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 (P) per week	1 Credit

Course Code and Definition:

Course code	**Definitions**
L	Lecture
T	Tutorial
P	Practical
C	Credits
BSC	Basic Science Courses
ESC	Engineering Science Courses
HSMC	Humanities and Social Sciences including Management courses
OEC-ASH	Open Elective courses of ASH
LC	Laboratory course
MC	Mandatory courses
AU	Audit Course

Course Level Coding Scheme:

Three-digit number is used as suffix with three letters to represent department (ASH), followed by representation of the category of course in one letter (B For Basic Science Courses; E for Engineering Science Courses; H for Humanities, Social Science, including Management Courses; and so on). Digit at hundred's place signifies the year in which it is offered, followed by the serial number of the course. A first semester course may have the following code:

ASHB101
ASHE103
ASHH107
ASHA108

Course Structure of the 1st Semester Courses of B.Tech Curriculum

Semester 1 (CSE)

Sl No	Category of Course	Course Code	Course Title	L	T	P	Credit	Type
1.	Basic Science Course	ASHP101	Physics-I	3	1	0	4	Theory Paper
2.	Basic Science Course	ASHB102	Mathematics-I	3	1	0	4	Theory Paper
3.	Engineering Science Course	ASHE103	Basic Electrical Engineering	3	1	0	4	Theory Paper
4.	Engineering Science Course	ASHE104	Engineering Graphics and Design	1	0	4	3	Practical Paper
5.	Basic Science Course	ASHP105	Physics-I Lab	0	0	2	1	Practical Paper
6.	Engineering Science Course	ASHE106	Basic Electrical Engineering Lab	0	0	2	1	Practical Paper
7.	Humanities Social Science including Management Courses	ASHH107	Design Thinking	0	0	2	1	Practical Paper
8.	Audit Course	ASHA108	IDEA Lab Workshop	2	0	4	0	Practical Paper
			Total				18	

Semester 1 (ECE+AE)

Sl No	Category of Course	Course Code	Course Title	L	T	P	Credit	Type
1.	Basic Science Course	ASHC101	Chemistry-I	3	1	0	4	Theory Paper
2.	Basic Science Course	ASHB102	Mathematics-I	3	1	0	4	Theory Paper
3.	Engineering Science Course	ASHE103	Basic Electrical Engineering	3	1	0	4	Theory Paper
4.	Engineering Science Course	ASHE104	Engineering Graphics and Design	1	0	4	3	Practical Paper
5.	Basic Science Course	ASHC105	Chemistry-I Lab	0	0	2	1	Practical Paper
6.	Engineering Science Course	ASHE106	Basic Electrical Engineering Lab	0	0	2	1	Practical Paper
7.	Humanities Social Science including Management Courses	ASHH107	Design Thinking	0	0	2	1	Practical Paper
8.	Audit Course	ASHA108	IDEA Lab Workshop	2	0	4	0	Practical Paper
			Total				18	

Course Structure of the 2nd Semester Courses of B.Tech Curriculum

Semester II (CSE)

Sl No	Category of Course	Course Code	Course Title	L	T	P	Credit	Type
1.	Basic Science Course	ASHC151	Chemistry-I	3	1	0	4	Theory Paper
2.	Basic Science Course	ASHB152	Mathematics-II	3	1	0	4	Theory Paper
3.	Engineering Science Course	ASHE153	Programming for Problem Solving	3	0	0	3	Theory Paper
4.	Humanities Social Science including Management Courses	ASHH154	English	2	0	2	3	Theory Paper
5.	Humanities Social Science including Management Courses	ASHH155	Universal Human Values	2	1	0	3	Theory Paper
6.	Basic Science Course	ASHC156	Chemistry-I Lab	0	0	2	1	Practical Paper
7.	Engineering Science Course	ASHE157	Programming for Problem Solving Lab	0	0	4	2	Practical Paper
8.	Engineering Science Course	ASHE158	Workshop/ Manufacturing Practices	1	0	4	3	Practical Paper
9.	Audit Course	ASHA159	Sports and Yoga or NCC/ NSS	2	0	0	0	Practical Paper
			Total				23	

Semester II (ECE+AE)

Sl No	Category of Course	Course Code	Course Title	L	T	P	Credit	Type
1.	Basic Science Course	ASHP151	Physics-I	3	1	0	4	Theory Paper
2.	Basic Science Course	ASHB152	Mathematics-II	3	1	0	4	Theory Paper
3.	Engineering Science Course	ASHE153	Programming for Problem Solving	3	0	0	3	Theory Paper
4.	Humanities Social Science including Management Courses	ASHH154	English	2	0	2	3	Theory Paper
5.	Humanities Social Science including Management Courses	ASHH155	Universal Human Values	2	1	0	3	Theory Paper
6.	Basic Science Course	ASHP156	Physics-I Lab	0	0	2	1	Practical Paper
7.	Engineering Science Course	ASHE157	Programming for Problem Solving Lab	0	0	4	2	Practical Paper
8.	Engineering Science Course	ASHE158	Workshop/ Manufacturing Practices	1	0	4	3	Practical Paper
9.	Audit Course	ASHA159	Sports and Yoga or NCC/ NSS	2	0	0	0	Practical Paper
			Total				23	

COURSE CODE:	**COURSE NAME:**	L	T	P	C
For Semester I i) ASHP101 ii) ASHP105	i) Physics-I (Introductory Physics)	3	1	0	4
For Semester II i) ASHP151 ii) ASHP156	ii) Physics-I Lab (Introductory Physics Lab)	0	0	2	1
Category of Course: Basic Science Course					
Pre-requisites: Basic knowledge of 10+2 level Physics					

Course Objectives:

1. To use scalar and vector analytical techniques for analysing forces
2. To understand basic kinematics concepts – displacement, velocity and acceleration (and their angular counterparts);
3. To study Bragg's Law and introduce the basic concept of crystallography
4. To study the basic concepts of quantum physics.
5. To understand the principles of semiconductor Physics
6. Physics lab provides students with the first-hand experience of verifying various theoretical concepts learnt in theory courses.

Course Outcomes:

At the end of the course, the students will be able to learn the basics of physics and apply them to solve engineering problems.

1. Understand and be able to apply Newton's laws of motion.
2. Understand and be able to apply other basic dynamics concepts - the Work-Energy principle and Impulse-Momentum.
3. Knowledge to solve simple quantum mechanics calculations
4. Understand and utilize the mathematical models of semiconductor junctions
5. Understand various laws which they have studied through experiments
6. Apply basic knowledge of physics to solve real-world problems

Course Contents:

UNIT I: Mechanics

Transformation of scalars and vectors under Rotation transformation; Forces in Nature; Solving Newton's equations of motion in polar coordinates; Potential energy function; F = - Grad V; Conservative and non-conservative forces; Central forces; Conservation of Angular Momentum; Energy equation and energy diagrams; Elliptical, parabolic and hyperbolic orbits and its Application

UNIT II: Crystal structure
Seven systems of crystals, Bravais space lattice, crystal structure (bce, fee and sc) lattice dimensions, lattice planes, and miller indices and their significance, X-rays-absorption of X-rays diffraction, Bragg's law. Bragg's X-ray spectrometer.

UNIT III: Introduction of quantum mechanics
Wave particle duality, Uncertainty principle, Free-particle wave function and wave-packets, probability current, Expectation values, Schrodinger equation and its application to particle in a box and harmonic oscillator.

UNIT-IV: Band theory of solids
Free electron theory, Density of states and energy band diagrams, Kronig-Penny model (to introduce origin of band gap), Energy bands in solids, E-k diagram, Types of electronic materials: metals, semiconductors, and insulators, Density of states, Fermi level, Effective mass, Phonons.

UNIT V: Semiconductor
Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), Carrier generation and recombination, Carrier transport: diffusion and drift, p-n junction, Metal-semiconductor junction (Ohmic and Schottky), Semiconductor materials of interest for optoelectronic devices.

Text Books:

1. Introduction to Mechanics — MK Verma
2. Introduction to Quantum Physics D. J. Griffiths,
3. Charks Kittle, Introduction to Solid State Physics, John Wiley & Sons
4. Chottopadhyay and Rakshit, Quantum Mechanics, Statistical Mechanics and Solid State Physics

References:

1. Engineering Mechanics, 2nd ed. — MK Harbola
2. An Introduction to Mechanics — D Kleppner & R Kolenkow
3. Principles of Mechanics — JL Synge & BA Griffiths
4. Mechanics — JP Den Hartog
5. J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc. (1995).
6. B. E. A. Saleh and M. C. Teich, Fundamentals of Photonics, John Wiley & Sons, Inc., (2007).
7. S. M. Sze, Semiconductor Devices: Physics and Technology, Wiley (2008).

Physics-I Lab

Physics Laboratory [L : 0; T:0 ; P : 2 (1 credit)]

Experiments from the following:

Introduction to Electromagnetic Theory
1. Magnetic field from Helmholtz coil
2. Measurement of Lorentz force in a vacuum tube.

Introduction to Mechanics
1. Coupled oscillators
2. Experiments on an air-track
3. Experiment on the moment of inertia measurement
4. Experiments with gyroscope
5. Resonance phenomena in mechanical oscillators.

Quantum Mechanics for Engineers
1. Frank-Hertz experiment
2. Photoelectric effect experiment
3. Recording hydrogen atom Spectrum

Oscillations, waves and optics
1. Diffraction and interference experiments (from ordinary light or laser pointers)
2. Measurement of the speed of light on a tabletop using modulation
3. Minimum deviation from a prism.

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COURSE CODE: ASHB102	**COURSE NAME:**	L	T	P	C
	Mathematics-I (Calculus and Linear Algebra)	3	1	0	4
Category of course: Basic Science Courses					
Pre-requisites: Basic knowledge of +2 level calculus and algebra					

Course Objectives:

1. To introduce the idea of applying differential and integral calculus to the notions of Curvature and to improper integrals. Apart from some engineering applications, it gives a basic introduction on Beta and Gamma functions.
2. To discuss Mean Value Theorems that is fundamental to application of analysis to Engineering problems.
3. To develop the tool of matrices to solve systems of linear equations arising in many engineering problems by different methods.
4. To familiarize the students with the concepts of vector spaces that is essential in most branches of engineering.

Course Outcomes:

At the end of the course the students should be able to

1. understand the basic knowledge of Calculus and its applications
2. be familiar with the concept of Matrices and solution of system of linear equations
3. be thorough with the concept of Linear Algebra and its applications in engineering

Course Contents:

Unit I: Differential Calculus
Rolle's Theorem; Mean value theorems; indeterminate forms and L'Hospital's rule; Maxima and minima.

Unit II: Integral Calculus
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.

Unit III: Matrices
Matrices, vectors: addition and scalar multiplication, matrix multiplication; Linear systems of equations, linear independence, rank of a matrix, determinants.

Unit IV: Vector Spaces and Linear Transformation
Vector Space, linear dependence and independence of vectors, basis, dimension; Linear transformations (maps), range and kernel of a linear map, rank and nullity, rank-nullity theorem, Matrix associated with a linear map.

Unit V: Eigenvalues, eigenvectors and diagonalization
Eigenvalues, eigenvectors. Diagonalization. Their applications in the solution of system of linear equations.

Text Books:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002. (Unit-I, II)
2. E. Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006. (Unit-III, IV, V)

References:

1. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
2. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
4. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.

COURSE CODE:	COURSE NAME:	L	T	P	C
i) ASHE103 ii) ASHE106	i) Basic Electrical Engineering	3	1	0	4
	ii) Basic Electrical Engineering Lab	0	0	2	1
Category of Course: Basic Engineering Course					
Pre-requisites: Basic knowledge of 10+2 level Physics					
Course Objectives: 1. To understand and analyze basic electric and magnetic circuits. 2. To study the working principles of electrical machines and power converters. 3. To introduce the components of high and low-voltage electrical installations.					
Course Outcomes: The students will learn: 1. To explain the strong basics of Electrical Engineering and practical implementation of Electrical fundamentals. 2. To identify different applications of commonly used electrical machinery.					

Course Contents:

UNIT I: Single Phase and three A.C. Circuits

Generation of sinusoidal voltage, form factor and peak factor of sinusoidal voltage and current and analysis with phasor diagrams of R, L, C, RL, RC and RLC circuits; Real power, reactive power, apparent power and power factor, Necessity and Advantages of three-phase systems, Generation of three-phase power, Relationship between line and phase values of balanced star and delta connections;

UNIT II: Transformers

Principle of operation and construction of single-phase transformers (core and shell types). EMF equation, losses, efficiency and voltage regulation; Synchronous Generators covering, Principle of operation; Types and constructional features; EMF equation.

UNIT III: DC Machines

Working principle of DC machine as a generator and a motor; Types and constructional features; EMF equation of generator, DC motor working principle; Back EMF and its significance, torque equation; Types of D.C. motors, characteristics and applications.

UNIT-IV: Three Phase Induction Motors
Concept of rotating magnetic field; Principle of operation, types and constructional features; Slip and its significance; Applications of squirrel cage and slip ring motors; Necessity of a starter, star-delta starter.

UNIT V: Sources of Electrical Power
Introduction to Wind, Solar, Fuel cell, Tidal, Geothermal, Hydroelectric, Thermal-steam, diesel, gas, nuclear power plants; Concept of cogeneration, and distributed generation.

Text Books:

1. AICTE's Prescribed Textbook: Basic Electrical Engineering, Khanna Book Publishing
2. Ritu Sahdev (2022), Basic Electrical Engineering, Khanna Book Publishing.
3. Nagrath I.J. and D. P. Kothari (2001), Basic Electrical Engineering, Tata McGraw Hill.

References:

1. Hayt and Kimberly, Engineering Circuit Analysis, Tata McGraw Hill.
2. Kulshreshtha D.C. (2009), Basic Electrical Engineering, Tata McGraw Hill.
3. Rajendra Prasad (2009), Fundamentals of Electrical Engineering, Prentice Hall, India Hughes
4. Mittel & Mittal, Basic Electrical Engineering, Tata McGraw Hill.

ASHE106-- Basic Electrical Engineering Lab

Basic Electrical Engineering Laboratory [L : 0; T:0 ; P : 2 (1 credit)]

List of experiments/demonstrations:

1. Basic safety precautions. Introduction and use of measuring instruments–voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
2. 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.
3. 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.
4. 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 sides. Cumulative three-phase power in balanced three-phase circuits.

5. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging - slip ring arrangement) and single-phase induction machine.
6. Torque Speed Characteristic of separately excited dc motor.
7. 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.
8. Synchronous Machine operating as a generator: stand-alone operation with a load. Control of voltage through field excitation.
9. 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.

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COURSE CODE: ASHE104	**COURSE NAME:**	L	T	P	C
	Engineering Graphics & Design	1	0	4	3
Category of Course: Engineering Science Courses					
Course Objectives: The objective of this Course is to provide the basic knowledge about Engineering Drawing. Detailed concepts are given in projections, technical drawing, dimensioning, and specifications, so useful for a student in preparing for an engineering career.					
Course Outcomes: After the completion of the course, the learner will be able to 1. 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. 2. use the techniques, skills, and modern engineering tools necessary for engineering practice. 3. describe engineering design and its place in society. 4. discuss the visual aspects of engineering design. 5. use engineering graphics standards. 6. illustrate solid modelling. 7. use computer-aided geometric design. 8. design creating working drawings. 10. inspect engineering communication.					

Course 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).

Unit I: 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; Orthographic Projections Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes;

Unit II: Projections of Regular Solids
Covering those 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.
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)..

Unit III: 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 Viewsand Vice-versa, Conventions;

Unit IV: Orthographic Projections of Points
Orthographic Projections of Points: Introduction to drawing standards, creation of 2D environment using CAD software, principles of orthographic projections, projections of points in all the four quadrants.

Unit V: Transformation of Projections
Conversion of Isometric Views to Orthographic Views.
Conversion of orthographic views to isometric views – simple objects. Plan and elevation of simple buildings with dimensions.

Text Books:

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 Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.

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COURSE CODE: ASHH107	**COURSE NAME:**	L	T	P	C
	Design Thinking	0	0	2	1
Category of Course: Humanities and Social Sciences including Management courses					
Pre-requisite: None					
Course Objectives: The objective of this Course is to provide the new ways of creative thinking and Learn the innovation cycle of Design Thinking process for developing innovative products which useful for a student in preparing for an engineering career.					
Course Outcomes: Student will able to 1. Compare and classify the various learning styles and memory techniques and Apply them in their engineering education 2. Analyze emotional experience and Inspect emotional expressions to better understand users while designing innovative products 3. Develop new ways of creative thinking and Learn the innovation cycle of Design Thinking process for developing innovative products 4. Propose real-time innovative engineering product designs and Choose appropriate frameworks, strategies, techniques during prototype development 5. Perceive individual differences and its impact on everyday decisions and further Create a better customer experience					

Course Contents:

Unit I: An Insight to Learning
Understanding the Learning Process, Kolb's Learning Styles, Assessing and Interpreting, Understanding the Memory process, Problems in retention, Memory enhancement techniques, Understanding Emotions, Experience & Expression, Assessing Empathy, Application with Peers

Unit II: Basics of Design Thinking
Definition of Design Thinking, Need for Design Thinking, Objective of Design Thinking, Concepts & Brainstorming, Stages of Design Thinking Process (explain with examples) – Empathize, Define, Ideate, Prototype, Test

Unit III: Being Ingenious & Fixing Problem
Understanding Creative thinking process, Understanding Problem Solving, Testing Creative Problem Solving, Understanding Individual differences & Uniqueness

Unit IV: Process of Product Design
Process of Engineering Product Design, Design Thinking Approach, Stages of Product Design, Examples of best product designs and functions, Assignment – Engineering Product Design

Unit V: Prototyping & Testing
What is Prototype? Why Prototype? Rapid Prototype Development process, Testing, Sample Example, Test Group Marketing

Text Books/ References:

As provided by the course instructor.

COURSE CODE: ASHA108	**COURSE NAME:**	L	T	P	C
	IDEA Lab Workshop	2	0	4	0
Category of Course: Audit Course					
Pre-requisite: None					

Course Objectives:

The objective of Idea Lab is to make engineering graduates more imaginative and creative in critical thinking, problem solving, design thinking, collaboration, communication, lifelong learning etc. In addition, it will help them

1. To learn all the skills associated with the tools and inventory associated with the IDEA Lab.
2. To learn useful mechanical and electronic fabrication processes.
3. To learn necessary skills to build useful and standalone system/ project with enclosures.
4. To learn necessary skills to create print and electronic documentation for the system/project

Course Outcomes:

Upon completion of this laboratory course, students will be able to

1. Study and practice on machine tools and their operations
2. Practice on manufacturing of components using workshop trades including pluming, fitting, carpentry, foundry, house wiring and welding.
3. Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiselling.

Course Contents:

Unit I:

Introduction to basic hand tools - Tape measure, combination square, Vernier caliper, hammers, fasteners, wrenches, pliers, saws, tube cutter, chisels, vice and clamps, tapping and threading.

Adhesives

Introduction to Power tools: Power saws, band saw, jigsaw, angle grinder, belt sander, bench grinder, rotary tools. Various types of drill bits,

Unit II:

Mechanical cutting processes - 3-axis CNC routing, basic turning, milling, drilling and grinding operations, Laser cutting, Laser engraving etc.

Basic welding and brazing and other joining techniques for assembly.

Concept of Lab aboard a Box.

Unit III:
3D printing and prototyping technology – 3D printing using FDM, SLS and SLA. Basics of 3D scanning, point cloud data generation for reverse engineering.
Prototyping using subtractive cutting processes. 2D and 3D Structures for prototype building using Laser cutter and CNC routers.
Basics of IPR and patents; Accessing and utilizing patent information in IDEA Lab

Unit IV:
Discussion and implementation of a mini project.

Unit V:
Documentation of the mini project (Report and video).

List of Lab activities and experiments:
1. Machining of 3D geometry on soft material such as soft wood or modelling wax.
2. 2D profile cutting on plywood /MDF (6-12 mm) for press fit designs.
3. Familiarity and use of welding equipment.
4. Familiarity and use of normal and wood lathe.
5. Design and implementation of a capstone project involving embedded hardware, software and machined or 3D printed enclosure.

Text Books:
1. The Big Book of Maker Skills: Tools & Techniques for Building Great Tech Projects. Chris Hackett. Weldon Owen; 2018. ISBN-13: 978-1681884325.

References
1. The Total Inventors Manual (Popular Science): Transform Your Idea into a Top-Selling Product. Sean Michael Ragan (Author). Weldon Owen; 2017. ISBN-13: 978-1681881584.
2. Make: Tools: How They Work and How to Use Them. Platt, Charles. Shroff/Maker Media. 2018. ISBN-13: 978-9352137374
3. The Art of Electronics. 3rd edition. Paul Horowitz and Winfield Hill. Cambridge University Press. ISBN: 9780521809269
4. Practical Electronics for Inventors. 4th edition. Paul Sherz and Simon Monk. McGraw Hill. ISBN-13: 978-1259587542
5. Encyclopedia of Electronic Components (Volume 1, 2 and 3). Charles Platt. Shroff Publishers. ISBN-13: 978-9352131945, 978-9352131952, 978-9352133703
6. Building Scientific Apparatus. 4th edition. John H. Moore, Christopher C. Davis, Michael A. Coplan and Sandra C. Greer. Cambridge University Press. ISBN-13: 978-0521878586
7. Programming Arduino: Getting Started with Sketches. 2nd edition. Simon Monk.

McGraw Hill. ISBN-13: 978-1259641633
8. Make Your Own PCBs with EAGLE: From Schematic Designs to Finished Boards. Simon Monk and Duncan Amos. McGraw Hill Education. ISBN-13 : 978-1260019193.
9. Pro GIT. 2nd edition. Scott Chacon and Ben Straub. A press. ISBN-13 : 978-1484200773
10. Venu vinod, PK., MA. W., Rapid Prototyping – Laser Based and Other Technologies, Kluwer, 2004.
11. Ian Gibson, David W Rosen, Brent Stucker., "Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing", Springer, 2010
12. Chapman W.A.J, "Workshop Technology", Volume I, II, III, CBS Publishers and distributors, 5th Edition,2002.

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COURSE CODE:	**COURSE NAME:**	L	T	P	C
For Semester I i) ASHC101 ii) ASHC105 For Semester II i) ASHC151 ii) ASHC156	i) Chemistry-I	3	1	0	4
	ii) Chemistry-I Lab	0	0	2	1

Category of course: Basic Science Course

Course Objectives:

1. To understand the basic concepts of bonding and shapes of atoms, molecules and solids.
2. To understand the concepts of crystal field theory of transition metal ions.
3. To understand the basic concepts of different spectroscopic techniques and its applications in emerging fields.
4. To study the interaction forces of gases and potential energy surfaces of molecules.
5. To study the different thermodynamic functions.
6. To study the basic concepts of oxidation and reduction
7. To study the different properties of periodic table.
8. To understand the phenomenon of isomerism and optical activity.
9. To study different types of organic reactions.
10. Chemistry lab will provide students with the first-hand experience of verifying various theoretical concepts learnt in theory courses.

Course Outcomes: This course will enable the students to.

1. Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
2. Rationalise bulk properties and processes using thermodynamic considerations.
3. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques and will help in identifying different organic molecules.
4. Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
5. Learnt the different types of organic reactions.
6. Apply basic knowledge of chemistry to solve real-world problems.
8. Estimate rate constants of reactions from concentration of reactants/products as a function of time.
9. Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc
10. Synthesize a small drug molecule and analyse a salt sample

Chemistry-I [L:3; T:1; P:0 (4 credits)]

Course Contents:

UNIT I: Atomic and molecular structure

Schrodinger equation. Particle in a box solutions and its applications, Hydrogen atom wave functions and its plots to explore their spatial variations. Equations for atomic and molecular orbitals. Molecular orbitals and energy level diagrams of diatomic molecules, butadiene and benzene. Aromaticity. Crystal field theory of transition metal ions and magnetic properties. Band structure of solids and the role of doping on band structures.

UNIT II: Spectroscopic techniques and applications

Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Nuclear magnetic resonance and magnetic resonance imaging, surface characterisation techniques. Diffraction and scattering.

UNIT III: Intermolecular forces, potential energy surfaces and chemical equilibria

Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces of H_3, and H_2F and trajectories on these surfaces. Thermodynamic functions: energy, entropy and free energy. Cell potentials, emf, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion. Ellingham diagrams.

UNIT-IV: Periodic properties

Effective nuclear charge, 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, hard soft acids and bases.

UNIT-V: Stereochemistry, organic reactions and synthesis of drug molecule

Representations of 3 dimensional structures, Isomerism in organic molecules and transition metal compounds, optical activity, absolute configurations and conformational analysis. Introduction to organic reactions. Synthesis of a commonly used drug molecule.

Suggested Text Books

(i) University chemistry, by B. H. Mahan
(ii) Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
(iii) Fundamentals of Molecular Spectroscopy, by C. N. Banwell
(iv) Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
(v) Physical Chemistry by P. W. Atkins
(vi) Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition

Chemistry-I Lab [L:0; T:0; P:2 (1 credit)]

Experiments from the following:
1. Determination of surface tension and viscosity
2. Thin layer chromatography
3. Ion exchange column for removal of hardness of water
4. Determination of chloride content of water
5. Colligative properties using freezing point depression
6. Determination of the rate constant of a reaction
7. Determination of cell constant and conductance of solutions
8. Potentiometry - determination of redox potentials and emfs
9. Synthesis of a polymer/drug
10. Saponification/acid value of oil
11. Chemical analysis of a salt
12. Lattice structures and packing of spheres
13. Models of potential energy surfaces
14. Chemical oscillations- Iodine clock reaction
15. Determination of the partition coefficient of a substance between two immiscible liquids
16. Adsorption of acetic acid by charcoal
17. Use of the capillary viscometers to demonstrate the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg.

COURSE CODE:	COURSE NAME:	L	T	P	C
ASHB152	Mathematics-II (Probability and Statistics)	3	1	0	4
Category of course: Basic Science Courses					
Pre-requisites: Basic knowledge of +2 level probability and statistics					
Course Objectives: 1. To make the students familiar with the basics of probability theory. 2. To explain the use of continuous and discrete probability distributions in all branches of engineering. 3. To develop the tools of basic statistics, applied statistics in connection with engineering purpose.					
Course Outcomes: At the end of the course the students will be able to learn the basics of Probability and Statistics and apply them to solve engineering problems.					

Course Contents:

Unit I: Basic Probability

Probability spaces, conditional probability, independence; theorem of total probability and Bayes' theorem.

Unit II: Random variables

Discrete random variables, continuous random variables, independent random variables, mean and variance of random variables, distribution functions and densities.

Unit III: Discrete Probability Distributions

Binomial and Poisson distributions, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials; Correlation coefficient.

Unit IV: Continuous Probability Distributions

Normal, exponential and gamma distributions with their properties.

Unit V: Basic and Applied Statistics

Measures of Central tendency, Test of significance. Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves.

Text Books:

1. E. Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006. (Unit- I-V)
2. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002. (Unit- I-V)

References:

1. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.
2. N.P. Bali and M. Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.

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COURSE CODE: ASHH154	**COURSE NAME:**	L	T	P	C
	English	2	0	2	3

Category of Course: Humanities and Social Sciences including Management courses

Pre-requisites: The learners should have the basic knowledge of English to understand the class lecture.

Course Objectives:

1. To provide learning environment to practice listening, speaking, reading and writing skills.
2. To assist the students to carry on the tasks and activities through guided instructions and materials.
3. To effectively integrate English language learning with employability skills and training.
4. To provide hands-on experience through group and individual presentations.

Course Outcomes:

The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

Course Contents:

Unit I: Vocabulary Building
1.1 The concept of Word Formation
1.2 Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives.
1.3 Synonyms, antonyms, and standard abbreviations.
1.4 Parts of Speech

Unit II: Basic Writing Skills
2.1 Interchange of Sentences
2.2 Use of phrases and clauses in sentences
2.3 Framing Questions
2.4 Narration

Unit III: Identifying Common Errors in Writing
3.1 Subject-verb agreement
3.2 Noun-pronoun agreement
3.3 Prepositions
3.4 Redundancies

Unit IV: Writing Skill
4.1 Writing short passage
4.2 Writing reports based on visuals
4.3 Writing instructions with clarity

Unit V: Oral Communication
5.1 Conversations in common everyday situations
5.2 Polite expression and their usage
5.3 Giving opinion; giving feedback
5.4 Communication at Workplace
5.5 Listening Comprehension

Text Books:

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Technical Communication: Principles and Practice. Meenakshi Raman. Oxford University Press

References:

1. Remedial English Grammar. F.T. Wood. Macmillan.2007
2. On Writing Well. William Zinsser. Harper Resource Book. 2001
3. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
4. Communication Skills. Sanjay Kumar and Pushp Lata. Oxford University Press. 2011.
5. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press.

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COURSE CODE: ASHH155	**COURSE NAME:**	L	T	P	C
	Universal Human Values	2	1	0	3

Category of Course: Humanities and Social Sciences including Management courses

Course Objectives:

1. To help the students appreciate the essential complementarily between 'VALUES' and
2. 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
3. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
4. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.
5. To provide a much-needed orientational input in value education to the young enquiring minds.

Course Outcomes:

By the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.

They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). It is hoped that they would be able to apply what they have learnt to their own self in different day-today settings in real life, at least a beginning would be made in this direction.

Therefore, the course and further follow up is expected to positively impact common graduate attributes like:

1. Holistic vision of life
2. Socially responsible behaviour
3. Environmentally responsible work
4. Ethical human conduct
5. Having Competence and Capabilities for Maintaining Health and Hygiene
6. Appreciation and aspiration for excellence (merit) and gratitude for all

Course Contents:

Unit I: Introduction to Value Education
Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)
Understanding Value Education
Self-exploration as the Process for Value Education
Continuous Happiness and Prosperity – the Basic Human Aspirations
Happiness and Prosperity – Current Scenario
Method to Fulfil the Basic Human Aspirations

Unit II: Harmony in the Human Being
Understanding Human being as the Co-existence of the Self and the Body
Distinguishing between the Needs of the Self and the Body
The Body as an Instrument of the Self
Understanding Harmony in the Self
Harmony of the Self with the Body
Programme to ensure self-regulation and Health

Unit III: Harmony in the Family and Society
Harmony in the Family – the Basic Unit of Human Interaction
'Trust' – the Foundational Value in Relationship
'Respect' – as the Right Evaluation
Other Feelings, Justice in Human-to-Human Relationship
Understanding Harmony in the Society
Vision for the Universal Human Order

Unit IV: Harmony in the Nature/Existence
Understanding Harmony in the Nature
Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature
Realizing Existence as Co-existence at All Levels
The Holistic Perception of Harmony in Existence

Unit V: Implications of the Holistic Understanding – a Look at Professional Ethics
Natural Acceptance of Human Values
Definitiveness of (Ethical) Human Conduct
A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order
Competence in Professional Ethics

Holistic Technologies, Production Systems and Management Models-Typical Case Studies
Strategies for Transition towards Value-based Life and Profession

Text Books:

1. A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

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COURSE CODE: ASHE158	**COURSE NAME:**	L	T	P	C
	Workshop/Manufacturing Practices	1	0	4	3
Category of Course: Engineering Science Courses					

Course Objectives:

1. To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.
2. To have a study and hands-on-exercise on plumbing and carpentry components.
3. To have a practice on gas welding, foundry operations and fitting
4. To have a study on measurement of electrical quantities, energy and resistance to earth.
5. To have a practice on soldering

Course Outcomes:

Upon completion of this course, the students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials.

Upon completion of this laboratory course, students will be able:

1. To fabricate components with their own hands.
2. To relate practical knowledge of the dimensional accuracies and dimensional tolerances possible
3. with different manufacturing processes.
4. To design small devices of their interest by assembling different components

Course Contents:

Module I: Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods.
Module II: CNC machining, Additive manufacturing.
Module III: Fitting operations & power tools.
Module VI: Carpentry.
Module V: Plastic moulding, glass cutting.
Module VI: Metal casting.
Module VII: Welding (arc welding & gas welding), brazing.

Practicals:

1. Machine shop
2. Fitting shop

3. Carpentry
4. Welding shop (Arc welding + Gas welding)
5. Casting
6. Smithy
7. Plastic moulding & Glass Cutting

Text Books :

1. Hajra Choudhury S.K., Hajra Choudhury 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**.**

References:

1.Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.

2. Gowri P. Hariharan and A. Suresh Babu," Manufacturing Technology – I" Pearson Education, 2008.

3. Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.

4. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGraw Hill House, 2017.

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COURSE CODE: ASHA159	**COURSE NAME:**	L	T	P	C
	Sports and Yoga	2	0	0	0

Category of Course: Audit Course

Pre-requisite: None

Course Objectives:

1. To make the students understand the importance of sound health and fitness principles as they relate to better health.
2. To expose the students to a variety of physical and yogic activities aimed at stimulating their continued inquiry about Yoga, physical education, health and fitness.
3. To create a safe, progressive, methodical and efficient activity based plan to enhance improvement and minimize risk of injury.
4. To develop among students an appreciation of physical activity as a lifetime pursuit and a means to better health.

Course Outcomes:

On successful completion of the course the students will be able:

1. To practice Physical activities and Hatha Yoga focusing on yoga for strength, flexibility, and relaxation.
2. To learn techniques for increasing concentration and decreasing anxiety which leads to stronger academic performance.
3. To learn breathing exercises and healthy fitness activities
4. To understand basic skills associated with yoga and physical activities including strength and flexibility, balance and coordination.
5. To perform yoga movements in various combination and forms.
6. To assess current personal fitness levels.
7. To identify opportModuleies for participation in yoga and sports activities.
8. To develop understanding of health-related fitness components: cardiorespiratory endurance, flexibility and body composition etc.
9. To improve personal fitness through participation in sports and yogic activities.
10. To develop understanding of psychological problems associated with the age and lifestyle.
11. To demonstrate an understanding of sound nutritional practices as related to health and physical performance.
12. To assess yoga activities in terms of fitness value.
13. To identify and apply injury prevention principles related to yoga and physical fitness activities.

14. To understand and correctly apply biomechanical and physiological principles elated to exercise and training.

Course Contents:

Unit I:

Module I: Introduction to Physical Education
Meaning & definition of Physical Education
Aims & Objectives of Physical Education
Changing trends in Physical Education
Module II: Olympic Movement
Ancient & Modern Olympics (Summer & Winter)
Olympic Symbols, Ideals, Objectives & Values
Awards and Honours in the field of Sports in India (Dronacharya Award, Arjuna Award, Dhayanchand Award, Rajiv Gandhi Khel Ratna Award etc.)

Unit II:

Module III: Physical Fitness, Wellness & Lifestyle
Meaning & Importance of Physical Fitness & Wellness
Components of Physical fitness
Components of Health related fitness
Components of wellness
Preventing Health Threats through Lifestyle Change
Concept of Positive Lifestyle
Module IV: Fundamentals of Anatomy & Physiology in Physical Education, Sports and Yoga
Define Anatomy, Physiology & Its Importance
Effect of exercise on the functioning of Various Body Systems. (Circulatory System, Respiratory System, Neuro-Muscular System etc.)
Module V: Kinesiology, Biomechanics & Sports
Meaning & Importance of Kinesiology & Biomechanics in Physical Edu. & Sports
Newton's Law of Motion & its application in sports.
Friction and its effects in Sports.

Unit III:

Module VI: Postures
Meaning and Concept of Postures.
Causes of Bad Posture.
Advantages & disadvantages of weight training.
Concept & advantages of Correct Posture.
Common Postural Deformities – Knock Knee; Flat Foot; Round Shoulders; Lordosis, Kyphosis, Bow Legs and Scoliosis.
Corrective Measures for Postural Deformities

Module VII: Yoga
Meaning & Importance of Yoga
Elements of Yoga
Introduction - Asanas, Pranayama, Meditation & Yogic Kriyas
Yoga for concentration & related Asanas (Sukhasana; Tadasana; Padmasana & Shashankasana)
Relaxation Techniques for improving concentration - Yog-nidra
Module VIII: Yoga & Lifestyle
Asanas as preventive measures.
Hypertension: Tadasana, Vajrasana, Pavan Muktasana, Ardha Chakrasana, Bhujangasana, Sharasana.
Obesity: Procedure, Benefits & contraindications for Vajrasana, Hastasana, Trikonasana, Ardh Matsyendrasana.
Back Pain: Tadasana, Ardh Matsyendrasana, Vakrasana, Shalabhasana, Bhujangasana.
Diabetes: Procedure, Benefits & contraindications for Bhujangasana, Paschimottasana, Pavan Muktasana, Ardh Matsyendrasana.
Asthema: Procedure, Benefits & contraindications for Sukhasana, Chakrasana, Gomukhasana, Parvatasana, Bhujangasana, Paschimottasana, Matsyasana.

Unit IV:
Module IX: Training and Planning in Sports
Meaning of Training
Warming up and limbering down
Skill, Technique & Style
Meaning and Objectives of Planning.
Tournament – Knock-Out, League/Round Robin & Combination.
Module X: Psychology & Sports
Definition & Importance of Psychology in Physical Edu. & Sports
Define & Differentiate Between Growth & Development
Adolescent Problems & Their Management
Emotion: Concept, Type & Controlling of emotions
Meaning, Concept & Types of Aggressions in Sports.
Psychological benefits of exercise.
Anxiety & Fear and its effects on Sports Performance.
Motivation, its type & techniques.
Understanding Stress & Coping Strategies.
Module XI: Doping
Meaning and Concept of Doping
Prohibited Substances & Methods
Side Effects of Prohibited Substances

Unit V:
Module XII: Sports Medicine
First Aid – Definition, Aims & Objectives.
Sports injuries: Classification, Causes & Prevention.
Management of Injuries: Soft Tissue Injuries and Bone & Joint Injuries
Module XIII: Sports / Games
Following subtopics related to any one Game/Sport of choice of student out of:
Athletics, Badminton, Basketball, Chess, Cricket, Kabaddi, Lawn Tennis, Swimming, Table Tennis, Volleyball, Yoga etc.
History of the Game/Sport.
Latest General Rules of the Game/Sport.
Specifications of Play Fields and Related Sports Equipment.
Important Tournaments and Venues.
Sports Personalities.
Proper Sports Gear and its Importance.

Text Books:

1. Modern Trends and Physical Education by Prof. Ajmer Singh.
2. Light On Yoga by B.K.S. Iyengar.

List of Courses Proposed for the 2nd year & 3rd year of B.Tech Curriculum

Basic Science Courses

Sl No	Category of Course	Course Title	L	T	P	Credit
1.	Basic Science Course	Chemistry-II	2	1	0	3
2.	Basic Science Course	Physics-II	2	0	1	3
3.	Basic Science Course	Basic Thermodynamics	3	0	0	3
4.	Basic Science Course	Mathematics-III	2	0	0	2

Humanities Social Science including Management Courses

Sl No	Category of Course	Course Title	L	T	P	Credit
1.	Humanities Social Science including Management Courses	Effective Technical Communication	2	0	2	3
2.	Humanities Social Science including Management Courses	Economics for Engineering	3	0	0	3
3.	Humanities Social Science including Management Courses	Organizational Behaviour	3	0	0	3
4.	Humanities Social Science including Management Courses	Managing Innovation and Entrepreneurship	3	0	0	3
5.	Humanities Social Science including Management Courses	Project Management	3	0	0	3
6.	Humanities Social Science including Management Courses	Values and Ethics	3	0	0	3
7.	Humanities Social Science including Management Courses	Education, Technology and Society	3	0	0	3

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COURSE CODE: ASHB…	**COURSE NAME:**	L	T	P	C
	Chemistry II (Chemical Applications)	2	1	0	3
Category of course: Basic Science Course					
Prerequisites: Chemistry-I					
Course Objectives: To explore the applications of chemistry that includes polymers, surfactants, nanomaterials, environmental and green chemistry, biomolecules and analytical techniques.					
Course Outcomes: This course applies the principles studied in Chemistry – I to understand the structures of different types of molecules in various environments. The students will be able distinguish between the structures, reactions and synthesis of polymers, surfactants, lubricants, metals, alloys, colloids and nanomaterials. New analytical techniques will be compared with the classical methods that use gravimetric and volumetric analysis. Chemical analysis of corrosion will be made. Green chemistry, environmental chemistry and non-conventional energy sources will be assessed in the present context.					

Chemistry II (Chemical Applications) [L:2; T:1; P:0 (3 credits)]

Course Contents:

UNIT I: Polymers

Synthesis of polymers and its mechanism. Molecular weight, shape and conformation of polymers. Crystallinity, melting point and glass transition. Viscoelasticity. Elastomers-structure, applications and curing. Conducting polymers and applications. Dendrimers. Solubility of polymers. Fabrication and moulding of polymers. Synthesis, properties and uses of PE, PVC, PMMA, formaldehyde resins, melamine-formaldehyde-urea resins. Adhesives, adhesive mechanism and applications.

UNIT II: Surfactants and Lubricants

Methods of preparation, cleaning mechanism. Critical micelle concentration and its determination. Hydrophobic and hydrophilic interactions. Micelles and reverse micelles. Detergents. Fricohesity of surfactants. Lubricants-physical and chemical properties, types and mechanism of lubrication. Additives of lubricants and freezing points of lubricants. Thermodynamic overview of electrochemical processes. Reversible and irreversible cells. Corrosion and its mechanism. Protection of corrosion and practical problems of corrosion.

UNIT III: Nanomaterials and Analytical techniques

Nanomaterials. Synthesis-top down and bottom up approaches. Properties and application of fullerenes, fullerols, carbon nanotubes and nanowires. Nanoelectronics. Applications of

nanomaterials in catalysis, telecommunication and medicine. Electron microscopy, scanning tunneling microscope and Atomic force microscope.

UNIT-IV: Environmental and green Chemistry
Air, water and noise pollution. Significance and determination of COD and BOD. Solid waste treatment of collection of NKP. Greenhouse effect and global warming. e-Waste. radioactive pollution. Applications of green chemistry and green technology.

UNIT-V: Energy science
Analysis of coal. Petroleum refining, liquid fuels, anti-knock agents. Cracking of oils. Limitations of fossil fuels. Non-conventional sources of energy-solar, wind, geo, hydro-power and biomass. Nuclear energy, reactors and nuclear waste disposal. Safety measures for nuclear reactors. Battery technology. Rechargeable batteries. Fuel cells. Photovoltaics.

Text Books

(1) Introduction to Nanoscience, by S. M. Lindsay
(2) A Textbook of Engineering Chemistry, by Shashi Chawla
(3) Engineering Chemistry, by S. S. Dara
(4) Engineering Chemistry, by P. C Jain and M. Jain
(5) Advanced Polymer Chemistry, by M. Chanda
(6) A Textbook of Environmental Chemistry, by O. D. Tyagi and M. Mehra
(7) Energy Scenario beyond 2100, by S. Muthukrishna Iyer
(8) Physical Chemistry of Metals, by L. S. Darken and R. W. Gurry
(9) Surfactants and Polymers in Aqueous Solution, by K. Holmberg, B. Jonsson, B. Kronberg and B. Lindman
(10) Physical Metallurgy, by R. E. Reed-Hill

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COURSE CODE: i) ASHB… ii) ASHB…	**COURSE NAME:**	L	T	P	C
	i) Physics-II (Advanced Engineering Physics)	2	0	0	2
	ii) Physics-II Lab (Advanced Engineering Physics Lab)	0	0	2	1
Category of course: Basic Science Course					
Pre-requisites: Knowledge of introductory physics given in 1st year					

Course Objectives:

1. To study heat and its applications
2. To study the basic concepts of Laser physics.
3. To understand the principles of superconductivity and magnetic proper properties of materials.
4. To develop the idea of nanoscience.
5. Physics lab provides students with the first-hand experience of verifying various theoretical concepts learnt in theory courses.

Course Outcomes: At the end of the course, the students will be able to learn the basics of physics and apply them to solve engineering problems.

1. Provide adequate exposure and develop insight into the basic principles of physics along with the possible applications
2. The acquaintance of basic physics principles would help engineers to understand the tools and techniques used in the industry and provide the necessary foundations for inculcating innovative approaches.
3. This would create awareness about the vital role played by science and engineering in the development of new technologies
4. The courses would provide the necessary exposure to the practical aspects, which is an essential component for learning science.

Course Contents:

UNIT I: Laser

Fundamentals of LASER- Energy levels in atoms, spontaneous emission of light, Stimulated emission of light – population of energy levels, population inversion, resonant cavity, excitation mechanisms, Lasing action; Properties of laser, characteristics of different types of laser.

UNIT II: Thermal Physics

Concept of Heat: Lattice vibrations – Einstein (individual) and Debye (collective), Boltzmann's distribution; Concept of entropy, specific heat; Attaining low temperature by variation of parameter X (like pressure, magnetic field etc.) in two steps- isothermal increase of X followed by adiabatic decrease of X. Example: a) Liquefaction of gas with X = Pressure; b) Adiabatic demagnetization; Transfer of heat by conduction, convection and radiation.

UNIT III: Electromagnetic Theory and Dielectrics
Coulomb's law for distribution of charges, Polarization Gauss's law, Magnetic induction and Lorentz force, Steady current and Biot- Savert law, Ampere's law, Generalization of Ampere's law, Maxwell's equations; Introduction to dielectrics, Concept of Polarization; Dipole and dipole moment, Depolarization field, depolarization factors, Local electric field at an atom, Lorentz field, Lorentz relation; Dielectric constant and polarizability – Clausius Mossotti equation; Types of polarization – electronic, ionic, dipolar, space charge; Temperature and frequency dependence of dielectric constant.

UNIT-IV: Magnetism and Superconductivity
Magnetic field and Magnetization; Magnetic susceptibility, Paramagnetism, gyromagnetic ratio, Lande's g-factor, Bohr Magneton, Curie's Law, Ferromagnetism, Exchange interaction between magnetic ions; Molecular field, Expression for Curie-Weiss law, Curie temperature, hysteresis, Hard ferromagnets, soft ferromagnets, Ferrites etc. Comparison and applications;
Superconductivity- Zero resistance, Critical temperature Tc ,Perfect diamagnetism, Meissner effect, Type I and Type II superconductors, Cooper pairs and formation of superconducting gap at Fermi level, Electron-Phonon interaction and BCS theory, Isotope effect, Applications

UNIT V: Physics of Nanomaterials
Nanoscale; Properties of nanomaterials- Optical (SPR, luminescence, tuning band gap of semiconductor nanoparticles), Electrical, Magnetic, Structural, Mechanical; Brief description of different methods of synthesis of nanomaterials (physical - laser ablation, ball milling; chemical - vapor deposition, sol gel); Some special nanomaterials like, Aerogels – properties and applications, Carbon nanotubes - properties and applications, Core shell nanoparticles - properties and applications; Applications of nanomaterials: Electronics, Energy, Automobiles, Space, Medical, Textile, Cosmetics; Nanotechnology and Environment.

Text Books:

1. Kittel C., Introduction to Solid State Physics, Wiley Eastern
2. Kulkarni Sulabha K., Nanotechnology: Principles & Practices, Capitol Publishing Co
3. Berman R., Thermal Conduction in Solids, Oxford Science Publications
4. Laud B.B., Lasers and Non-Linear Optics, New Age Publications

References:

1. Callister W.C. Jr., Material Science and Engineering: An Introduction, 6th Edn., John Wiley & Sons
2. Charles P. Poole, Jr., Frank J. Owens, Introduction to Nanotechnology, Wiley Eastern
3. Kittel C., Introduction to Solid State Physics, Wiley Eastern

4. Guy K. White, Experimental Techniques in Low Temperature Physics, Oxford Science Publications
5. Dobson K., D. Grace& D. Lovett, Physics, Collins

ASHB -- Physics-II Lab
(Advanced Engineering Physics Lab)

Physics Laboratory [L : 0; T:0 ; P : 2 (1 credits)]

Choice of ten experiments from the following:

1. Determination of velocity of ultrasonic waves using ultrasonic interferometer;
2. Estimation of errors in temperature / resistance measurement using Wheatstone bridge;
3. Temperature dependence of characteristics of semiconductor laser;
4. Laser beam profile – to find beam divergence
5. Experiment on piezoelectricity – detection / determination of expansion on application of electric field
6. Determination of dielectric constant using ac or dc fields
7. Hall Effect and determination of Hall coefficient
8. Determination of energy band gap of semiconductor (diode/thermistor)
9. Characteristics of solar cell at different intensities and determination of maximum workable power
10. Newton's cooling law for Al rod and Al sheet with same mass
11. Measurement of Magneto-resistance of semiconductors
12. Ferroelectric hysteresis
13. Measurement of white noise in the resistance as a function of temperature and calibration against known thermometer and thus use a resistor as secondary noise thermometer
14. Holography – Recording and reconstruction of hologram
15. Thermal conductivity of insulator by Lee's disc method

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COURSE CODE: ASHE…	**COURSE NAME:**	L	T	P	C
	Basic Thermodynamics	3	0	0	3

Category of Course: Engineering Science Course

Pre-requisites: Basic knowledge of 10+2 level Physics

Course Objectives:

1. To be able to use Basic definitions and terminology.
2. Make calculations of heat requirements of thermal power plants and IC Engines.
3. Calculate the efficiencies and relate them to what occurs in an actual power plant.
4. Compare the performance of various cycles for energy production.

Course Outcomes:

At the end of the course, the students will be able to learn the basics of thermodynamics and apply them to solve engineering problems.

1. Use thermodynamic terminology correctly.
2. Explain fundamental thermodynamic properties.
3. Derive and discuss the first and second laws of thermodynamics.
4. Solve problems using the properties and relationships of thermodynamic fluids.
5. Analyse basic thermodynamic cycles.
6. Students must have understanding of thermodynamic fundamentals before studying their application in applied thermodynamics.
7. The understanding of thermodynamic properties and processes will assist students in other related coursework.

Course Contents:

UNIT I: Introduction of thermodynamics

System, Control Volume, Surrounding, Boundaries, Universe, Thermodynamic Equilibrium, Cycle, Reversibility, Quasi – static Process, Irreversible Process, Causes of Irreversibility – Energy in State and in Transition, Zeroth Law of Thermodynamics, Ideal Gas Scale

UNIT II: Law of Thermodynamics

Joule's Experiments – First law of Thermodynamics, Heat Engine, Heat pump, Parameters of performance, Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence / Corollaries, Carnot's principle, Carnot cycle and its specialties, Thermodynamic scale of Temperature, Clausius Inequality, Entropy, Availability and Irreversibility, Gibbs and Helmholtz Functions, Maxwell Relations.

UNIT III: Perfect Gas Laws

p-V-T- surfaces, T-S diagrams, Phase Transformations, Dryness Fraction – Clausius Clapeyron Equation, Various Thermodynamic processes and energy Transfer – Steam

Calorimetry. Perfect Gas Laws – Equation of State, specific and Universal Gas constants, Heat and Work Transfer

UNIT-IV: Deviations from perfect Gas Model
Vander Waals Equation of Stat, Mixtures of perfect Gases, Mass Fraction, Gravimetric and Volumetric Analysis – Dalto's Law of partial pressures, Avogadro's Laws of additive volumes, Enthalpy, Specific Heats and Entropy of Mixture of Perfect Gases and Vapour, Atmospheric air - Psychometric Properties, Dew point Temperature, Specific Humidity, Relative Humidity, Saturated Air, Vapour pressure, Degree of saturation

UNIT V: Power Cycles
Otto, Diesel, Dual Combustion cycles, Sterling Cycle, Atkinson Cycle, Ericsson Cycle, Joule Cycle – Description and representation on P–V and T-S diagram, Thermal Efficiency, Refrigeration Cycles- Brayton and Rankine cycles, Bell-Coleman cycle, Vapour compression cycle-performance Evaluation.

Text Books:

1. Engineering Thermodynamics / PK Nag /TMHill, 4th Edition, 2008.
2. Fundamentals of Engineering Thermodynamics , P. Yadav, Central Publishing, Allahabad, 2009.

References:

1. Fundamentals of Thermodynamics - Sonntag, Borgnakke and Van Wylen - John Wiley 2010.
2. Thermodynamics – An Engineering Approach – Yunus Cengel & Boles /TMH, New Delhi 2008.

COURSE CODE: ASHB201	COURSE NAME:	L	T	P	C
	Mathematics-III (Calculus, Differential Equations and Algebraic Structures)	2	0	0	2
Category of Course: Basic Science Courses					
Pre-requisites: Basic knowledge of single variable calculus and differential equations.					
Course Objectives: 1. To present the effective mathematical tools for the solutions of differential equations that model physical processes. 2. To introduce the tools of different multivariable calculus and algebraic structures that are used in the modeling of various engineering problems.					
Course Outcomes: At the end of the course the students should be able to 1. understand the basics of ordinary differential equations and their engineering applications. 2. get familiar with the concept of sequences, series, multivariable calculus and algebraic structures and their applications					

Course Contents:

Unit 1: Sequences and Series

Convergence of sequence and series, tests for convergence; Power series, Taylor's series.

Unit 2: Multivariable Calculus

Limit, continuity and partial derivatives, directional derivatives, total derivative.

Unit 3: First order ordinary differential equations

Exact, linear and Bernoulli's equations, Euler's equations,

Unit 4: Ordinary differential equations of higher degree and higher orders

Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

Unit 5: Algebraic Structures

Algebraic structures with one binary operation – semigroup, monoid and group. Cosets, Lagrange's theorem, normal subgroup.

Text books:

1. G. B. Thomas and R .L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002. (Unit-I,II)
2. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984. (Unit_III,IV)
3. J. P. Tremblay and R. P. Manohar, Discrete Mathematics with Applications to Computer Science, Tata McGraw-Hill, 1997. (Unit-V)

References

1. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
2. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
3. C. L. Liu, Elements of Discrete Mathematics, 2nd Ed., Tata McGraw-Hill, 2000.

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COURSE CODE: ASHH…	**COURSE NAME:**	L	T	P	C
	Effective Technical Communication	2	0	2	3
Category of Course: Humanities and Social Sciences including Management courses					
Pre-requisite: The learners should have the basic knowledge of grammar to write correct sentences.					
Course Objectives: Considering the significance of English language as a tool for academic and professional communication, the course aims to develop and enhance the linguistic and communicative competence of the learners. This course aims to train the B.Tech students in basic principles of communication and language by developing their LSRW skills, namely listening, speaking, reading and writing skills, and thereby, improving their proficiency in oral and written communication in English. During the course, the learners will be exposed to various forms of professional communication.					
Course Outcomes: At the successful completion of the course, students will be able to understand 1. How communication works and why it is important 2. Methods for speaking and presenting with confidence 3. How to share views in a professional setting 4. Techniques for writing professional business documents 5. How to interact in one-on-one or group meetings					

Course Contents:

Unit I:
Differences between technical and literary style; Different kinds of technical documents; Organization structures; Strategies for organization; Writing introduction and conclusion.

Unit II:
Organizing principles of sentences in a paragraph; Topic Sentence; Support Sentence; Closing Sentence; Recognizing incoherence and sequencing of sentences.

Unit III:
Creating coherence; Avoiding ambiguity; Hedging; Transition and Signal words.

Unit IV:

Technical writing style and language; Use of appropriate diction; Importance of proper punctuation.

Unit V:
Public speaking; Group discussion; Formal presentation; Interviews; Presentation aids; Impromptu Speech.

Text Books:

1. Raman Sharma, Technical Communications, Oxford Publication, London, 2004.
2. Sharma, R. and Mohan, K. Business Correspondence and Report Writing, TMH New Delhi 2002.

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.
3. Dale Jungk, Applied Writing for Technicians, McGraw Hill, New York, 2004.

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COURSE CODE: ASHH…	**COURSE NAME:**	L	T	P	C
	Economics for Engineers	3	0	0	3
Category of Course: Humanities and Social Sciences including Management courses					
Pre-requisite: None					

Course Objectives:

The objective of this course is to familiarize the prospective engineers with elementary principles of economics. It also deals with acquainting the students with standard concepts and tools that they are likely to find useful in their profession when employed in the firm/industry/corporation in public or private sector. It also seeks to create and awareness about the status of the current economic parameters /indicators/ policy debates. All of this is a part of the quest to help the students imbibe soft skills that will enhance their employability.

Course Outcomes:

1. After the completion of the course, learners will be able to
2. Describe the principles of economics that govern the operation of any organization under diverse market conditions
3. Comprehend macroeconomic principles and decision making in diverse business set up
4. Explain the Inflation & Price Change as well as Present Worth Analysis
5. Apply the principles of economics through various case studies

Course Contents:

Unit I: Micro-Economics

Basic concepts: What is Economics?—utility—wealth—income—consumption--savings Demand/Supply – elasticity –. Cost & Cost Control –Techniques, Types of Costs-MC, AC, TC. Revenue-MR . AR and TR. Market Structures: Perfect Competition, Monopoly and Monopolistic Competition.

Unit II: Macro-Economics

National Income-concepts of GDP, GNP, NNP, NI, PI and DI. Measurment of National Income. Inflation—causes and measures to control. Business cycle: Phases- implications

for business decision making. Role of Monetary and Fiscal policies in controlling inflation and cyclical fluctuations.

Unit III: Banking and Investment
Central Bank –Monetary Aggregates; Commercial Banks & their functions; Capital and Debt Markets. Investment Analysis – NPV, ROI, IRR, Payback Period, Depreciation, Time value of money. Business Forecasting – Elementary techniques. Statements – Cash flow, Financial. Case Study Method.

Unit IV: Indian Economy
Structure of Indian Economy: Primary, Secondary and Tertiary Sectors and their contribution to National Income. Sunrise and Sunset sectors in Indian Economy. India as Digital and Knowledge Economy. Trends in the growth of manufacturing and start-up sector.

Unit V: Current Business Environment
Trends in current national business environment and emerging challenges—Trends in current international Business environment—trends in the growth of disruptive technologies and its implications for global and national business environments.

References:

1. Mankiw Gregory N.(2002), Principles of Economics, Thompson Asia
2. V. Mote, S. Paul, G. Gupta(2004), Managerial Economics, Tata McGraw Hill
3. Misra, S.K. and Puri (2009), Indian Economy, Himalaya
4. Pareek Saroj (2003), Textbook of Business Economics, Sunrise Publishers

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COURSE CODE: ASHH…	**COURSE NAME:**	L	T	P	C
	Organizational Behaviour	3	0	0	3
Category of Course: Humanities and Social Sciences including Management courses					
Pre-requisite: None					
Course Objectives: The objective of the course is to orient the engineering students with the concepts and practical implications of Behavior, personality and attitude of individuals and groups in organization.					
Course Outcomes: After the completion of the course 1. The students will acquire the skills of understanding individual and group behavior, culture, attitude and personality. 2. The students will gain the knowledge of organizational behavior					

Course Contents:

Unit I:
Organisational Behaviour- Concept and Emergence of OB Concept; Historical Background- Hawthorne Studies, Psychological foundations; Models of Organisational Behaviour, Challenges and Opportunities for Organisational Behavior; Ethics and Organisational Behaviour.

Unit II:
Individual Behaviour: Personality, Learning, Values and Attitudes, Perception, Learning Behaviourist, cognitive and social learning; Stress at work. Management's assumptions about people- McGregor's Theory X and Theory Y.

Unit III:
Motivation - Maslow's Need Hierarchy, Herzberg's Two Factors Theory, Vroom's Expectancy Theory; Theory of Intrinsic Motivation by Ken Thomas; Work –Designing for creating motivating Jobs.

Unit IV:
Inter-personal Behaviour: Interpersonal communication and Feedback, Feedback utilisation; Transactional Analysis (TA); Johari Window. Group Behaviour: Group Dynamics, Cohesiveness and Productivity; Group Decision Making; Organisational Politics.

Unit V:
Leadership- Concept and Styles; Fielder's Contingency Model; Leadership Effectiveness; Sources, patterns, levels, and types of conflict; Traditional and modern approaches to conflict; Functional and dysfunctional conflicts; Resolution of conflict. Organisational change- resistance and management

Text Books:

Text Books:

1. Robbins, Stephen P. and Timothy A. Judge: Organisational Behaviour. Prentice -Hall, New Delhi.
2. Aswathappa, K: Organisation Behaviour. Himalaya Publishing House, New Delhi.

Reference books:

1. Singh, K: Organizational Behaviour: Text and Cases. Pearson.
2. Pareek, U. and Khanna, S: Understanding Organizational Behaviour. Oxford University Press.
3. Sharma, R. A: Organisational Theory and Behaviour. Tata McGraw -Hill Publishing Co. Ltd.
4. Sekaran, Uma: Organisational Behaviour: Text and Cases. Tata McGraw-Hill Publishing Co. Ltd.
5. Singh, B. P. and T. N. Chhabra: Organisation Theory and Behaviour. Dhanpat Rai and Co. P. Ltd., New Delhi; 2000.

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COURSE CODE: ASHH…	**COURSE NAME:**	L	T	P	C
	Managing Innovation and Entrepreneurship	3	0	0	3

Category of Course: Humanities and Social Sciences including Management courses

Course Objectives:

The objective of the course is to enable the learners

1. describe the challenges and requirements put on management, board members and share holders in different development situations
2. analyse and value different business development processes,
3. account for and value the importance of a business plan, how it is designed and applied on a technical development idea
4. plan and implement a business development project in a team
5. describe and discuss the fundamentals of intellectual property rights and legislation, value and comment its importance for companies in different development stages, particularly in companies active within biotech or natural resource management
6. reason and critically value different conditions under which an technical business idea can be developed into an innovation.

Course Outcomes:

On successful completion of the course, the learners will:

1. have knowledge of the key concepts underpinning entrepreneurship and its application in the recognition and exploitation of product/ service/ process opportunities
2. will have understanding of the key concepts underpinning innovation and the issues associated with developing and sustaining innovation within organisations
3. will be able to Apply new ideas, methods and ways of thinking

Course Contents:

Unit I: Introduction to Entrepreneurship:
Evolution of entrepreneurship from economic theory Managerial and entrepreneurial competencies. Entrepreneurial growth and development.

Unit II: Creativity and Innovation: Creativity and Innovation:
Concepts Shifting Composition of the Economy Purposeful Innovation & the 7 Sources of Innovative Opportunity; The Innovation Process. Innovative Strategies; Planning - incompatible with Innovation & entrepreneurship.

Unit III: Entrepreneurial Motivation:

Need for continuous learning & relearning Acquiring Technological Innovation Entrepreneurial motivation (nAch story) Achievement Motivation in Real life. Case Study.

Unit IV: International Entrepreneurship:
Concepts and Nature of International Entrepreneurship. The changing International environment. Ethics and International Entrepreneurship. Strategic Issues in International Entrepreneurship.

Unit V: Problem Identification and Problem Solving:
Problem Identification. Problem solving. Innovation and Diversification.

Text Books:

1. Martin, M.J., 1994, "Managing Innovation and Entrepreneurship in Technology based Firm", John Wiley.
2. Drucker, P. F. (1985), Innovation and Entrepreneurship, New York: Harper.

References

1. Christensen, C. M. and Raynor, M. E. (2003), The Innovator's Solution: Creating and Sustaining Successful Growth, Boston, MA: Harvard Business School Press.
2. Harvard Business Review on Innovation (Collection of articles), Harvard Business School Press (2001).
3. Harvard Business Review on Entrepreneurship (Collection of articles), Harvard Business School Press (1999)
4. Rogers, E.M. (2003), Diffusion of Innovations, 5th ed., New York: Simon and Schuster.
Drucker, P. F. (2000), "The Discipline of Innovation," Harvard Business Review, May, (originally published 1985, May-June, 63(3), 67-72.1

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COURSE CODE: ASHH…	COURSE NAME:	L	T	P	C
	Project Management	3	0	0	3

Category of Course: Humanities and Social Sciences including Management courses

Course Objectives:

The objectives of this course are to:

1. Make the learners understand the concepts of Project Management for planning to execution of projects.
2. Make them understand the feasibility analysis in Project Management and network analysis tools for cost and time estimation.
3. Enable them to comprehend the fundamentals of Contract Administration, Costing and Budgeting.
4. Make them capable to analyze, apply and appreciate contemporary project management tools and methodologies in Indian context.

Course Outcomes:

On completion of this course, the learners will be able to:

1.Understand project characteristics and various stages of a project.

2. Understand the conceptual clarity about project organization and feasibility analyses – Market, Technical, Financial and Economic. Execution Control.

3. Analyze the learning and understand techniques for Project planning, scheduling and Execution Control

4. Apply the risk management plan and analyse the role of stakeholders.

5. Understand the contract management, Project Procurement, Service level Agreements and productivity.

6. Understand the How Subcontract Administration and Control are practiced in the Industry.

Course Contents:

Unit I: Introduction to Project management: Characteristics of projects, Definition and objectives of Project Management, Stages of Project Management, Project Planning Process, Establishing Project organization.

Unit II: Work definition: Defining work content, Time Estimation Method, Project Cost Estimation and budgeting, Project Risk Management, Project scheduling and Planning Tools: Work Breakdown structure, LRC, Gantt charts, CPM/PERT Networks.

Unit III: Developing Project Plan (Baseline), Project cash flow analysis, Project scheduling with resource constraints: Resource Levelling and Resource Allocation. Time Cost Trade off: Crashing Heuristic.

Unit IV: Project Implementation: Project Monitoring and Control with PERT/Cost, Computers applications in Project Management, Contract Management, Project Procurement Management.

Unit V: Post-Project Analysis.

Text Books:

1. Shtub, Bard and Globerson, Project Management: Engineering, Technology, and Implementation, Prentice Hall, India
2. Horald Kerzner, Project Management: A Systemic Approach to Planning, Scheduling and Controlling, CBS Publishers, 2002.
3. John M Nicholas, Project Management for Business and Technology: Principles and Practice, Prentice Hall, India, 2002.

References:

1. Wiest and Levy, Management guide to PERT/CPM, Prentice Hall. Ibdia
2. S. Choudhury, Project Scheduling and Monitoring in Practice.
3. P. K. Joy, Total Project Management: The Indian Context, Macmillan India Ltd.
4. N. J. Smith (Ed), Project Management, Blackwell Publishing, 2002.
5. Robert K. Wysocki, Robert Back Jr. and David B. Crane, Effective Project Management, John Wiley, 2002.
6. Jack R Meredith and Samuel J Mantel, Project Management: A Managerial Approach, John Wiley, 2000.

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COURSE CODE: ASHH…	**COURSE NAME:**	L	T	P	C
	Values and Ethics	3	0	0	3

Category of Course: Humanities and Social Sciences including Management courses

Course Objectives:

In this course it is emphasized that understanding the meaning and nature of ethics, human values and holistic life for leading a good, successful and happy life through continuous examination of thoughts and conduct in day to day life. The status and responsible role of individual in abatement of value crisis in contemporary world in order to develop a civilized and human society. Understanding the process of ethical decision making through critical assessment of incidents/cases of ethical dilemmas in personal, professional and social life.

Thus it is considered necessary to view place of Ethics and Human Values in development of individual and society through identification and cross examination of life values and world view of his/her role models in society.

Course Outcomes:

After the completion of the course, the students will be able to

1. understand the concept of contemporary ethics at different levels: Individual, local and Global and enable them to cross examine the ethical and social consequences of the decisions of their life-view and world view.
2. develop the ability of students to create a balance between their individual freedom and social responsibilities and enable them to identify the personal, professional and social values and integrate them in their personality after cross examination.
3. cross examine their earlier decisions taken in life and understand the meaning of ethical dilemma to overcome the ethical dilemmas and engage in critical reflection.
4. develop positive habits of thought and conduct and work cohesively with fellow beings who have variety of strengths, experiences, shortcomings and challenges, hence to enable them to handle diverse type of personalities.
5. develop a method for making ethically sound decisions for themselves, within hostels, classrooms, university campus and society.

Course Contents:

Unit I:

Definition and classification of values: Extrinsic values, Universal and Situational values, Physical, Environmental, Sensuous, Economic, Social, Aesthetic, Moral and Religious

values.

Unit II:
Concepts related to values: Purusartha, Virtue, Right, duty, justice, Equality, Love and Good.

Unit III:
Egoism, Altruism and universalism. The Ideal of Sarvodaya and Vasudhaiva Kutumbakam.

Unit IV:
The Problem of Sustenance of value in the process of Social, Political and Technological changes.

Unit V:
The Problem of hierarchy of values and their choice, The views of Pt. Madan Mohan Malviya and Mahatma Gandhi.

Text Books:

1. Little, William, : An Introduction of Ethics (allied Publisher, Indian Reprint 1955)
2. William, K Frankena : Ethics (Prentice Hall of India, 1988)

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COURSE CODE: ASHH…	**COURSE NAME:**	L	T	P	C
	Education, Technology and Society	3	0	0	3
Category of Course: Humanities and Social Sciences including Management courses					
Pre-requisite: None					
Course Objectives: 1. To explore the various ways in which technology has and may in future affect not only the mode of delivery of education but also the very nature of education. 2. To understand the requirement of education for becoming an effective member of the society, and to fulfil the potential of a learner to the fullest without too much thought of an individual's responsibility towards the contemporary society.					
Course Outcomes: On successful completion of this course, the students will be able to integrate their technical education for betterment of society as well motivates them to lead a good human life.					

Course Contents:

Unit I:
Necessity of education for human life, Impact of education on society.

Unit II:
Nature and scope of education (Gurukul to ICT driven), Emotional intelligence Domains of learning, Approaches to learning, Learning outcomes.

Unit III:
Role of education in technology advancement.

Unit IV:
Technology and society; management of technology; technology transfer.

Unit V:
Ethical and value implications of education and technology on individual and society.

Text Books:

1. Education and Social order by Bertrand Russel
2. Theories of learning by Bower and Hilgard
3. Technology and Society by Jan L Harrington