

Geo-morphology: approaches and methods.

##### **UNIT III**

Chronology: Method of dating the events of prehistory; relative dating methods-stratigraphy, typotechnology, palynology, paleontology, FUN estimation. Absolute dating method- radio carbon, Potassium argon, Dendochronology (Tree ring analysis), Thermoluminescence (TL), Obsidian hydration, archaeomagnetism, fission-track, uranium series, Amino acid Racemization, varve clay analysis and other physical and chemical methods. Differences between absolute and relative methods of dating; recent development of dating methods and their application in archaeology. Pre historic sites-alluvial site, Lacustrine site, Aeolian site, coastal site.

##### **UNIT IV**

Paleoecology-Environmental change during quaternary- climatic, geomorphic, faunal and floral; causes of ice age; sea core analysis; geological framework of the quaternary period; zonal concept- glacial, per



glacial and geomorphology; Pleistocene stratigraphy for paleo-environment and chronological glacio-aluvial deposit. Tropical reconstruction of framework of prehistoric culture-Moraine, River Terraces, U-shaped valley, Loess, Solifluction, gravel and silt deposition, palaeontological, paleobotanical evidences.

## UNIT V

Techniques and Methods.

## READINGS

Agrawal, D.P. (1984) *The Archaeology of India*. New Delhi: Select Book Service Syndicate.

Allchin, Bridget and Raymond. (1983) *The Rise of Civilization in India and Pakistan*. New Delhi: Select Book Service Syndicate.

Bahn, Paul. (2006) *Archaeology: A Very Short Introduction*. New Delhi: Oxford University Press.

Bhattacharya, D.K. (1999) *An Outline of Indian Prehistory*. Delhi: Palaka Prakashan.

Binford, Lewis R. (1983) *In Pursuit of the Past: Decoding the archaeological Record*. New York: Thames and Hudson.

Blame, Jane and Alistair Peterson (2006) *Archaeology in Practice: A Student Guide to Archaeological Analysis*. Oxford: Blackwell.

Crabtree, Pam J., and Douglas V. Campana (2006) *Exploring Prehistory: How Archaeology Reveal our Past* (2nd Edition). Boston: McGraw Hill.

Cunliffe, Barry, Chris Gosden and Rosemary A. Joyce (2009) *The Oxford Handbook of Archaeology*. Oxford: Oxford University Press.

David, Nicholas and Carol Kramer (2001) *Ethnoarchaeology in Action*. Cambridge: Cambridge University Press.

Ember, Carol R., Melvin Ember and Peter N. Peregrine (2008) *Anthropology* (12th Edition). Delhi: Pearson-Education.

Fagan, Brian, M. (1991) *Archaeology: A Brief Introduction*. New York: Harper Collins Publishers.

Fagan, Brian, M. (2005) *World Prehistory: A Brief Introduction*. New Jersey: Pearson- Prentice Hall.

Feder, Kenneth L. (2007) *The Past in Perspective: An Introduction to Human Prehistory*. (4th Edition). Boston: McGraw Hill.

Gamble, Clive (2003) *Archaeology: A Basics*. London: Routledge.

Ghosh, A. (1989) *An Encyclopaedia of Indian Archaeology* (Vol. 1-2). New Delhi: Munshiram Manohar

Publishers Pvt. Ltd.

Gosden, Chris (2007) Prehistory: A Very Short Introduction. New Delhi: Oxford University Press.

Grant, Jim, Sam Gorin and Neil Fleming (2008) The Archaeology Course Book: An Introduction to Themes, Sites, Methods and Skills. London: Routledge.

Hurst, David Thomas (1999) Archaeology: Down to Earth. Belmont: Wadsworth Thomas Learning.

Medhi, Dilip K. (Ed.) (1993) Man and Environment in Northeast India. Vol. I. (Introductory). Guwahati: Western Book Depot.

Medhi, Dilip K. (Ed.) (2002) Man and Environment in Northeast India. Vol. II. Essays in Archaeology and Anthropology.

Medhi, Dilip K. (Ed.) (2002) Man and Environment in Northeast India. Vol. III. Heritage Issue.

Pearsall, Deborah M. (2008) Encyclopaedia of Archaeology. Oxford Academic Press.

Rajan, K. (2002) Archaeology: Principles and Methods. Thanjavur: Manoo Pathipakkam.

Rami Reddy, V. (1987) Elements of Prehistory. New Delhi: Mittal Publications.

Sankalia, H.D. (1982) Stone Age Tools: A Brief Introduction. New Jersey: Pearson- Prentice Hall.

Setter, S. and Ravi Korisetter (2002) Prehistory: Archaeology of South Asia. Vol.1-4. Delhi: Manohar Publisher.

Sutton, Mark Q. and Robert M. (2008) Archaeology: The Science of the Human Past (3rd Edition). Boston: Pearson.

White, Nancy Marie (2008) Archaeology for Dummies. Indianapolis: Wiley

### **ANT 105: PRACTICALS**

**(Core Course)**

Full Marks: 100

Pass Marks: 40

No. of Lectures: 60

Credits: 6

### **OBJECTIVE**

This course aims to acquaint broadly the applications of biological anthropology in the fields like serology, dermatoglyphics and sense perception for better understanding of biological evolution and variation of human. Besides, the students are also introduced to Technometric analysis and functional interpretation of prehistoric artifacts as well as field experiences of social and cultural life by using field techniques and tools.

### **SECTION-A: BIOLOGICAL ANTHROPOLOGY**

UNIT I: Serology: ABO system, Rh system (test tube method), ABH section, estimation of Hb%, Identification of blood stain, Physiometric studies, blood pressure, pulse rate and grip strength.

UNIT II: Dermatoglyphics: a) Techniques of taking finger and palm prints. b) Identification of finger patterns; indices-pattern intensity, Furuhat's and Dankmeier's ridge counting, palmer main line formula, main line formula, index, palmer patterns- interdigitat, thenar and hypothenar.

UNIT III: Sense perception: Colour blindness, testing of taste sensitivity to PTC.

### **SECTION-B: PREHISTORIC ANTHROPOLOGY**

UNIT IV:

(A): Technometric analysis and functional interpretation of prehistoric artefacts (selected series).

(B): Laboratory note book and viva voce

### **SECTION-C: RESEARCH TECHNIQUES IN SOCIAL/ CULTURAL ANTHROPOLOGY**

UNIT V: Conducting a small field work by using any one of the self constructed tools like observation guide, interview schedule/guide and questionnaire and preparation of a field report on a topic assigned by the teacher in charge.

### **READINGS**

#### **SECTION-A: BIOLOGICAL ANTHROPOLOGY**

Cummis, H. and Charles Midlo (1961) Finger Prints, Palms and Soles: An Introduction Dermatoglyphics. New York: Dover Publication Inc.

Das, B.M. and Ranjan Deka (1993) Physical Anthropology, Allahabad, Kitab Mahal.

Faruqui Nafis Ahmed (2009) Human Osteology (2nd edition), New Delhi: CBS Publisher.

France, Diane L. (2007) Lab Manual and Workbook for Physical Anthropology (6th edition), Belmonte: Thomson Wadsworth.

Monatgue, Ashley M.F. (1960) A Handbook of Anthropometry. Springfield: Charles C. Thomas and Co.

Nath, S. (2006) Anthropometry: The Measurement of Body size, Shape and Form. New Delhi: Friends Publications.

Samantha Hens M. (2008) Methods and Practice in Biological Anthropology: A Workbook and Laboratory

Manual for Introductory Course. Upper Saddle River: Pearson-Prentice Hall.

Singh, Inder P. and M.K. Bhasin (1989) Anthropometry: A Manual of Biological Anthropology Delhi: Kamla-Raj Enterprises. IGML-Book Call No. 573.6 in 2A

Singh, Inder P. And M.K. Bhasin (2006) A Manual of Biological Anthropology Delhi: Kamla-Raj Enterprises. IGML-Book Call No. 573.6 in 2M 9

#### **SECTION-B: PREHISTORIC ANTHROPOLOGY**

British Museum (1956) Flint Implements- An Account of Stone Age Techniques and Cultures. London: The Trustees of British Museum.

Andresky, William Jr. (2008) Lithic Technology. Cambridge: Cambridge University Press.

Bhattacharya, D.K. (1977) Old Stone Age.

Medhi, Dilip K (2002) Prehistoric Fashion of Stone Tools. Man and Environment in Northeast India. Vol. II. Guwahati & Delhi: Omson publication.

### **SECTION-C: RESEARCH TECHNIQUES IN SOCIAL/ CULTURAL ANTHROPOLOGY**

Burgess, Robert G. Field Research: A Source Book and Manual.

Goode, W.J. and P.K. Hatt (1952) Methods in Social Research. New York: McGraw Hill.

Raj, Hans (1988) Theory and Practice in Social Research. Delhi: Sujit Publications.

**SEMESTER II**  
**ANT 201: ANTHROPOLOGY OF NORTHEAST INDIA**  
**(Core Course)**  
 Full Marks: 100  
 Pass Marks: 40  
 No. of Lectures: 60  
 Credits: 6

### **OBJECTIVE**

This course introduces the students to origin to growth of anthropology in Northeast India in general and its branches like physical anthropology, socio-cultural anthropology and prehistory in particular.

### **CONTENTS**

#### **UNIT I**

Origin and growth of social and cultural anthropology in Northeast India: Pre-Independence and post-Independence scenario, people of Northeast India.

#### **UNIT II**

Major areas of anthropological research: Kinship studies, Christianity and change, ethnicity and identity, social change and continuity.

#### **UNIT III**

Origin and growth of physical anthropology in Northeast India: Pre-Independence and post-Independence scenario.

#### **UNIT IV**

Major trends in physical anthropology research in Northeast India: Growth and development studies, dermatoglyphic studies, population genetics, demography, and studies in the field in the studies in the field of nutrition and health.

#### **UNIT V**

Major prehistoric researches: Garo hills, Nagaland, North Cachar hills, Manipur .

## **READINGS**

Burling, Robbins .1999. Rengsangiri: Family and kinship in a Garo Village. Tura: Books.

Das, B.M. 1981. Microevolution. New Delhi: concept publishing Co.

Das, B.M. ed. 1974. Contemporary Anthropology Research in North East India. Dibrugarh: University publications.

Das F.A. and I. Barua. 1996. Communities in North East India. New Delhi: Mittal publications.

Elwin, V.1959. A philosophy for NEFA. Shillong: Govt. Printing.

Goswami, M.C. and P.B.Das. 1990. The people of Arunachal Pradesh: A physical Survey. Itanagar: Govt. Of Arunachal Pradesh.

Hodson, T.C. 1989. The Naga Tribes of Manipur. Delhi: price publication.

Khongsdier, R. 2000. Contemporary Research in Anthropology. New Delhi: Commonwealth Publishers.

Lyall, S.C. 1908. The Garos. London: David Nutt.

Medhi, Dilip K.(ed), 1993. Man and Environment in Northeast India, Vol. I. Guwahati & Delhi: Omson publication.

Medhi, Dilip K (ed), 2002. Man and Environment In Northeast India. Vol. II. Guwahati & Delhi: Omson publication.

Medhi, Dilip K. 2008. Man and Environment in Northeast India, Vol. III. Guwahati: Eastern Book House.

Misra, U. 1988. North East India: Quest for identity. Guwahati: Omsons publications.

Nakane, C.1979. Garo and Khasi: A Comparative Study in Matrilineal system. The Hague: Mouton.

Playfair, A. 1909. The Garo. London: David Nutt.

Raha, M.K. and A.K. Ghosh. 1998. North-East India: The Human Interface. New Delhi: Gyan pub. House.

Sengupta, S.1997. Studies in Anthropology: Recent Perspectives. New Delhi: Inter- India.

Singh. B.P. 1987. The problem of Change: A study of Northeast India. Delhi: OUP

Subba, T.B. and G.C. Ghosh. 2003. The Anthropology of India Northeast India. New Delhi: Orient Longman.

## **ANT 202: ANTHROPOLOGICAL DEMOGRAPHY**

**(Core Course)**

Full Marks: 100

Pass Marks: 40

No. of Lectures: 60

Credits: 6

## **OBJECTIVE**

This course introduces the students to nature of demography and population studies, history and factors of population growth, population composition, migration and sources of population data.

## **CONTENTS**

### **UNIT I**

Definition and Meaning, Difference between Demography and Population Studies, Relevance of Demography in Anthropology.

### **UNIT II**

History and factors of population growth – climatic and environmental changes in the historical periods, social and cultural factors such as sex selection, abortion, mate selection, age at marriage, reproductive health etc.

### **UNIT III**

Migration- Demographic variables causing migration and their importance; causes and consequences of migration.

### **UNIT IV**

Population composition, sex-ratio, vital processes like fertility, fecundity, migration, mortality and morbidity.

### **UNIT V**

Sources of demographic data; Census, gazetteers, archival and field data.

## **READINGS**

Henriette Engelhardt, Hans-Peter Kohler, and Alexia Funkhouser-Prskawetz (2009) Causal Analysis in population studies: Concepts, Methods Applications (The Springer Series on Demographic Methods and Population Analysis). Springer Publication.

IIPS (International Institute of Population Studies) (1995) National Family Health Survey (MCH and Family Planning), India 1998-99.

World Health Organization (1999) The World Health Report 1999: Making a Difference WHO, Geneva, Switzerland, WHO.

Park, K. (2000) Preventive and Social Medicine, Banarasidas Bhanot Publishers, Jabalpur.

Grigg, D.B (1982) Modern Population Growth in historical Perspective, Geography 67, pp 97-108.

Husain, M (2003) Human Geography, Rawat Publication, New Delhi.

## **ANT 203: FUNDAMENTAL ANTHROPOLOGY (Open Course For Non Anthropology Students)**

Full Marks: 100

Pass Marks: 40

No. of Lectures: 60  
Credits: 6

## **OBJECTIVE**

This course introduces the students to the nature, development and scope of Anthropology, its branches and relation to other disciplines. The course also introduces topics on human evolution, human heredity and variation and population genetics. Culture and its aspect, language and its importance, fieldwork tradition in Anthropology, ethnography of communication, Applied Anthropology, scope of research in Anthropology.

## **CONTENTS**

### **UNIT I**

Definition, nature and development of Anthropology, branches and scope of Anthropology, relation of Anthropology with other disciplines. .

### **UNIT II**

Human evolution, human heredity and variation, population genetics.

### **UNIT III**

Culture and its aspects, language and its importance

### **UNIT IV**

Fieldwork tradition in Anthropology, holistic approach, ethnography of communication.

### **UNIT V**

Applied Anthropology, Scope of research in Anthropology.

## **READINGS:**

Peter MetCalfe (2005) Anthropology: The Basics; Routledge

Huntel and Whitten (1979) Anthropology: Contemporary Perspectives, Little Brown and Co.

Barnard G. Cambell (1998) Human Evolution, Aldine

Ember and Ember (1999) Anthropology, Prentice Hall, New Jersey

Haddon,A.C. 1908. The study of Man. London: J. Murray.

Haddon,A.C. 1934. History of Anthropology. London:Warrs.

Harris, M. 1968. Rise of Anthropological Theory. New York.

Herskovits, M.J. 1958: Cultural Anthropology. Calcutta : Oxford & IBH Publishing Co.

Ashley Montagu, M.F. (1961) An Introduction to Physical Anthropology; Illinois, Charles C. Thomas.

Barua Saumitra 2002. Human Genetics: An Anthropological Perspective. Kolkata: Classique Books.

Das, B.M. (1997) Outline of Physical Anthropology, Allahabad, Kitab Mahal.

Gardner Eldon John, Simmons Michale J and Snustad D Peter 1991. Principles of Genetics 8th edition .New York: John Willey & Sons.

Harper, P. S. 1998, Practical Genetic Counselling, 4th ed., Oxford: Butter worth Heinemann.

Klug WS and Cummings MR 1999. Essentials of Genetics 3rd edition. New Jersey: Prentice Hall.

Laskar, G.W. (1976) Physical Anthropology, New York, Rinehart and Kiston.

Lewis Richi 2003. Human Genetics: Concepts and Applications 5th edition. Boston: WCB McGraw Hill.

**ANT 204: TRIBES IN THE INDIAN CONTEXT**  
**(Open Course For Anthropology/Non Anthropology Students)**

Full Marks: 100

Pass Marks: 40

No. of Lectures: 60

Credits: 6

**OBJECTIVE**

This course introduces the students to conceptualization of tribe, classification of tribes and tribal issues, development and contemporary tribal situation in India.

**CONTENTS**

**UNIT I**

Concept of Tribe: Theoretical, administrative issues; Constitutional Safeguards.

**UNIT II**

Distribution and Classification of Tribes: Racial, Geographical, Linguistic, Economic etc.

**UNIT III**

Tribal Issues: Health, Identity, Development, Displacement, Unrest.

**UNIT IV**

Tribal Development: Tribal Sub-Plan, ITDP, PTGA, Forest Policy.

**UNIT V**

Tribes in contemporary situation: Urbanization, Industrialization, Globalization.

**READINGS**



Xaxa, Virginius 2008 State Society and Tribes: Issues in Post-colonial India. New Delhi: Dorlingkindersley, Pearson Education.

Subba, Tanka B. 1999 Between Ethnography and Fiction: Verrier Elwin and the Tribal Question in India, New Delhi: Orient Lonman.

Medhi, Dilip K. 2008 The Garos. Men and Environment in Northeast India, Vol II. Guwahati and Delhi: Omsons Publication.

Miri, Mrinal 1993 Continuity and Change in Tribal Society. Indian Institute of Advanced Study, Shimla.

Sharma, T. 1993 Man, Society and Language in Northeast India. Men and Environment in Northeast India, Vol II. Guwahati and Delhi: Omsons Publication. 13

Singh, K.S. 1972 Tribal Situation in India.

Furer-Heimendorf, C Von 1985 Tribes of India Dube, S.C. .. Tribal Situation in India.

### **ANT 205: KINSHIP, MARRIAGE AND FAMILY**

**(Core Course)**

Full Marks: 100

Pass Marks: 40

No. of Lectures: 60

Credits: 6

#### **OBJECTIVE**

This course introduces the students to three important institutions constituting social structure of society – kinship, marriage and family. It also acquaints them with the processes of change in these institutions.

#### **CONTENTS**

##### **UNIT I**

Kinship, descent and filiations:

- i. Kinship as cultural principles and social mechanism
- ii. Principle and structure of descent: unilineal, cognatic and bilateral principle.

##### **UNIT II**

Kinship nomenclature:

- i. Types of terminology
- ii. Rules of marriage and kin terms.

##### **UNIT III**

Meaning, form and regulation of marriage alliance systems.

##### **UNIT IV**

## The Family

- i. Definition and foundation of family
- ii. Descent groups and domestic groups
- iii. Variation in family forms.
- iv. Approaches to the family forms.

## UNIT V

Changing kinship, marriage and family in India.

## READINGS

- Barnes, J.A 1971 Three styles in the study of kinship. Berkeley: University of California Press.
- Carsten, Janet 2004 After kinship: New Departure in Anthropology. Cambridge, U.K. Cambridge University Press.
- Farber, Barnerd 1966 Kinship and Family Organization, New York: Wiley,
- Goody, Jack and Meyer Fortes 1973 The Character of Kinship. Cambridge: University Press.
- Harris, C.C. 1990 Kinship Concept in social thought. Minneapolis: University of Minnesota Press.
- Karve, Iravati 1968 Kinship organisation in India. London: Asia Pub. House.
- Levi Staruss, Claude 1996 The elementary structures of kinship. Boston: Beacon Press.
- Radcliffe, Brown A.R. and Daryl Forde 1950 African systems of kinship and marriage. London: Published for the International African Institute by Oxford University Press.
- Trautmann, Thomas R. 1981 Dravidian Kinship. Cambridge studies in social anthropology, Cambridge (Eng): Cambridge University Press. 14

**SEMESTER III**  
**ANT 301: ANTHROPOLOGICAL THEORIES – I**  
**(Core Course)**  
 Full Marks: 100  
 Pass Marks: 40  
 No. of Lectures: 60  
 Credits: 6

## OBJECTIVE

This course introduces the students to seminal theories which have contributed to emergence of social/cultural anthropology as a specialized branch of knowledge.

## CONTENTS

### UNIT I

Classical Anthropological Theories: Evolutionism, Diffusion, Historical particularism and culture historical approach.

**UNIT II**

Functionalism (Durkheim & Malinowski)

Structural Functionalism (Radcliffe Brown & others)

Structural & dynamism: Edmund, leach, Meyer, Evan Pritchard,

Social organisation: Malinowski and Firth.

**UNIT III**

Neo- Evolutionism

Leslie white, Julien Steward & Marshal Sahlins

**UNIT IV**

Structuralism & Neo Structuralism Levi-s Strauss, Edmund Leach.

**UNIT V**

Conflict Theories: Coser, Gluckman and Dahrendorf.

**READINGS**

Evens-Ppritchard, Edward (1981) A History of Anthropological Thought, London, Boston: Faber & Faber.

Lowie, R.H. (1938) The History of Ethno logical Theory, New York: Holt, Rinehart and Winston.

Manners, R.A. and D. Kaplan (eds) (1968) Theory in Anthropological: A Source Book, London: RKP.

Layton, Robert (1997) An Introduction to Theory in Anthropology, Cambridge: Cambridge Univ. Press.

Moore, J.D. (1997) Vision of Culture: An Introduction to Anthropological Theories and Theorists, New Delhi: Sage.

Harris, Marvin (1968/2001) The Rise of Anthropological Theory, New York: Thomas Y. Crowell Co. 15

**ANT 302: ECONOMIC ANTHROPOLOGY**

**(Core Course)**

Full Marks 100

Pass Marks 40

No. of Lectures: 60

Credits: 6

**OBJECTIVE**

The course introduces the student to nature and scope of economic anthropology and approaches to study various economics.

**CONTENTS****UNIT I**

Approaches to the Study Economic Anthropology : Origin and Scope of Economic Anthropology – substantivists, formalist and Culturalist, tribal and peasant economics.

## **UNIT II**

Production and subsistence economies: Hunting and gathering, shifting cultivation, barter, generalized and reciprocal exchange trade and market (Gift, potlatch, Kula Ring, Jajmani System and Feast of Merit); Significance of gifts

## **UNIT III**

Economic of the organized and unorganized sectors: cottage and village industries, unorganized labour.

## **UNIT IV**

Marxist Approach: Dimensions of social institution e.g kinship (Maurice Godalier), Lineage mode of production (Emmanuel Terray)

## **UNIT V**

Penetration of Capitalism in pre-capitalist society– Urbanization, Colonization, Industrializations, and their impact on the economic societies of India.

## **READINGS**

Herskovist, M.J ---Economic Anthropology

Dalton, George --- Economic Anthropology

Godelier, Maurice (1977) Perspective in Marxist Anthropology, Cambridge.

Terry, Emmanuel (1972) Marxism and Primitive Societies. New York.

Geertz, Clifford – Peddlers and Princes.

## **ANT 303: ECOLOGY AND DEVELOPMENT**

**(Core Course)**

Full Marks: 100

Pass Marks: 40

No. of Lectures: 60

Credits: 6

## **OBJECTIVE**

This course introduces the students to understand the relation between ecology and development, its culture and technological aspects, sustainable development and indigenous knowledge system. 16

## **CONTENTS**

### **UNIT I**

Relationship between Culture, Environment and Technology.

### **UNIT II**

Human and nature interface: Adaptation, environmental impacts, ecosystems and biodiversity.

### **UNIT III**

Anthropological approach to development: Isolation, Assimilation and Integration.

### **UNIT IV**

Sustainable Development: Anthropocentric and nature-centric approach.

### **UNIT V**

Indigenous knowledge system and their relevance: Nature resource management, Ethno- pharmacopeia.

### **READINGS**

Bennett J.W. (1976) The Ecological Transition: Culture Anthropology and Human Adaptation, New York: Pergamon press.

Ellen, R.F. and P.H. Burnham (Eds). (1979) Social and Ecological System, London : Academic Press.

Hardesty, D.L. (1977) Ecological Anthropology, New York: Wiley & Sons.

Medhi. Dilip K. (1982) Jhum Fire and the Ecology of Garo Hills, Meghalaya. Garo Hills-Land and people. Guwahati: Omsons Publication.

Misra, K.K. (2005) Indigenous knowledge, Nature Resource Management and Development. The Konda Reddy Experience. Bhopal: IGRMS and Delhi: Pratibha Prakashan.

Milton, K. (1996) Environmentalism and Culture Theory: Exploring the Role Anthropology in Environmental Discourse. New York, NY: Routledge.

Ingold, T. (1980) Hunter, Pastoralism and Ranchers, Cambridge : Cambridge University Press.

Gadgil, M. And R. Guha (1994) Ecological Conflicts and Environmental Movements in India, Development and Change. 25:101-136.

### **ANT 304.1: ANTHROPOLOGY OF RELIGION**

**(Elective Course)**

Full Marks: 100

Pass Marks: 40

No. of Lectures: 60

Credits: 6

### **OBJECTIVE**

This course introduces the students to anthropological understanding of religion and its various aspects like sacred objects, symbols, rituals, functionaries, magic and witchcraft.

### **CONTENTS**

#### **UNIT I**

Concept of Sacred: Edward Tylor, James Frazer, Herbert Spencer, Rudolph Otto, Emile Durkheim, B. Malinowski, A.R. Redcliffe Brown, M.N. Srinivas, Melford Spiro.

**UNIT II**

Sacred Symbols: E.E. Evans Pritchard, Sherry Ortner, Clifford Geertz, Mary Douglas, Victor Turner.

**UNIT III**

Rituals: Functions and Meanings- Emile Durkheim, A.R. Redcliffe Brown, E.R. Leach and Van Gennep, Clifford Geertz 17

**UNIT IV**

Religious Specialists: Shamans, Priests, Yogis and Mystics.

**UNIT V**

Witchcraft and Magic: Traditional and Modern.

**READINGS**

Lessa and Vogt (1979) A Reader in Comparative Religion. New York: Harper and Row.

Michael Lambeck (2002) A Reader in Anthropology of Religion. Malden: Blackwell.

Durkheim, E. (1995) Elementary Forms of Religious Forms. New York: Free Press.

Turner, Victor (1969) The Ritual Process. Chicago: Aldine.

Douglas, Mary (1996) Natural Symbols: Explorations in Cosmology. London: Routledge.

Gennep, Van (1960) Rites of Passage. Chicago: Chicago University Press.

Kluckhohn, Clyde .. Novado Witchcraft

Evans, Pritchard .. Nuer Religion

Evans, Pritchard .. Witchcraft among the Azande.

**ANT 304.2: HUMAN GROWTH AND DEVELOPMENT**

**(Elective Course)**

Full Marks: 100

Pass Marks: 40

No. of Lectures: 60

Credits: 6

**OBJECTIVE**

This course introduces the students to processes, factors and requirements of human growth and development along with methods for its study and analysis.

**CONTENTS****UNIT I**

Human Growth: Definition, concepts – differentiation, maturation and development.

**UNIT II**

Factors affecting growth: Genetic, Environmental, Hormonal, Nutritional, Socio-economic, Secular trends, Gerontology.

**UNIT III**

Methods of studying human growth and development – Longitudinal, cross sectional, mixed longitudinal, growth curves, epiphyseal union, Dentition.

**UNIT IV**

Analysis of human physique and body composition – Sheldon, Parnoll, Heath –Carter.

**UNIT V**

Nutritional requirements, fats, minerals, vitamins under nutrition, obesity, Malnutrition, Physiological factors in Growth- Blood pressure, Heart rate, pulse rate.

**READINGS**

Harrison et, al (Ed) Human Biology: An Introduction to Human Evolution, variation Growth and Adaptation.

Garn and Shamir Methods of Research in Human Growth.

Tanner, J.M. From Foetus into Man

Watsonard Lowery J.M. Growth and Development of children.

**ANT 304.3: METHODS AND PRINCIPLES OF ARCHAEOLOGY**

**(Elective Course)**

Full Marks: 100

Pass Marks: 40

No. of Lectures: 60

Credits: 6

**OBJECTIVE**

This course introduces the students to nature, scope and relevance of archaeology through study of major methods and principles used in it.

**CONTENTS****UNIT I**

Archaeology: definition, aims and scope, its relevance. Its relationship with history and science. The background: from antiquarianism to modern archaeology. Development of field techniques; growth of archaeology as scientific discipline, branches of archaeology, archaeological theories.

**UNIT II**

Methods of exploration, geophysical methods, Geographical Information System. Unearthing the sites: planning excavations; layout; techniques of excavations, tools and equipments.

Excavations of sites: rock-shelter and prehistoric sites; burial; stupa; mud structure

Stratigraphy: Principles of stratification, factors and process of formation of layers, Identification and recording of strata.

Retrieval of botanical and other non-artefactual remains. Floatation technique, soil analysis, sample collection of various materials.

### **UNIT III**

Methods of recording of contexts of excavated remains; there dimensional recording.

Documentation - Drawing-pottery, site and antiquity, plan, elevation, section;

Photography - filed and indoor; Surveying, Instruments and their use, preparation of maps, cartography.

Determining the chronology and periods of the excavated remains, methods of Relative chronology: Typology, Statistical studies, Absolute methods of dating: Radiocarbon, Potassium-argon, Thermoluminescence, Pollen analysis, Fluorine test, Obsidian hydration, Dendrochronology.

### **UNIT IV**

Classification of objects/findings, Analysis of data, Reconstruction of cultural sequence, reconstruction of socio-economic aspects, Including contextual and site catchment analysis, site formation processes, scientific analysis of excavated remains.

### **UNIT V**

Model report, preparation of text and illustrations (drawing and photographs)

### **READINGS**

Bhan, Paul. (2006) Archaeology: A Very Short Introduction. New Delhi: Oxford University Press.

Fagan, Brian, M. (1999) Archaeology: A Brief Introduction. Prentice Hall: New Jersey.

Gamble, Clive (2003) Archaeology: A Basics. London: Routledge.

Ghosh, A. (1989) An Encyclopaedia of Indian Archaeology (Vol. 1-2). New Delhi: Munshiram Manohar Publishers Pvt. Ltd.

Gosden, Chris (2007) Prehistory: A Very Short Introduction. New Delhi: Oxford University Press.

Greene, Kevin (2000) Archaeology – An Introduction. Routledge Publication.

Hodder, Ian (1992) The Archaeological Process: An Introduction. Blackwell Publisher, Oxford.

Medhi, Dilip K. (Ed.) (2002) Man and Environment in Northeast India. Vol. III. Heritage Issue.

Rajan, K. (2002) Archaeology: Principles and Methods. Thanjavur: Manoo Pathipakkam.

Renfrew, C. and P. Bhan (1991) Archaeology: Theories and Methods and Practice, Thames and Hudson, London.

Tripathi, Alok Remote Sensing and Archaeology. Sundeep Prakashan, Delhi



**(Core Course)**  
 Full Marks: 100  
 Pass Marks: 40  
 No. of Lectures: 60  
 Credits: 6

## **OBJECTIVE**

This course introduces the students to methods, techniques, concepts and philosophical foundations research in anthropology.

## **CONTENTS**

### **UNIT I**

Philosophical Foundations Anthropological Methods.

### **UNIT II**

Fieldwork Tradition: British and American Traditions; Importance of language and rapport in fieldwork; ethics of fieldwork.

### **UNIT III**

Data, Concept, Hypothesis and Theory.

### **UNIT IV**

Quantitative and Qualitative data collection: Sampling, Questionnaire, Interview Schedule, Observation, Case study.

### **UNIT V**

Data Analysis and Report Writing.

## **READINGS**

Bernard H.R. (2006) Research Methods in Anthropology: Qualitative and Quantitative Approach. Rowman and Lillerfield Publication.

Srivastava, V.K. (1994) Methodology and Fieldwork. Oxford University Press.

Russel, H. and H. Russel Research Methods in Anthropology. Alta Mira Press.

Medhi, Dilip K. (Ed.) (2002) Research Methodology in Prehistoric Archaeology. Man and Environment in Northeast India. Vol. II. Guwahati and Delhi: Omsons Publications

Miller, D.C. and N.J. Salkind (2002) Handbook of Research Design and Social Measurement. Sage.

Barnes, J.A. (1977) The Ethics of Enquiry in Social Sciences. Delhi: OUP.

Burgess, R.G. (1984) In the Field: An Introduction to Field Research. London: Routledge.

Epstein, A.L. (1978) Crafts in Social Anthropology. Delhi: Hindustan Publishing Corporation.

Pelto, P.J. (1970) Anthropological Research: The Structure of Enquiry. New York: Harper and Sons.

Sarana, G. (1975) The Methodology of Anthropology. New York: The University of Arizona Press. 20

## **SEMESTER IV**

### **ANT 401: ANTHROPOLOGICAL THEORIES – II**

**(Core Course)**

Full Marks: 100

Pass Marks: 40

No. of Lectures: 60

Credits: 6

#### **OBJECTIVE**

This course introduces the students to advanced theories and critique that have emerged in anthropology in response to newly emergent social phenomena and accumulation of theoretical knowledge.

#### **CONTENTS**

##### **UNIT I**

Marxist and historical Approach

##### **UNIT II**

Cultural Approach, Symbolism and Interpretative theory: David Schneider, Raymond Firth, Marshal Sahlins and Clifford Geertz.

##### **UNIT III**

Cultural critique and Post-modernism: Marcus and Fisher, James Clifford and Stephen Taylor

##### **UNIT IV**

Post-Colonial Critique: Kuper and Appadurai

##### **UNIT V**

Feminist Critique

#### **READINGS**

Layton, Robert (1997) An Introduction to Theory in Anthropology, Cambridge: Cambridge Univ. Press.

Moore, J.D. (1997) Visions of Culture: An Introduction to Anthropological Theories and Theorists, New Delhi: Sage.

Geertz, Clifford (1973) Interpretation of Cultures, New York: Basic Books.

Taylor, Stephen (ed.) (1987) Cognitive Anthropology, Prospect Heights, III: Waveland Press, pp. 1-23.

Ortner, Sherry (1996) Making Gender: The Politics and Erotics of Culture, Boston: Beacon Press Books.

Clifford, James and G.E.Marcus (eds.) (1986) Writing Culture: the Poetics and Politics of Ethnography, The University of California Press.

**ANT 402: MEDICAL ANTHROPOLOGY****(Core Course)**

Full Marks: 100

Pass Marks: 40

No. of Lectures: 60

Credits: 6

**OBJECTIVE**

This course introduces the students to medical anthropology by imparting knowledge on social ecology of health, health culture, ethnomedicine, cultural context of health and illness, and health care services in India.

**CONTENTS****UNIT I**

Medical Anthropology, definition and major areas of study: Goals of Medical Anthropology; Basic premises in Medical Anthropology; Medical Anthropology and medical Sociology. Brief history of emergence of Medical Anthropology; Contribution of Anthropology of Religion, Clinical Sociology (Medical Sociology) and evolving conceptual systems by anthropologists.

**UNIT II**

Epidemiology and social ecology; definitions; epidemiology; Different components of studies; Rates and ratios used in epidemiological studies. Ecology, culture, human behaviour and disease occurrence; Anthropology of infectious and non-infectious diseases. Epidemiology and Medical Anthropology- need for collaboration; Ethnomedicine and epidemiology.

**UNIT III**

Health culture and ethnomedicine; Ethnomedicine- Major areas of study under ethnomedicine- Disease etiology, disease classification, diagnosis and treatment in folk societies; Significance of ethnomedical studies.

**UNIT IV**

Cultural context of health and illness behaviour; Illness behaviour- definition; Models of illness behaviour; Utilization of medical services; Determinants of utilization of modern medical services.

**UNIT V**

Health care services in India; 3-tier system of health care delivery in India; Health planning in India; Recommendations of different committees appointed from time to time. Major sectors of health care system in India.

**READINGS**

Banerjee B.G. and Ritula Jalota (1988) Folk illness Ethnomedice, New Delhi, Northern Book Centre.

Basantibala, Jene et al. (1989) Health and Family Welfare Service in India, New Delhi, Ashish Publishing.

Cockerham W.C. (1978) Medical Sociology, New Jersey, Prentice Hall.

Grolling F.X. (1976) Medical Anthropology, The Hague, Mouton Press.

Higgins P.C. et al (ed) (1978) Health, Illness and Medicine; A Reader in Medical Sociology, Chicago, Rand M.C.Nally Publishers.

Janes R.C. Craig et al (ed) (1986) Anthropology and Epidemiology; Interdisciplinary Approaches Study of Health and Disease, Boston, D. Reidel Publishing Company.

Kochar V. (1980) Basic Trusts and Guidelines of National Health Policy; Status of Implementation; Bombay, Tata institute of Social Sciences.

Medhi, Dilip K. (1993) Traditional Medicine in Modern Times: The Place of Herbal and Geo-products in the life of the People of Assam. Man and Environment in Northeast India, Vol.I (ed. Dilip K.Medhi) Guwahati & Delhi: Omsons Publications.

Medhi, Dilip K. (2002) An Assamese Health Calendar.. Man and Environment in Northeast India, Vol.II. Guwahati & Delhi: Omsons Publications.

Salil Basu (ed) (1994) Tribal health in India. Delhi, Manak Publications.

### **ANT 403: ANTHROPOLOGY OF GENDER**

**(Core Course)**

Full Marks: 100

Pass Marks: 40

No. of Lectures: 60

Credits: 6

### **OBJECTIVE**

This course introduces the students to concepts and approaches in anthropology of gender, gender and health, gender and development, gender and globalisation and gender studies.

### **CONTENTS**

#### **UNIT I**

Concept of gender and its evolution, social and biological theories of gender, cultural construction of gender, anthropological approach to gender studies, gender in patrilineal and matrilineal societies.

#### **UNIT II**

Gender and health, sexuality and reproductive health, fertility, gender and mental health, disease and gender.

#### **UNIT III**

Recent changes in gender studies: Feminist movement and gender movement, gay and trans-sexuality.

#### **UNIT IV**

Gender and development, Gender perspective in development, gender sensitivity, gender equity, gender discrimination, gender development index, gender equity index.

## UNIT V

Gender and Globalization, Rethinking gender roles, influence of mass media, communication and new reproductive technology, new perspective on sexuality.

## READINGS

Ardener, Shirley (1985) *The Social Anthropology of Women and Feminist Anthropology*. Anthropology Today, 1 (5).

Barnard, A. (2000) *History and theory in Anthropology*. Cambridge: University Press.

Connell, R.W. (2002) *Gender*. Cambridge: Polity Press.

Cormack, C.M. and M. Strathern (1998) *Nature, Culture and Gender*. Cambridge: University Press.

Croll, E. (2000) *Endangered Daughters: Discrimination and Development in Asia*. London: Routledge.

Dube, Leela (1997) *Comparative Perspective in Gender in South and Southeast Asia*. New Delhi: Vistaar.

Evans Pritchard, E.E. (1965) *The position of Women in Primitive Society and Other Essays in Social Anthropology*. London: Faber Ltd.

Harris, M. (1991) *Cultural Anthropology*. NY: Harper Collins.

Kakar, S. and J.M. (1995) *Tales of Love, Sex and Danger*. Delhi: OUP.

Kelkar, G. and D. Nathan (1991) *Gender and Tribe*. New Delhi: Kali for Women.

Mayers, M.J. et al (1990) *Gender, Kinship, Power*. NY: Routledge.

McGee, R.J and R.L. Warms (1996) *Anthropological Theory*. London: Mayfield Pub.

Moore, H.L (1986) *Space, Text and Gender*. Cambridge: U Press.

Moore, H.L (1994) *A Passion for Difference: Essays in Anthropology and Gender*. Bloomington: Indiana University Press.

Moser, C. (1993) *Gender, Planning and Development*. London: Routledge.

O'Reilly, A. (2001) *Mothers and Sons: Feminist Perspectives*. London: Routledge.

Ortner, S.B. and H. Whitehead (1956) *Sexual Meanings: The Cultural Context of Gender and Sexuality*. Cambridge: University Press.

Rao, A. (2000) *Autonomy: Life Cycle, Gender and Status among Himalayan Pastoralists*. Herndon: Berghahn Books.

Rapport, N. And J. Overing (2000) *Social and Cultural Anthropology*. London: Routledge.

Singh, A.M. and A. Kelle-Vitanen (1987) *Invisible Hands: Women in Home-based production*. New Delhi: Sage.

Unnithan Kumar M. (2001) Identity, Gender and Poverty: New Perspectives on Caste and Tribe. Delhi: Rawat.

Zehol, L. (2006) "Gender issues in Tribal Society of North-East India: Some Observations". Bulletin of the Department of Anthropology. Dibrugarh University, 34:99-106

Gunewardena, Nandini and Ann E. Kingsolver (2007) The Gender and Globalization: Women navigating cultural and economic marginalities. Santa Fe N.M.: School for Advanced Research Press.

### **ANT 404.1: NUTRITIONAL ANTHROPOLOGY**

**(Elective Course)**

Full Marks: 100

Pass Marks: 40

No. of Lectures: 60

Credits: 6

### **OBJECTIVE**

This course introduces the students to basic concepts, states, variation and evaluation of nutrition in the given socio-economic contexts.

### **CONTENTS**

#### **UNIT I**

Nutrition: Basic terms and concepts, Socio-cultural context of foods-hot and cold, preferences and avoidances.

#### **UNIT II**

Overview of nutrients: Malnutrition, undernutrition, overnutrition, obesity; Recommended dietary intakes of nutrients.

#### **UNIT III**

Types, functions and uses of nutrients: Broad view, special problems related to and nutrition and identification of the growth at risk.

#### **UNIT IV**

Birth weight variations/ abnormal growth and growth failure, determinations of nutritional levels- Anthropometric and Clinical Signs, Bio-chemical.

#### **UNIT V**

Diet and Nutrition: Socio-economic and dietary assessment, evaluation, monitoring and surveillance, concept of standard/reference values of growth and nutritional status.

### **READINGS**

Burton, B.J. (1976) Human Nutrition. McGraw Hill, New York.

Draper, H.H (Ed.) (1977) Advances in Nutritional Research. Vol. I. Plenum, New York.

Fleck. H. (1981) Introduction to Nutrition. Macmillan, New York.

- Gerard, R.W. (Ed) (1952) Food for Life. University of Chicago Press, Chicago.
- Goodhart, R.S. and M.E. Shils (Ed) (1973) Modern Nutrition in Health and disease. Lea and Febiger, Philadelphia.
- Gopalan, C. And K. Vijayraghavan 1971 Nutrition Atlas of India. National Institute of Nutrition, Hyderabad.
- Jensen, B. 2008 Nutritional Anthropology. New Delhi: Global Vision Publishing.
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- Martin, E.A. and A.D Coolidge 1978 Nutrition in Action. Holt, Rinehart and Winston, New York.
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- Pike, R.L. and M.L. Brown 1975 Nutrition: An Integrated Approach, Wiley, New York.
- Robinson, C.H. and E.S. Weigley 1978 Fundamentals of normal nutrition. Macmillan, New York.
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- Singh, Inder P. and M.K. Bhasin 1989 Anthropometry: A Laboratory Manual on Biological Anthropology. Delhi: Kamla-Raj Enterprises. IGML – Book Call No. 573.6 in 2M.
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- Surinder Nath 1997 Nutritional Anthropology, Ashtam Praashan, Delhi.
- Vishweswara Rao 1978 Nutritional Status of Preschool Children and the related factors. Indian Journal of Nutrition and Dietetics, 15: 223-234.
- Vishweswara Rao, K.G. Radhaiah, S.V.S. Raju and M.C. Swaminathan 1981 Relative importance of various Anthropometric Measurements and Indices for an evaluation of Nutritional status. Indian Paediatrics, 18: 223-231.
- Vishweswara Rao 1984 Growth retardation and Malnutrition. Nutrition News, 6-14.
- Vishweswara Rao, K.P. Rau and B.V.S. Thimmayamma 1986 Nutritional Anthropometry of Indian Adults. Indian Journal of Nutrition and Dietetics, 15: 223-234.
- Vishweswara Rao, K. 1987 Vital Statistics and Nutritional Status of Indians. Indian Journal of Nutrition and Dietetics, 24: 272-297.

#### **ANT 404.2: ANTHROPOLOGY OF COMMUNICATION**

**(Elective Course)**

Full Marks: 100

Pass Marks: 40

No. of Lectures: 60

Credits: 6

#### **OBJECTIVE**

This course introduces the students to forms of human communication, ethnography of communication, culture and communication, mass media and development communication..

## **CONTENTS**

### **UNIT I**

Human Communication: Gestures, verbal and non-verbal communication, conversation, Speech community.

### **UNIT II**

Ethnography of Communication: basic Terms, Concepts and Issues, analysis of Communicative events, attitude towards Communicative Performance, Methodology.

### **UNIT III**

Culture and Communication: Symbolism, ritual, socio-linguistics, space and time, language and gender.

### **UNIT IV**

Mass Communication: Electronic, Print and Traditional Media, Theories of Mass Communication.

### **UNIT V**

Development Communication: SITE, Health Communication, Role of communication in agriculture, education and rural development.

## **READINGS**

Agrawal, B.C. (1985) Satellite Instructional Television Experiment. Ahmedabad: Space Application Centre.

Mead, G.H 1934 Mind, Self and Society. Chicago: University of Chicago Press.

De Vito, Joseph A. 1934 Human Communication (6th edition). New York: Harper Collins College Publications.

Gumperz, J.J. 1968 The Speech Community International Encyclopaedia of Social Sciences. New York: Macmillan. Reprinted in Linguistic Anthropology – A Reader. Alessandro Duranti (ed). Oxford Blackwell Publishers, 43-52.

Saville Troike, M. 1982 Ethnography of Communication. Oxford: Basil Blackwell.

Duranti, Alessandro 1997 Linguistic Anthropology. New York: Cambridge University Press.

Leech, E 1976 Culture and communication. Cambridge: Cambridge University Press.

Rao, N.S. 1997 a An Anthropological Approach to Folk Dances. Indian Anthropologist. 27.1: 57-75.

### **ANT 404.3: ARCHAEOLOGY OF INDIA**

**(Elective Course)**

Full Marks: 100

Pass Marks: 40

No. of Lectures: 60



Credits: 6

## **OBJECTIVE**

This course introduces the students to archaeology in India through its pre-historical and historical phases with special reference to Indus civilization.

## **CONTENTS**

### **UNIT I**

Scope, terminology and periodization.

History of archaeology in India: contribution of Institutions and individuals.

### **UNIT II**

Prehistory: chronology, climatic conditions, type and nature of sites, tool technology, typology, material and study of stone artifacts.

Important Sites.

### **UNIT III**

Indus civilization and Chalcolithic cultures Early, mature and late Harappan culture, Ahar, Malwa, Jorwe, Important excavated sites.

### **UNIT IV**

Historical archaeology, sources, important excavated sites.

### **UNIT V**

Conservation and preservation, preventive and curative factors causing deterioration, museology.

## **READINGS**

Agrawal, D.P. (1984) The Archaeology of India. New Delhi: Select Book Service Syndicate.

Allchin, Bridget and Raymond. (1983) The Rise of Civilization in India and Pakistan. New Delhi: Select Book Service Syndicate.

Ancient India, No. 9 Archaeological Survey of India. New Delhi

Bhattacharya, D.K. (1999) An Outline of Indian Prehistory. Delhi: Palaka Prakashan.

Childe, G.V. (1956) Piecing Together the Past: the Interpretation of Archaeological Data. Routledge and Kegan Paul, London.

Crabtree, Pam J., and Douglas V. Campana (2006) Exploring Prehistory: How Archaeology Reveal our Past (2nd Edition). Boston: McGraw Hill.

Ghosh, A. (1989) An Encyclopaedia of Indian Archaeology (Vol. 1-2). New Delhi: Munshiram Manohar Publishers Pvt. Ltd.

Gosden, Chris (2007) Prehistory: A Very Short Introduction. New Delhi: Oxford University Press.

Roy, Surindranath (1996) The story of Indian Archaeology 1784-1947. Archaeological Survey of India, New Delhi.

Sankalia, H.D. (1982) Stone Age Tools: A Brief Introduction. New Jersey: Pearson- Prentice Hall.

Tripathi, Alok The Ancient Monument and Archaeological Sites and Remains Act 1958, Sundeep Prakashan, Delhi.

### **ANT 405: DISSERTATION**

**(Core Course)**

Full Marks: 100

Pass Marks: 40

No. of Lectures: 60

Credits: 12

The students shall be given instructions on techniques and methods of field investigation in special classes. They should undertake field work on a chosen field of study. The field work should be carried out under guidance of a teacher and dissertation based on the data collection from the field should be submitted.