

B. Voc. Programme
Assam University, Silchar
Detailed Syllabus 1st Year
Semester -1
(Certificate in Food Processing)

BVA-101 : Basic Mathematics

Unit 1 Concept of Sets, Relations and functions, Mathematical induction, Logarithms.

Unit 2 Linear equations, Quadratic equations, Permutation and combination, Binomial theorem

Mathematical logic.

Unit 3 Basic trigonometry, Matrices and Determinants, Boolean algebra, Functions, limit and continuity.

Unit 4 Differentiation, Application of derivatives, Indefinite integration, Definite integration, Differential equation.

Unit 5 Probability and its application, Methods of data collection, sampling and sampling methods, measurement of central tendency, mean, median, mode, standard deviation, standard error, variance.

Correlation & regression analysis, analysis of variance (ANOVA), tests of significance, t-test, z- test and f- test., Different statistical techniques and tools for industrial and research data analysis, Basic concept of optimisation and optimisation techniques.

Suggested Readings

1. Basic Higher Secondary Mathematics (Vol-1 and 2) (NCERT/CBSE)
 2. Kreyszig, E. Advanced Engineering Mathematics – (John Wiley & Sons)
 3. Thomas and Finney. Calculus and Analytical Geometry – (Narosa)
 4. Grewal, B.S. Higher Engineering Mathematics
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BVA-102 : Communication English

Unit 1 Basics of English grammar : Articles and determiners, Verbs and tenses, Concord (Subject-Verb agreement), Vocabulary building, Sentence construction, Sentence transformation and combination, Change of Voice and its application in writing and speaking, Conversion of direct and indirect speech and its application in writing and speaking.

Unit 2 Spoken English : Parts of speech and production of speech, Sounds of English consonants, vowels, diphthongs, phonetic, transcription, stress and tone

- Unit 3* Art of reading : Reading skill, Pronunciation and accent, Reading comprehension and paragraph
- Unit 4* Hands-on writing : Communication: written forms, Letter writing: Business and personal, Paragraph writing, Preparation of technical reports: Project proposal/synopsis, project report, abstract, thesis
- Unit 5* Practical exposure/Internship: Communication with groups (Project report submission) Introducing yourself, Making requests, Greeting and taking leave, Spoken communication

Suggested Readings

1. Bhaskar, W.W.S. and Prabhu, N.S. English through Reading. Vol 1 and 2. MacMillan.
 2. D'Souza, E. and Sahani, G. Communication Skills in English. Noble Publishing House.
 3. Sharma, R.C. and Mohan, K. Business Correspondence and Report Writing. McGraw Hill.
 4. Fiske, J. Introduction to Communication Studies. Rotledge.
 5. Gartside, L. Model Business Letters.
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BVAF-101 : Food Processing Operations

- Unit 1* Introduction to Food Processing: Definition, Objectives, Scope of food processing industry, Introduction to different operations employed in food processing *viz.* Milling, Boiling, Par Boiling, Steaming, Braising, Stewing, Roasting, Frying, Grilling, Baking, Microwave cooking, Fermentation, Pickling, Refining.
- Unit 2* Food Preservation I: Thermal Processing (Heat resistance of microorganisms and their spores, Thermal Death Time, Heat treatments: boiling, steam under pressure, evaporation, pasteurization, blanching, canning).
- Unit 3* Food Preservation II: Drying (Methods of drying – Dehydration by air drying, sun drying and freeze drying), Concentration Methods: Intermediate Moisture Foods, Radiations (Ultraviolet and ionizing irradiations, their effect on microorganisms, use of radiations in the processing of various foods). Chemical (Class I and Class II Preservatives).
- Unit 4* Low Temperature Processing (Low temperature storage, refrigeration and freezing), Cold chain, Large scale cold storage structures.
- Unit 5* Recent methods in Food Processing – Microwave processing, Extrusion cooking, Ohmic Heating, Reverse Osmosis, Electro dialysis, Ultra-filtration, High Pressure Processing, Super critical fluid extraction.

Suggested Readings

1. Jood and Sudesh, 2002, Food Preservation, Agrotech Publisher Academy, Udaipur.
 2. Potter, N.N., 2002, Food Science, CBS Publishers, ND.
 3. Sethi and Mohini, 2001, Food Science, CBS Publishers, ND.
 4. Srilakshmi, B., 2001, Food Science, New Age International Pvt. Ltd., ND.
 5. Mahendru, S.N., 2000, Food Additives, Tata McGraw Hills, ND.
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6. Manay, N.S., 2001, Foods: Facts & Principles, Wiley Eastern Ltd., ND.
 7. Fellows, P., 2005, Food Processing Technology: Principles & Practices, CRC Press, Woodhead Publishing Ltd., England.
 8. Chakraverty, A., 2000, Postharvest Technology of Cereals, Pulses & Oilseeds, Oxford & IBH Publishing Co. Pvt. Ltd.
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BVAF-102 : Food Processing Machineries

- Unit 1* Working principle, function, design and construction, operation and maintenance of different processing and analytical machineries and their accessories used in fruit and vegetable processing industries.
- Unit 2* Working principle, function, design and construction, operation and maintenance of different processing and analytical machineries and their accessories used in cereal, pulses and legume processing industries.
- Unit 3* Working principle, function, design and construction, operation and maintenance of different processing and analytical machineries and their accessories used in bakeries and confectionaries.
- Unit 4* Working principle, function, design and construction, operation and maintenance of different processing and analytical machineries and their accessories used in milk product and beverage industries.
- Unit 5* Working principle, function, design and construction, operation and maintenance of different processing and analytical machineries and their accessories used in plantation products (tea, coffee, cocoa) processing industries.

Suggested Readings

1. Brennam, J. G., Butters, J. R., Cowell, N. D and Lilly, A. E. I. (1990). Food Engineering Operations. Elsevier Science Pub. Co., Inc.
 2. Geankoplis, C. J. (2002). Transport Processes and Unit Operations. Prentice Hall of India, New Delhi
 3. Heldman, D. R. and Hartel, R. W. (1999). Principles of Food Processing. An Aspen Publications, USA
 4. McCabe, W.L., Smith, J. C. and Harriott, P. (1985). Unit operations of chemical Engineering. 4th Ed. McGraw -Hill Book Company, Inc.
 5. Sahay, K. M. and Singh, K. K. (2001). Unit Operations of Agricultural Processing. Vikash Publishing House Pvt. Ltd., 2nd Ed., India.
 6. Process Equipment Design, M V Joshi, V. V. Mahajan, Macmillan India Ltd., 3rd Edition, 2000.
 7. Chemical Process Equipment, selection and Design, S.M. Walas, Butterworth Heinemann series in Chemical Engineering, 3rd Edition, 2009.
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BVAF-103 : Food Product Processing, Preparation and Development

- Unit 1* Selection and processing of fruits and vegetables for the production of jam, jelly, marmalades, leather, pickles, sauce, squash, cordial, ketchup, puree, concentrates, powders etc. Minimally processed fruits and vegetables.
- Unit 2* Process of production of different bakery and confectionary products:
Breads, biscuits, cookies & crackers, cakes & pastries; doughnuts; rusks; other baked products.
Hard-boiled candies, toffees, fruit drops, chocolates and other confections.
- Unit 3* Process of production of different milk product: liquid milk products: toned, double toned products, reconstituted, recombined milk, dried and condensed milk products,

butter, cheese, Ice-cream, malted milk drinks, infant foods, fermented milk and other milk products (casein, whey proteins, lactose etc.).

Unit 4 Process of production of different fermented and non fermented beverages: Instant tea and coffee, fruit juice based beverages, milk and whey based beverages, Carbonated beverages, Packaged drinking water, Wine, Beer, Whiskey, Brandy, and Rum. Cereal Fermentation.

Unit 5 Detailed study of product, process and market, Planning and developmental activities and evaluating them. Development of prototype product and its testing for acceptance. Development of process and planning for production trials. Planning the test market. Actual production trials and test marketing. Evaluation of test results. Launching of the product. Advertising and marketing plans. Suggestions for improving success.

Suggested Readings

1. Brennam, J. G., Butters, J. R., Cowell, N. D and Lilly, A. E. I. (1990). Food Engineering Operations. Elsevier Science Pub. Co., Inc.
 2. Henderson, S. and Perry, S. M. (1976) Agricultural Process Engineering. 5th ed. AVI Publishing Co. Inc.
 3. McCabe, W.L., Smith, J. C. and Harriott, P. (1985). Unit operations of chemical Engineering. 4th Ed. McGraw -Hill Book Company, Inc.
 4. J. J. Asiedu. Processing tropical crops. ELBS Macmillan.
 5. A. Chakraverty. Post Harvest Technology of cereals, Pulses and oilseeds. 3rd Oxford IBH Publishing Co. Pvt. Ltd.
 6. D.A. Dendy and B.J. Dobraszczyk. Cereals and Cereal products: Chemistry and Technology. Aspen publishers, Maryland
 7. B. Godon and C. Williams. Primary cereal processing: A comprehensive source book
 8. B.R. Greg, A.G. Law, S.S. Viridi and J.S. Balis, Seed Processing. Avion Printers, ND.
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BVAF-104 : Food Processing Operations Lab.

1. To blanch a seasonal fruit or vegetable & assess quality of blanching process.
2. To study the effect of browning on raw fruits & vegetables.
3. To study effect of heat and acidity on milk proteins.
4. To study the effectiveness of pasteurization.
5. To study Pasteurization of milk using microwave technique.
6. To study different methods of food processing i.e. by heat, low temperature & drying of given food sample.
7. To check the shelf life of a given food at ambient temperature and under refrigeration.

Suggested Readings

1. Jood and Sudesh, 2002, Food Preservation, Agrotech Publisher Academy, Udaipur.
 2. Potter, N.N., 2002, Food Science, CBS Publishers, ND.
 3. Sethi and Mohini, 2001, Food Science, CBS Publishers, ND.
 4. Srilakshmi, B., 2001, Food Science, New Age International Pvt. Ltd., ND.
 5. Mahendru, S.N., 2000, Food Additives, Tata McGraw Hills, ND.
 6. Manay, N.S., 2001, Foods: Facts & Principles, Wiley Eastern Ltd., ND.
 7. Fellows, P., 2005, Food Processing Technology: Principles & Practices, CRC Press, Woodhead Publishing Ltd., England.
 8. Chakraverty, A., 2000, Postharvest Technology of Cereals, Pulses & Oilseeds, Oxford & IBH Publishing Co. Pvt. Ltd.
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BVAF-105 : Food Processing Machineries Lab.

1. Study and operation of various instruments and machineries used in fruit and vegetable processing.
2. Study and operation of various instruments and machineries used in cereal, pulses and legume processing.
3. Study and operation of various instruments and machineries used in bakeries and confectionaries.
4. Study and operation of various instruments and machineries used in production of different types of milk products and beverages.
5. Study and operation of various instruments and machineries used in plantation products (tea, coffee, cocoa) processing.

Suggested Readings

1. Brennam, J. G., Butters, J. R., Cowell, N. D and Lilly, A. E. I. (1990). Food Engineering Operations. Elsevier Science Pub. Co., Inc.
 2. Geankoplis, C. J. (2002). Transport Processes and Unit Operations. Prentice Hall of India, New Delhi
 3. Heldman, D. R. and Hartel, R. W. (1999). Principles of Food Processing. An Aspen Publications, USA
 4. McCabe, W.L., Smith, J. C. and Harriott, P. (1985). Unit operations of chemical Engineering. 4th Ed. McGraw -Hill Book Company, Inc.
 5. Sahay, K. M. and Singh, K. K. (2001). Unit Operations of Agricultural Processing. Vikash Publishing House Pvt. Ltd., 2nd Ed., India.
 6. Process Equipment Design, M V Joshi, V. V. Mahajan, Macmillan India Ltd., 3rd Edition, 2000.
 7. Chemical Process Equipment, selection and Design, S.M. Walas, Butterworth Heinemann series in Chemical Engineering, 3rd Edition, 2009.
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BVAF-106 : Food Product Processing, Preparation and Development Lab.

1. Preparation and analysis of jam, jelly, marmalades, leather, pickles, sauce, squash, cordial, ketchup, puree, concentrates, powders etc.
2. Preparation and analysis of Breads, biscuits, cookies & crackers, cakes & pastries; doughnuts; rusks; other baked products, hard-boiled candies, toffees, fruit drops, chocolates and other confections
3. Preparation and analysis of dried and condensed milk products, butter, cheese, Ice-cream, malted milk drinks, infant foods, fermented milk and other milk products (casein, whey proteins, lactose etc.).
4. Preparation and analysis of fruit juice based beverages, milk and whey based beverages, carbonated beverages, Packaged drinking water, Wine, Beer, Whiskey, Brandy, and Rum. Cereal Fermentation.
5. Innovative development of a product.

Suggested Readings

1. Brennam, J. G., Butters, J. R., Cowell, N. D and Lilly, A. E. I. (1990). Food Engineering Operations. Elsevier Science Pub. Co., Inc.
 2. Henderson, S. and Perry, S. M. (1976) Agricultural Process Engineering. 5th ed. AVI Publishing Co. Inc.
 3. McCabe, W.L., Smith, J. C. and Harriott, P. (1985). Unit operations of chemical Engineering. 4th Ed. McGraw -Hill Book Company, Inc.
 4. J. J. Asiedu. Processing tropical crops. ELBS Macmillan.
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5. Chakraverty. Post Harvest Technology of cereals, Pulses and oilseeds. 3rd Oxford IBH Publishing Co. Pvt. Ltd.
 6. D.A. Dendy and B.J. Dobraszczyk. Cereals and Cereal products: Chemistry and Technology. Aspen publishers, Maryland
 7. B. Godon and C. Williams. Primary cereal processing: A comprehensive source book
 8. B.R. Greg, A.G. Law, S.S. Viridi and J.S. Balis, Seed Processing. Avion Printers, ND.
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Semester -2
(Diploma in Food Processing)

BVA-201: Business Management

- Unit 1* 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* 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* 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* 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 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

Suggested Readings

1. Walter J.W.. An introduction to agri-business management
 2. Megginson, L.C., Byrd. M. J. and Meginson, W. L. Small business management: An Entrepreneur's guidebook, McGraw Hill.
 3. Truet, L.J. and Truett, D.B. Managerial Economics, John Willey and Sons.
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BVA-202 : Principles of Entrepreneurship

Unit 1 Nature, scope and importance of entrepreneurship; business ideas, source of business ideas, feasibility studies, problem solving and decision making.

Unit 2 Agricultural sector and food processing industry problems and opportunities; self employment need and entrepreneurship in agriculture and food sector.

Unit 3 Project sizing, fund management and enterprise management issues in agriculture and food entrepreneurship.

Unit 4 Entrepreneurship development policies of government in agriculture and food business.

Unit 5 Visit to entrepreneurs and report submission

Suggested Readings

1. Singh, B.P. Management Concepts & Practices, DhanpatRai& sons, NaiSarak, Delhi.
 2. Naidu, N.V.R. and Rao, K.T. 2009. Management and Entrepreneurship, I.K. International Pvt. Ltd.
 3. Eastham, J. Sharples, L. and Ball, S. 2001. Food Supply Chain Management, Elsevier Science.
 4. Dwivedi, R.S. Management – An Integrated Approach, National Publishing Co., Delhi.
 5. Small scale food entrepreneurship: A technical guide for food ventures, authored &
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BVAF-201 : Food Analysis

- Unit 1* Introduction to food analysis, types of samples and sampling techniques, storage and preservation of samples, expression of results. Proximate analysis of foods: Principles of moisture, fat, protein, carbohydrates, crude fiber and vitamins in foods.
- Unit 2* Sensory analysis of foods: overview of the sensory principles and practices, selection and screening of the sensory panel, types of panel (trained, semi trained), methodology of sensory evaluation: discriminative tests: difference tests, paired comparison, duo trio, triangle; descriptive tests.
- Unit 3* Instrumentation in food analysis: principles, types and applications of colorimetry and spectroscopy, photometry, electrophoresis; chromatography and atomic absorption spectrophotometry.
- Unit 4* Instrumentation in food analysis: color measurement in foods; X-ray analysis of foods and its applications; mass spectroscopy; nuclear magnetic resonance (NMR); differential scanning calorimetry (DSC). Refractometry and ultrasonics in food analysis; texture analysis in foods, sensory versus instrumental analysis of texture, rapid methods of microbial analysis; immunoassays methods.
- Unit 5* Various laws, guidelines and regulations associated with food analysis at national and international level.

Suggested Readings

1. Ronald S. Kirk, Ronald, Sawyer, (1991). *Pearson's Composition & Analysis of foods*, 9th Edition Longman scientific & Technical , U.K.
 2. Pomeranz , Y. & Mrloan (1978) . *Food Analysis: Theory and Practice*, Westport, connectiant : AVI .
 3. Amerine, M.A. Pangborn, R.M., and Rosseler, E.B. 1965. Principles of Sensory Evaluation of Food. Academic Press, New York.
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BVAF-202 : Basic Chemical Science and Food Chemistry

- Unit 1* **Basic Inorganic and Organic Chemistry**
Carbohydrates: Classification, structure and properties of carbohydrates. Role of carbohydrates in food industry. Sugar, starch, cellulose, glucans, hemicelluloses, gums, peptic substances, polysaccharides. Modified starch.
- Unit 2* **Lipids:** Classification and physico-chemical properties of food lipids. Refining of crude oils, hydrogenation and winterization. Vegetable and animal fat, margarine, lard, butters. Frying and shortening. Flavor changes in fats and oils, lipid oxidation, factors affecting lipid oxidation.
Proteins: Classification, structure, properties, purification and denaturation of proteins. Protein interaction and degradation, protein-protein interaction, protein-lipid complexes and protein-carbohydrate complex. Major protein systems and factors affecting them, the nature of interaction in proteins derived from milk. Egg proteins, meat proteins, fish muscle proteins, oil seed proteins and cereal proteins. Metabolic antagonist and allergens associated with food proteins. Modified protein.
- Unit 3* **Vitamins:** Role of vitamins in food industry, effect of various processing treatments and fortification of foods.
Minerals: Role of minerals in food industry, effect of various processing treatments.
- Unit 4* **Biological Changes in Food:** Plant Pigments and their role in Food Industry: Bitter

substance and tannins.

Enzymes: Nature, classification and properties of food enzyme, enzyme activity in different food systems, commercial availability. Food enzyme technology, immobilization of enzymes, removal of toxicants through enzymes, flavor production by enzymes.

Unit 5 **Browning reaction in foods:** Enzymatic and Non-Enzymatic browning in foods of vegetable and animal origin during storage and processing of foods. Single cell Protein.

Suggested Readings

1. Aurand, L.W. and Woods, A.E. 1973. Food Chemistry. AVI, Westport.
 2. Birch, G.G., Cameron, A.G. and Spencer, M. 1986. Food Science, 3rd Ed. Pergamon Press, New York.
 3. Fennema, O.R. Ed. 1976. Principles of Food Science: Part-I Food Chemistry. Marcel Dekker, New York.
 4. Meyer, L.H. 1973. Food Chemistry. East-West Press Pvt. Ltd., New Delhi.
 5. Potter, N.N. 1978. Food Science. 3rd Ed. AVI, Westport.
 7. S. Ranganna. Handbook of Analysis and Quality Control for Fruit and Vegetable Products. McGraw Hill.
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BVAF-203 : Food Analysis Lab.

1. Qualitative tests for Carbohydrates.
2. Separation of sugars by Paper Chromatography.
3. Qualitative tests for Proteins and Amino acids.
4. Quantitative test of Sugars by Anthrone method.
5. Determination of starch content from wheat flour.
6. Determination of saponification value of Lipids.
7. Starch hydrolysis by salivary amylase.
8. Estimation of Vit. C.
6. Shelf life evaluation of various food products.
9. Estimation of DNA by DPA method.
10. Estimation of RNA by orcinol method.
11. Sensory evaluation of food products. Various sensory test techniques.

Suggested Readings

1. Ronald S. Kirk, Ronald, Sawyer, (1991). *Pearson's Composition & Analysis of foods*, 9th Edition Longman scientific & Technical , U.K.
 2. Pomeranz , Y. &Mrloan (1978) . *Food Analysis: Theory and Practice*, Westport, connectiant : AVI .
 3. Amerine, M.A. Pangborn, R.M., and Rosseler, E.B. 1965. Principles of Sensory Evaluation of Food. Academic Press, New York.
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BVAF-204 : Basic Chemical Science and Food Chemistry Lab.

1. Preparation of Reagents (Standard Solutions)
2. Determination of moisture
3. Determination of protein
4. Determination of fat
5. Determination of total ash
6. Determination of crude fiber

7. Determination of carbohydrate
8. Determination of minerals.
9. Estimation of reducing, non-reducing, total sugars
10. Estimation of starch
11. Determination of ascorbic acid
12. Determination of pH and acidity of foods.

Suggested Readings

1. Aurand, L.W. and Woods, A.E. 1973. Food Chemistry. AVI, Westport.
 2. Birch, G.G., Cameron, A.G. and Spencer, M. 1986. Food Science, 3rd Ed. Pergamon Press, New York.
 3. Fennema, O.R. Ed. 1976. Principles of Food Science: Part-I Food Chemistry. Marcel Dekker, New York.
 4. Meyer, L.H. 1973. Food Chemistry. East-West Press Pvt. Ltd., New Delhi.
 5. Potter, N.N. 1978. Food Science. 3rd Ed. AVI, Westport.
 8. S. Ranganna. Handbook of Analysis and Quality Control for Fruit and Vegetable Products. McGraw Hill.
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BVAF-205 : Internship/Industrial training (Food Processing and Analysis aspects)

Students will have to undergo at least one month (or 180 hours) industrial training in the domain of food processing, food analysis or quality control aspects. After completion of the training students have to submit a training report and certificate from the industry to the department.

2nd Year

(Advanced Diploma in Food Processing)

Semester -3

BVA-301 : Basic Computer Applications

Unit 1 Introduction to Computer, Computer: Concept and reality, Basic parts: Hardware and software, Devices: Input and Output, CPU and its components, Memory: Primary and secondary

Unit 2 Software and Hardware, Introduction to software and hardware, Types of

software with explanations, Operating systems: Functions and types, DOS, Windows and Linux: differences and applications

Unit 3 MS-Office, Introduction to MS-word, Excel and PowerPoint, Different menus of MS-word, Excel and PowerPoint, Working with MS-word, Excel and PowerPoint, Application of these softwares in official activities

Unit 4 Introduction to internet, Concept, evolution, characteristics and limitations, E-mail, www, FTP, Telnet, Intranet, Extranet, Searching, uploading and downloading from internet, Hardware and software requirement for internet, Search engines, browsers, video conferencing

Unit 5 Internship: Project report submission, World Wide Web (www), Data analysis in Excel, Internet operations: Online transactions and online marketing, Using Tally for accounting.

Suggested Readings

1. Sinha, P.K & Sinha, P., Computer Fundamentals, Bpb. Publication.
 2. Dromey, R.G, How To Solve It By Computer, Phi.
 3. Microsoft Office – Complete Reference – Bpb Publication.
 4. Rajaraman. Fundamentals of Computers. Prentice Hall of India, 3rd Edition.
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BVA- 302 : Work Ethics and Values

Unit 1 Work ethics, Definition and nature, Characteristics of ethical problems in management Ethical theories; Causes of unethical behaviour; Ethical abuses; Work ethics.

Unit 2 Professional Ethics, Need and Importance, Goals, Dignity of labour, Ethical values in different professions, Management, Business, Teaching, Civil Services, Politics, Medicine, Policing, Judiciary.

Unit 3 Safety, responsibilities and rights, Safety and risk, Assessment of safety and risk, Risk benefit analysis and reducing risk, Case studies, Collegiality and loyalty, Respect for authority, collective bargaining, Confidentiality, Conflict of interest, Occupational crime, Professional rights, Employee rights, Intellectual property rights, discrimination.

Unit 4 Engineering ethics, Computer ethics, Environmental ethics, Engineers as managers, Consulting engineers and engineers as experts and advisors, Moral leadership.

Unit 5 Morals, values and ethics, Integrity, Work ethic, Service, Learning, Civic virtue, Respect for others, Living peacefully, Caring, Sharing, Honesty, Courage, Valuing time, Cooperation, Commitment, Empathy, Self-confidence, Character, Spirituality.

Suggested Readings

1. SubirChowdhury. Blending the best of the East & West. EXCEL
 2. Ghosh. Ethics & Mgmt. & Indian Ethos. VIKAS.
 3. Pherwani. Business Ethics. EPH
-

BVAF-301 : Food Microbiology

- Unit 1* **General characteristics of microorganisms:** Classification and identification of yeasts, molds and groups of bacteria important in food industry.
Source of contamination: Air, water, soil, sewage, post processing contamination.
Intrinsic and extrinsic factors influencing growth of microorganisms in foods.
Classification of foods and general principles involved in their preservation:
- Unit 2* **Effects on Microbes:** Low temperature preservation, lethal effects of chilling, freezing and thawing; high temperature preservation. Heat resistance of microorganisms, heat penetration and thermal processing. Pasteurization, sterilization, canning and dehydration; chemical preservation and its toxic effects, irradiations.
- Unit 3* **Food Fermentation:** Bacterial, yeast and mold cultures; single and mixed cultures, propagation, maintenance and evaluation of cultures; factors effecting activity of cultures, bacteriophages, residual antibiotics and chemicals.
- Unit 4* **Microbiology of Fermentation:** Fermented milks. Cereal foods, vinegar, oriental foods, alcoholic beverages.
Therapeutic value of fermented foods.
Technology of Alcoholic beverages
Food Spoilage: Spoilage of fresh and processed fruit and vegetables, spoilage of meat, fish, eggs and poultry products. Microbial toxins.
- Unit 5* **Pathogens in foods:** Microbial infections and intoxications, Growth and survival of pathogens in food.
Food borne diseases: Investigations and control.
Role of Biotechnology in Food Microbiology.
Role of Oligosaccharide in Food Microbiology
Probiotics and Prebiotics.

Suggested Reading

1. Branen A.L. and Davidson, P.M. 1983. Antimicrobials in Foods. Marcel Dekker, New York.
 2. Jay J.M. 1986. Modern Food Microbiology. 3rd Edn. VNR, New York.
 3. Robinson, R.K. Ed. 1983. Dairy Microbiology. Applied Science, London.
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BVAF-302 : Instrumentation and Advanced Food Analysis

- Unit 1* Preparation of Chemical solutions: Concept of molar, molal, and normal solutions, pH and Buffers; importance and measurement of pH.
- Unit 2* Colorimetry: Beers and Lambert's law. General principles of Colorimeters and Spectrophotometers, Photometry: Spectrofluorometers, Flame photometry: atomic absorption spectrophotometry
- Unit 3* Chromatographic Techniques: General principles. Partitions and adsorption chromatography. Paper, thin layer, gas liquid, ion exchange and affinity chromatography. Gel filtration. Introduction to high pressure liquid chromatography.
- Unit 4* Electrophoretic Techniques: General principles. Paper and Gel Electrophoresis.

Polyacrylamide Gel Electrophoresis.

Unit 5 Principle, mechanism of working and construction of thermocouple, load cell, pressure sensors, light sensors, temperature sensors. Components, mechanism and construction of various biosensors for the determination of various food components and moisture.

Suggested Readings

1. D. M. Considine. Process/Industrial instruments and Control Handbook. McGraw Hill
 2. X. Ogate. Modern control Engineering. Prentice Hall
 3. D. Patranabis. Principles of industrial Instrumentation. Tata McGraw Hill
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BVAF-303 : Food Safety and Quality Assurance

Unit 1 Objectives, importance and functions of quality control. Methods of quality, assessment of food materials-fruits, vegetables, cereals, dairy products, meat, poultry, egg and processed food products.

Unit 2 Sanitation and hygiene, GMP, GLP, Statistical quality control. Food laws and standard, PFA, AGMARK, FSSAI.

Unit 3 Sampling and specification of raw materials and finished products, Concept of Codex Alimentarius/ /USFDA/ISO 9000 series, rules and regulations for waste disposals.

Unit 4 Food adulteration and food safety, TQM, HACCP, Sensory evaluation-introduction, panel screening, Sensory and instrumental analysis in quality control, IPR and patents.

Unit 5 Major laws and regulations associated with establishment, operation and workers of food industries and plantation industries.
Industrial visit and report submission.

Suggested Readings

1. Amerine, M.A. Pangborn, R.M., and Rosseler, E.B. 1965. Principles of Sensory Evaluation of Food. Academic Press, New York.
 2. Birk, G.G., Herman, J.G. and Parker, K.J. Ed. -1977. Sensory Properties of Foods. Applied Science, London.
 3. Charalambous, G. and Inglett, G. 1981. The Quality of Foods and Beverages. (2 vol.set). Academic Press, New York.
 4. Furia, T.E. Ed. 1980. Regulatory Status of Direct Food Additives. CRC Press, Florida.
 5. Krammer, A. and Twigg, B.A. 1970. Quality Control for the Food Industry. 3rd Edn. AVI, Westport.
 6. Pattee, H.E. Ed. 1985. Evaluation of Quality of Fruits and Vegetables. AVI, Westport.
 7. Ranganna, S. 1986. Handbook of Analysis and Quality Control for Fruits and Vegetable Products. Tata McGraw Hill, New Delhi.
 8. Tannenbaum, S.R. Ed. 1979. Nutritional and Safety Aspects of Food Processing, marcel Dekker, New York.
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BVAF-304 : Food Microbiology Lab.

1. Culture media preparation,
2. sterilization and activities of microorganism;
3. Determination of microbial growth curves based on absorbance.
4. Isolation, plating and characterization of microbes, population, colony count.
5. Gram staining.
6. Antibiotic sensitivity and determination of minimum inhibitory concentration.
7. Isolation and characterization from normal and decayed food items.

8. Effect of environmental factor on growth and development of microbes.
9. Study on food fermentation processes.
10. Isolation and identification of coli forms and vibrio species.

Suggested Reading

1. Branen A.L. and Davidson, P.M. 1983. Antimicrobials in Foods. Marcel Dekker, New York.
 2. Jay J.M. 1986. Modern Food Microbiology. 3rd Edn. VNR, New York.
 3. Robinson, R.K. Ed. 1983. Dairy Microbiology. Applied Science, London.
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BVAF-305 : Instrumentation and Advanced Food Analysis Lab.

1. Preparation of different types of chemical solutions (molar, molal, normal) with different types of chemicals of different strength.
2. Preparation of buffer solutions.
3. Establishment of Beers and Lambert's law in colorimetric devices.
4. Paper, thin layer, gas liquid, ion exchange and affinity and high pressure liquid chromatography.
5. Electrophoretic separation and purification of organic compounds.
6. Observation and report submission on various types of biosensors.

Suggested Readings

1. D. M. Considine. Process/Industrial instruments and Control Handbook. McGraw Hill
 2. X. Ogate. Modern control Engineering. Prentice Hall
 3. D. Patranabis. Principles of industrial Instrumentation. Tata McGraw Hill
-

BVAF-306 : Food Safety and Quality Assurance Lab.

1. Quality assessment of food materials-fruits, vegetables, cereals, dairy products, meat, poultry, egg and processed food products by various methods.
2. Sanitation and hygiene
3. GMP, GLP
4. Statistical quality control
5. Food laws and standard
6. PFA, AGMARK, FSSAI.
7. Sampling and specification of raw materials and finished products
8. Concept of Codex Alimentarius/ /USFDA/ISO 9000 series
9. Rules and regulations for waste disposals.
10. NOS
11. Labour laws.

Suggested Readings

1. Amerine, M.A. Pangborn, R.M., and Rossler, E.B. 1965. Principles of Sensory Evaluation of Food. Academic Press, New York.
 2. Birk, G.G., Herman, J.G. and Parker, K.J. Ed. -1977. Sensory Properties of Foods. Applied Science, London.
 3. Charalambous, G. and Inglett, G. 1981. The Quality of Foods and Beverages. (2 vol.set). Academic Press, New York.
 4. Furia, T.E. Ed. 1980. Regulatory Status of Direct Food Additives. CRC Press, Florida.
 5. Krammer, A. and Twigg, B.A. 1970. Quality Control for the Food Industry. 3rd Edn. AVI, Westport.
 6. Pattee, H.E. Ed. 1985. Evaluation of Quality of Fruits and Vegetables. AVI, Westport.
 7. Ranganna, S. 1986. Handbook of Analysis and Quality Control for Fruits and Vegetable Products. Tata McGraw Hill, New Delhi.
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Semester -4

BVA-401 : Principles of Marketing and Accounts

- Unit 1* Marketing concepts, nature, scope and importance of marketing, Corporate orientation towards the market place, marketing tasks, the marketing environment scanning, Marketing mix, MIS, Marketing research – Importance, scope and steps in marketing, Research process.
- Unit 2* Consumer market and buyer behaviour, Social, cultural, personal and psychological factors affecting consumer behaviour, Maslow's theory of motivation, Buying motives, Market segmentation and market targeting.
- Unit 3* Product Concepts; New product development process, Product life cycle, Product mix strategies, Brand management, Pricing objectives, pricing policies and strategies, methods of fixing prices.
- Unit 4* Channel of distribution – Objectives of channels, Functions of channels, Retailer and wholesalers, Choice of distribution channel, Concepts of promotion- Personal selling, Sales process, Methods of sales promotion; Meaning and objectives of advertising.
- Unit 5* Marketing organization – evolution of marketing department, Organizing the marketing department, Marketing's relations with other department, New issues in marketing, Direct marketing, Consumerism, Marketing in non-profit organizations, Green marketing.

Suggested readings

1. Singh B.P., Management Concepts & Practices, Dhanpat Rai & sons, Nai Sarak, Delhi.
 2. Naidu NVR and Krishna Rao T (2009). Management and Entrepreneurship, I.K. International Pvt. Ltd.
 3. Jane Eastham, Liz Sharples & Stephen Ball (2001). Food Supply Chain Management, Elsevier Science.
 4. Dwivedi R.S. Management – An Integrated Approach, National Publishing Co., Delhi.
 5. Small scale food entrepreneurship: A technical guide for food ventures, authored & published by Northeast Centre for Food Entrepreneurship
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BVA-402 : Advanced Foundation Course

- Unit 1* Principles of custom hiring, Principles of management of land, labour, capital and investment, Repair of machines and machine management.
- Unit 2* Converting ideas into products and patents, IPR.

Unit 3 Demand and supply.

Unit 4 Basic food laws, quality standards, testing and test procedures.

Unit 5 Basic plantation labour acts, custom and central excise rules and laws, factory act, Technical, non-technical and legal aspects.

Suggested Readings

1. Jane Eastham, Liz Sharples & Stephen Ball (2001). Food Supply Chain Management, Elsevier Science.
 2. Dwivedi R.S. Management – An Integrated Approach, National Publishing Co., Delhi.
 3. Small scale food entrepreneurship: A technical guide for food ventures, authored & published by Northeast Centre for Food Entrepreneurship
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BVAF-401 : Elective-I (Students can choose any one of the following courses)

- (A) Fruit and Vegetable Processing Technology
- (B) Milk and Milk Product Technology
- (C) Meat, Fish and Poultry product Technology
- (D) Cereal, Legume and Pulses Processing Technology
- (E) Tea and Plantation Processing Technology
- (F) Technology of Bakery and Confectionery

BVAF-402 : Technical report writing and presentation on the area of industrial need

BVAF-403 : Technical report writing and presentation on the area of industrial need

Students will prepare a technical report on the assigned topic of industrial importance and the same will be presented in front of all the faculty member/industry representatives.

BVAF-404 : Internship/Industrial training (Food quality control/Food processing/ Tea processing/entrepreneurship management aspects)

Students will have to undergo at least one month (or 180 hours) industrial training in the domain of food quality control/food processing tea processing/entrepreneurship management aspects. After completion of the training students have to submit a training report and certificate from the industry to the department.

3rdYear
(B. Voc. degree in Food Processing)
Semester -5

BVA-501 : Discipline Centric Elective -I (One of the following)

- A Estimation and Costing
 - B Food Plant Design
 - C Human Resource Management
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BVA-502 : Discipline Centric Elective -II (One of the following)

- A Instrumentation and Advanced Food Analysis
 - B Fermentation and Process Control
 - C Packaging and Coating Technology
-

BVA-503 : Discipline Centric Elective -III (One of the following)

- A Industrial Waste Management
 - B Food Biotechnology
 - C Nutrition and Dietetics
-

BVA-504 : Open Elective

The student will take this course from the B.Voc. programme outside their discipline

BVA F-501 : Project in consultation with SSC and industries

A project will be undertaken by the group of students in consultation with the industry partner. The project will aim at identification of a scientific problem in the industries and development and evaluation of suitable technologies to overcome the identified problem. It can also involve the identification of the mechanization gaps and bridging the gap by development of suitable machines.

Semester -6

BVAF -601 : Internship in Industries

Each student will be undergo internship in the selected industries for 15 to 18 weeks. He has to obtain the certificate of internship from the industries. A report will be written by the student and it is presented at the end of training period.

1st Year

Semester -1

(Certificate in Farm Machinery and Power Technology)

BVA-101 : Basic Mathematics

- Unit 1* Concept of Sets, Relations and functions, Mathematical induction, Logarithms.
- Unit 2* Linear equations, Quadratic equations, Permutation and combination, Binomial theorem
Mathematical logic.
- Unit 3* Basic trigonometry, Matrices and Determinants, Boolean algebra, Functions, limit and continuity.
- Unit 4* Differentiation, Application of derivatives, Indefinite integration, Definite integration, Differential equation.
- Unit 5* Probability and its application, Methods of data collection, sampling and sampling methods, measurement of central tendency, mean, median, mode, standard deviation, standard error, variance.
Correlation & regression analysis, analysis of variance (ANOVA), tests of significance, t-test, z- test and f- test., Different statistical techniques and tools for industrial and research data analysis, Basic concept of optimisation and optimisation techniques.

Suggested Readings

1. Basic Higher Secondary Mathematics (Vol-1 and 2) (NCERT/CBSE)
 2. Kreyszig, E. Advanced Engineering Mathematics – (John Wiley & Sons)
 3. Thomas and Finney. Calculus and Analytical Geometry – (Narosa)
 4. Grewal, B.S. Higher Engineering Mathematics
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BVA-102 : Communication English

Unit 1 Basics of English grammar : Articles and determiners, Verbs and tenses, Concord (Subject-Verb agreement) , Vocabulary building, Sentence construction, Sentence transformation and combination, Change of Voice and its application in writing and speaking, Conversion of direct and indirect speech and its application in writing and speaking.

Unit 2 Spoken English : Parts of speech and production of speech, Sounds of English consonants, vowels, diphthongs, phonetic, transcription, stress and tone

Unit 3 Art of reading : Reading skill, Pronunciation and accent, Reading comprehension and paragraph

Unit 4 Hands-on writing : Communication: written forms, Letter writing: Business and personal, Paragraph writing, Preparation of technical reports: Project proposal/synopsis, project report, abstract, thesis

Unit 5 Practical exposure/Internship: Communication with groups (Project report submission) Introducing yourself, Making requests, Greeting and taking leave, Spoken communication

Suggested Readings

5. Bhaskar, W.W.S. and Prabhu, N.S. English through Reading. Vol 1 and 2. MacMillan.
 6. D'Souza, E. and Sahani, G. Communication Skills in English. Noble Publishing House.
 7. Sharma, R.C. and Mohan, K. Business Correspondence and Report Writing. McGraw Hill.
 8. Fiske, J. Introduction to Communication Studies. Rotledge.
 5. Gartside, L. Model Business Letters.
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BVAM-101 : Farm Machinery Operation and Maintenance

Unit 1 Farm mechanization, Various sources of farm power and their utilization.

Unit 2 General servicing and maintenance of machines, Inspection, Repair cycle.

Unit 3 Farm implements for tillage, sowing, intercultivation and plant protection. Working principle and operation of farm implements.

Unit 4 Working principle, operation and maintenance of power driven machines. Rotavator, Winches, Harvesting and threshing machines, Servicing and maintenance. Working principle of special equipments, sugarcane crusher, maize sheller, chaff cutter, rice sheller etc.

Unit 5 Farm implements in tea cultivation, Equipment for uprooting, land clearing, cutting of timber, field preparation for tea planting, levelling, spraying, pruning, plucking etc.

Suggested Readings

1. Jain, S.C. and Rai, C.R. 2008. Farm Tractor Maintenance and Repair. Standard Publishers Distributors, Delhi
 2. Jain, S.C. and Philip, G. 2003. Farm Machinery – An Approach. Standard Publishers Distributors, Delhi
 3. Kepner, R.A., Bainer, R. and Berger, E.L. 1978. Principles of Farm Machinery. John Wiley and Sons, New York.
 4. Srivastava, A.K., Goering, C.E., Roherbach, R.P. and Buckmaster, D.R. 2013. Engineering Principles of Agricultural Machines, 2nd edition. ASABE, St. Joseph, USA
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BVAM-102 : Basics of IC Engine, Pump Set, Electric Motor Servicing and Maintenance

Unit 1 Diesel and petrol engine, 2-stroke and 4-stroke engines, single cylinder and multi-cylinder engines, working principle, construction details, components and materials of construction.

Unit 2 Various systems of the engine, air intake and exhaust system, fuel supply, injection system, lubrication and cooling system, Servicing and maintenance.

Unit 3 Carburation system, Governing system, Engine trouble shooting; familiarisation with possible causes of troubles and their remedies.

Unit 4 Working principle, operation, servicing and maintenance of pump set, Power sources for irrigation pumps, Centrifugal, submersible pumps and their suitability to different conditions, Servicing and maintenance.

Unit 5 Working principle, operation, servicing and maintenance of electric motor, Types of electric motor and their uses, Starters and accessories, Wiring work and transmission of electric power.

Suggested Readings

1. Liljedahl, J.B., Turnquist, P.K., Smith, D.W. and Hoki, M. 1979. Tractors and their Power Units. Wiley, New York.
 2. Goering, C.E. and Hansen, A.C. 2013. Engine and Tractor Power. ASABE, USA.
 3. Srinivasan, S. 2001. Automotive Engines. Tata McGraw Hill Publishing Co. Ltd.,
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New Delhi.

4. Singh, K. 2006. Automobile Engineering. Standard Publishers Distributors, Delhi.

BVAM-103 : Repair and Maintenance Workshop Practice - I

Unit 1 Hand tools and machines required for the farm workshop, Safety and precautions, Classification of steel, Steel alloys, Cast iron, Copper, aluminium and their alloys, Market forms of steel and specifications.

Unit 2 Methods of joining metals, Temporary and permanent joints.

Unit 3 Arc and gas welding equipment, tools and accessories, Welding rods and flux, Basic electricity applicable to arc welding, Heat and temperature, Characteristics of arc, Types of oxy-acetylene flame and uses, Welding symbols, Welding processes and methods of welding various metals, Brazing and soldering, Pipe welding.

Unit 4 Forging tools, its importance and types such as tongs, swage block, anvil etc.

Unit 5 Heat treatment process Annealing, Normalizing, Tempering, Hardening, Case hardening and its importance.

Suggested Readings

1. S.K. Choudhury, A.K. Choudhury and N. Roy. Elements of Workshop Technology, Vol: I-II, Manufacturing Processes, Media Promoters & Publishers Pvt. Ltd.,
 2. W. A. J. Chapman and E. Arnold. Vol 1 and 2. Viva Low Priced Edition.
 3. B. S. Raghuvanshi. Workshop Technology. DhanpatRai and Sons.
-

BVAM-104 : Farm Machinery Operation and Maintenance Lab.

1. Collection of data regarding manufacturers of tractor, power tiller, their models and specifications.
Collection of data regarding manufacturers of engines and electric motors, and their specifications.
2. Collection of data regarding manufacturers of various farm implements, earth moving machinery, sprayers and dusters, their models and specifications.
Collection of data regarding manufacturers of rotavator, harvester, threshers and special equipment, their models and specifications.
3. Study of fuel, cooling and lubrication systems of tractor and power tiller engines.
4. Demonstration of transmission and hydraulic systems of tractors and power
5. tillers.
6. Demonstration of hitching practices of various tillage implements.

7. Demonstration of working of seed drill planters.
Demonstration of working of sprayers and dusters.
8. Demonstration of working of rotavator.
Demonstration of working of power tiller.
9. Demonstration of working of winches.
10. Demonstration of working of harvesting and threshing machines.
11. Demonstration of working of pruning and plucking machines.
Servicing and maintenance of engines and farm implements.
12. Demonstration of working of various special equipments i.e. sugarcane crusher, maize sheller, chaff cutter, rice sheller etc. at the locally available site.
Visit to rice mill or other processing industry
Visit to repair and servicing centres, and report submission.
Visit to tea estate, and report submission.

Suggested Readings

1. Jain, S.C. and Rai, C.R. 2008. Farm Tractor Maintenance and Repair. Standard Publishers Distributors, Delhi
 2. Jain, S.C. and Philip, G. 2003. Farm Machinery – An Approach. Standard Publishers Distributors, Delhi
 3. Kepner, R.A., Bainer, R. and Berger, E.L. 1978. Principles of Farm Machinery. John Wiley and Sons, New York.
 4. Srivastava, A.K., Goering, C.E., Roherbach, R.P. and Buckmaster, D.R. 2013. Engineering Principles of Agricultural Machines, 2nd edition. ASABE, St. Joseph, USA
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BVAM-105 : Basics of IC Engine, Pump Set, Electric Motor Servicing and Maintenance

Lab.

1. Identification of types of engine on various power driven machines, manufacturers of engine and engine specifications.
2. Study on engine components and materials of construction.
3. Servicing of the fuel filter.
4. Servicing of fuel injection pump.
5. Servicing of fuel injector.
6. Air Bleeding from fuel supply system.
7. Repair and maintenance of air intake and exhaust systems.
8. Practice on fuel supply, carburation and injection system servicing and
9. maintenance.

- Practice on assembling and dismantling of electric and diesel engine
10. operated centrifugal and submersible pumps.
 11. Practice on simple wiring of various electrical appliances used in farm.
 12. Rules and methods of winding of armature, stator, rotor and fields coils.
Safety precautions and measures in winding shop.

Suggested Readings

1. Liljedahl, J.B., Turnquist, P.K., Smith, D.W. and Hoki, M. 1979. Tractors and their Power Units. Wiley, New York.
 2. Goering, C.E. and Hansen, A.C. 2013. Engine and Tractor Power. ASABE, USA.
 3. Srinivasan, S. 2001. Automotive Engines. Tata McGraw Hill Publishing Co. Ltd., New Delhi.
 4. Singh, K. 2006. Automobile Engineering. Standard Publishers Distributors, Delhi.
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BVAM-106 : Repair and Maintenance Workshop Practice Lab. - I

1. Identification and applications of various hand tools and workshop machines.
2. Practice on cutting, hack sawing, marking, filing,
Practice on various types of joints in fitting, riveting, bolting etc.
3. Practice on drilling, tapping, dieing. punching, chipping
4. Setting up of arc and gas welding machines
5. Arc and gas welding practice.
6. Edge preparation and joining of various metal parts, Lap, butt, fillet and
7. corner joints, Beveling and MS plate and circular gas cutting
8. Pipe welding and flange joint
9. Repair of any machine parts by gas and arc welding process.
10. Setting up of black smithy shop
11. Practice on forging.
12. Practice on heat treatment.

Suggested Readings

1. S.K. Choudhury, A.K. Choudhury and N. Roy. Elements of Workshop Technology, Vol: I-II, Manufacturing Processes, Media Promoters & Publishers Pvt. Ltd.,
 2. W. A. J. Chapman and E. Arnold. Vol 1 and 2. Viva Low Priced Edition.
 3. B. S. Raghuwanshi. Workshop Technology. DhanpatRai and Sons.
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Semester -2
(Diploma in Farm Machinery and Power Technology)

BVA-201: Business Management

Unit 1 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 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 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 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 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

Suggested Readings

1. Walter J.W.. An introduction to agri-business management
 2. Megginson, L.C., Byrd. M. J. and Meginson, W. L. Small business management: An Entrepreneur's guidebook, McGraw Hill.
 3. Truet, L.J. and Truett, D.B. Managerial Economics, John Willey and Sons.
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BVA-202 : Principles of Entrepreneurship

Unit 1 Nature, scope and importance of entrepreneurship; business ideas, source of business ideas, feasibility studies, problem solving and decision making.

Unit 2 Agricultural sector and food processing industry problems and opportunities; self employment need and entrepreneurship in agriculture and food sector.

Unit 3 Project sizing, fund management and enterprise management issues in agriculture and food entrepreneurship.

Unit 4 Entrepreneurship development policies of government in agriculture and food business.

Unit 5 Visit to entrepreneurs and report submission

Suggested Readings

1. Singh, B.P. Management Concepts & Practices, Dhanpat Rai & sons, Nai Sarak, Delhi.
 2. Naidu, N.V.R. and Rao, K.T. 2009. Management and Entrepreneurship, I.K. International Pvt. Ltd.
 3. Eastham, J. Sharples, L. and Ball, S. 2001. Food Supply Chain Management, Elsevier Science.
 4. Dwivedi, R.S. Management – An Integrated Approach, National Publishing Co., Delhi.
 5. Small scale food entrepreneurship: A technical guide for food ventures, authored & published by Northeast Centre for Food Entrepreneurship
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BVAM-201 : Tractor and Power tiller Operation, Servicing and Maintenance

Unit 1 Mechanical power transmission system, Belt drive, chain drive and gear drive, Classification of gear trains, simple and compound gear trains, Velocity ratio, Calculation of driver and driven speeds, Gear ratio, angular and peripheral speed, Power transmission through PTO. Lubrication and lubricants, Solid, semi-solid and liquid lubricants, Properties of a good lubricant, Designation of lubricating oils, Seals and packing, Safety and precautions.

Unit 2 Components of the power transmission system of tractors and power tillers, Working principle of clutch, function, working of single and multi-plate clutch, Gear box, Differential and final drive, Servicing and maintenance, PTO drive, its position and operational control, Power transmission system of power tiller.

Unit 3 Steering system and front axle, different components of the system, Brakes, function of a brake system, Working of brake, Steering and brake systems of power tiller. Hydraulic and hitch system, different components, assemblies and controls of hydraulic system and hitch system and functions, merits of hydraulic system over mechanical system. Matching tools and machines.

Unit 4 Tyres, tubes and wheel ballasting, constructional features of pneumatic tyres,

size and ply rating, air inflation techniques; size of rims, retreading of tyres, need of ballasting.

Unit 5 Tea processing and machines used for the production of tea, Servicing and maintenance. Electrical system, different components of an electrical system and their functions.

Suggested Readings

1. Liljedahl, J.B., Turnquist, P.K., Smith, D.W. and Hoki, M. 1979. Tractors and their Power Units. Wiley, New York.
 2. Goering, C.E. and Hansen, A.C. 2013. Engine and Tractor Power. ASABE, USA.
 3. Srinivasan, S. 2001. Automotive Engines. Tata McGraw Hill Publishing Co. Ltd., New Delhi.
 4. Singh, K. 2006. Automobile Engineering. Standard Publishers Distributors, Delhi.
-

BVAM-202 : Repair and Maintenance Workshop Practice - II

Unit 1 Hand tools and machine required in the repair and servicing workshop, Timber, Seasoning of wood, Carpentry hand tools and machines, Marking tools, Saw and plane, Carpentry joints, Plywood and by-product of plywood.

Unit 2 Hand tools used in sheet metal work, Development of surfaces and related calculations, Pipe, specifications and pipe joints

Unit 3 Lathe, Types and construction of lathe, Function of parts, size and specifications, Safety and precautions, Lathe tools their angles and uses, Driving mechanism, Speed and feed mechanism, Lathe accessories, Chucks, different types of job holding devices on lathe and advantages, Coolants and cutting fluids

Unit 4 Classification, specification and general description of drilling machines, power hack saw and grinding machine, Types, shape and selection of grinding wheels, Grinding wheels balancing and dressing,. Shaping machine, Working principle and specifications, Essential features, Mechanisms to control stroke length, Automatic feed mechanism.

Unit 5 Types, construction and specifications of milling machines, Types of milling cutters and their profile, Job and tool holding devices, Methods of indexing, Cutting speed and feed for milling, Selection of milling cutters.

Suggested Readings

1. S.K. Choudhury, A.K. Choudhury and N. Roy. Elements of Workshop Technology, Vol: I-II, Manufacturing Processes, Media Promoters & Publishers Pvt. Ltd.,
 2. W. A. J. Chapman and E. Arnold. Vol 1 and 2. Viva Low Priced Edition.
 3. B. S. Raghuwanshi. Workshop Technology. DhanpatRai and Sons.
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BVAM-203 : Tractor and Power tiller Operation, Servicing and Maintenance Lab.

1. Collection of data regarding manufacturers of various lubricants, their technical specifications and applications, application of different grades of lubricating oils.
2. oils.
3. Demonstration of alignment and fitting of power drives.
Visit to tea factory, and report submission.
4. Visit to mechanised farm, KVK and farm workshops, and report submission
Familiarisation with the main components, various gauges, instruments and controls of tractors.
5. Safety in driving of tractors and road signals.
Familiarisation with the main components, various gauges, instruments and controls of power tiller
6. General cleaning, oiling and greasing of tractors and power tiller.
Checking and tightening of nuts and bolts, checking: fuel, oil, cooling systems and
7. battery checking and inflating tyres.
8. Observation of different gauges and controls for proper functioning.
9. General precautions and observations while starting running and stopping of engines.
10. Practice on driving forward and reverse.
11. Common defects and remedies of different systems of tractor and power tiller.
Repairing tyre puncture and practice in liquid tyre blasting
12. Hitching the implements.
Practice in trolley reversing.
To develop competency in reading part and service catalogue and maintenance
of log books and history sheets.
Visit to repair and servicing workshop, and report submission.
Visit to tea processing factory, and report submission.

Suggested Readings

1. Liljedahl, J.B., Turnquist, P.K., Smith, D.W. and Hoki, M. 1979. Tractors and their Power Units. Wiley, New York.
 2. Goering, C.E. and Hansen, A.C. 2013. Engine and Tractor Power. ASABE, USA.
 3. Srinivasan, S. 2001. Automotive Engines. Tata McGraw Hill Publishing Co. Ltd., New Delhi.
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BVAM-204 : Repair and Maintenance Workshop Practice Lab. - II

1. Setting up of carpentry shop and plumbing work.
2. Practice on sawing, chiseling and planing in carpentry shop.
3. Practice on joints in carpentry, mortise and tenon joint, dovetail joint.
4. Practice on pipe joints, use of nipple and sockets, Y,T,K joints, plumbing work practice.
5. Practice on the preparation of sheet metal funnel, cylinder etc. and brazing
6. / soldering
Practice on sheet metal work, Development practice of the surfaces of
7. prism, cylinder, pyramids, cones etc.,
Marking on plates for drilling practice, spot facing, counter boring, counter
8. sinking, tapping and reaming operation.
Practice on lathe machine, plain turning, taper turning, thread cutting,
9. drilling, boring, knurling, chamfering and parting off.
10. Practice on face milling, gang milling, spiral milling, gear milling
11. Practice on simple, compound, differential and angular indexing methods.
12. Practice on shaping machine.
Practice on grinding machine.

Suggested Readings

1. S.K. Choudhury, A.K. Choudhury and N. Roy. Elements of Workshop Technology, Vol: I-II, Manufacturing Processes, Media Promoters & Publishers Pvt. Ltd.,
 2. W. A. J. Chapman and E. Arnold. Vol 1 and 2. Viva Low Priced Edition.
 3. B. S. Raghuwanshi. Workshop Technology. DhanpatRai and Sons.
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BVAM-205: Training in Farm Workshops

Training in tractor and vehicle repair workshops or tractor training centres for 2-4 weeks. At the end of the training, student have to bring the certificate. They have to write the report of training and present the report of the training.

2nd Year
(Advanced Diploma in Farm Machinery and Power Technology)
Semester -3

BVA-301 : Basic Computer Applications

- Unit 1* Introduction to Computer, Computer: Concept and reality, Basic parts: Hardware and software, Devices: Input and Output, CPU and its components, Memory: Primary and secondary
- Unit 2* Software and Hardware, Introduction to software and hardware, Types of software with explanations, Operating systems: Functions and types, DOS, Windows and Linux: differences and applications
- Unit 3* MS-Office, Introduction to MS-word, Excel and PowerPoint, Different menus of MS-word, Excel and PowerPoint, Working with MS-word, Excel and PowerPoint, Application of these softwares in official activities
- Unit 4* Introduction to internet, Concept, evolution, characteristics and limitations, E-mail, www, FTP, Telnet, Intranet, Extranet, Searching, uploading and downloading from internet, Hardware and software requirement for internet, Search engines, browsers, video conferencing
- Unit 5* Internship: Project report submission, World Wide Web (www), Data analysis in Excel, Internet operations: Online transactions and online marketing, Using Tally for accounting.

Suggested Readings

1. Sinha, P.K & Sinha, P., Computer Fundamentals, Bpb. Publication.
 2. Dromey, R.G, How To Solve It By Computer, Phi.
 3. Microsoft Office – Complete Reference – Bpb Publication.
 4. Rajaraman. Fundamentals of Computers. Prentice Hall of India, 3rd Edition.
-

BVA- 302 : Work Ethics and Values

- Unit 1* Work ethics, Definition and nature, Characteristics of ethical problems in management Ethical theories; Causes of unethical behaviour; Ethical abuses; Work ethics.
- Unit 2* Professional Ethics, Need and Importance, Goals, Dignity of labour, Ethical values in different professions, Management, Business, Teaching, Civil Services, Politics, Medicine, Policing, Judiciary.
- Unit 3* Safety, responsibilities and rights, Safety and risk, Assessment of safety and risk, Risk benefit analysis and reducing risk, Case studies, Collegiality and loyalty, Respect for authority, collective bargaining, Confidentiality, Conflict of

interest, Occupational crime, Professional rights, Employee rights, Intellectual property rights, discrimination.

Unit 4 Engineering ethics, Computer ethics, Environmental ethics, Engineers as managers, Consulting engineers and engineers as experts and advisors, Moral leadership.

Unit 5 Morals, values and ethics, Integrity, Work ethic, Service, Learning, Civic virtue, Respect for others, Living peacefully, Caring, Sharing, Honesty, Courage, Valuing time, Cooperation, Commitment, Empathy, Self-confidence, Character, Spirituality.

Suggested Readings

1. SubirChowdhury. Blending the best of the East & West. EXCEL
 2. Ghosh. Ethics & Mgmt. & Indian Ethos. VIKAS.
 3. Pherwani. Business Ethics. EPH
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BVAM-301 : Tractor and their Power Units - I

Unit 1 Difference between construction of engine, other systems, body and chassis of tractor and other vehicles, diesel and petrol engines, single and multi-cylinder engines.

Unit 2 Working of tractor engine, turbo-charger, governor and other engine systems, Common troubles, repair and maintenance

Unit 3 Dismantling and assembling of engine, Wear and tear of engine components, measurement of wear, and repair.

Unit 4 Self-propelled machines used in farm and tea estates, Working, servicing and maintenance.

Unit 5 Principles of electricity supply and utilization in farm, Use of renewable sources of energy and waste recycling technologies.

Suggested Readings

1. Liljedahl, J.B., Turnquist, P.K., Smith, D.W. and Hoki, M. 1979. Tractors and their Power Units. Wiley, New York.
 2. Goering, C.E. and Hansen, A.C. 2013. Engine and Tractor Power. ASABE, USA.
 3. Srinivasan, S. 2001. Automotive Engines. Tata McGraw Hill Publishing Co. Ltd., New Delhi.
 4. Singh, K. 2006. Automobile Engineering. Standard Publishers Distributors, Delhi.
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BVAM-302 : Tea Industry Machines and Land Reclamation Machinery

Unit 1 Cultivation of tea, Land clearing, levelling, field preparation and irrigation.

Unit 2 Pruning and plucking of tea leaves, Processing of tea, Machines and their

working.

Unit 3 Principles of hydraulics and land reclamation machines used in farm and tea estates.

Unit 4 Output capacity of various machines and production of land reclamation machinery, Factors affecting the performance of machine.

Unit 5 Common troubles, remedies, repair servicing and maintenance of machines.

Suggested Readings

1. Jain, S.C. and Rai, C.R. 2008. Farm Tractor Maintenance and Repair. Standard Publishers Distributors, Delhi
 2. Jain, S.C. and Philip, G. 2003. Farm Machinery – An Approach. Standard Publishers Distributors, Delhi
 3. Kepner, R.A., Bainer, R. and Berger, E.L. 1978. Principles of Farm Machinery. John Wiley and Sons, New York.
 4. Srivastava, A.K., Goering, C.E., Roherbach, R.P. and Buckmaster, D.R. 2013. Engineering Principles of Agricultural Machines, 2nd edition. ASABE, St. Joseph, USA.
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BVAM-303 : Fabrication and Development of Farm Machinery

Unit 1 Role of fabrication in industry, Basic Trigonometric calculations, Marking of angles, triangles, square, rectangle, parallelogram, hexagon, octagon and circle, Calculation of volume and surface area,

Unit 2 Materials used in the fabrication of machine, market forms of materials, Analysis of machine into individual parts, Sketching individual parts.

Unit 3 Processes involved in the fabrication and development of machines, Tools, machines and other facilities required for the fabrication, Power sources, their selection and installation.

Unit 4 Jigs and fixtures, Development of jigs and fixtures for the large scale production of various machine parts, Enhancing productivity of labour and machine.

Unit 5 Calculation of cost of fabrication and development, Developing multiple technical skills for fabrication and development of machine in industries and farms.

Suggested Readings

1. S.K. Choudhury, A.K. Choudhury and N. Roy. Elements of Workshop Technology, Vol: I-II, Manufacturing Processes, Media Promoters & Publishers Pvt. Ltd.,
 2. W. A. J. Chapman and E. Arnold. Vol 1 and 2. Viva Low Priced Edition.
 3. B. S. Raghuwanshi. Workshop Technology. DhanpatRai and Sons.
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BVAM-304 : Tractor and their Power Units Lab. - I

1. To dismantle a single cylinder diesel engine, clean components, prepare a report on the condition of parts, suggest remedial measures, repair,
2. reassemble and test.
To dismantle a multi cylinder diesel engine of a tractor, clean components, prepare a report on the condition of parts, suggest remedial measures,
3. repair, reassemble and test.
4. Checking and adjusting of ignition timing.
5. To study and carryout the fuel injection pump timing.
To study and sketch the pneumatically operated governor mechanism of fuel
6. injection pump of a multi-cylinder pump.
To study and sketch the mechanical governor mechanism of a multi cylinder
7. fuel injection pump.
8. Engine Tuning.
9. Demonstration of cylinder relining, reboring, honing etc.
10. Practice on adjustment of engine timing during assembly.
Dismantling and assembling of engine operated farm implements, self-
11. propelled machines and industrial machines.
12. To prepare a costing and estimate statement for a repair and servicing of engine.
Visit to nearby garages and tractor workshops, report submission.

Suggested Readings

1. Liljedahl, J.B., Turnquist, P.K., Smith, D.W. and Hoki, M. 1979. Tractors and their Power Units. Wiley, New York.
 2. Goering, C.E. and Hansen, A.C. 2013. Engine and Tractor Power. ASABE, USA.
 3. Srinivasan, S. 2001. Automotive Engines. Tata McGraw Hill Publishing Co. Ltd., New Delhi.
 4. Singh, K. 2006. Automobile Engineering. Standard Publishers Distributors, Delhi.
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BVAM-305 : Tea Industry Machines and Land Reclamation Machinery Lab.

1. Demonstration of the operation of disc plow.
2. Demonstration of the operation of disc harrow
3. Demonstration of the operation of subsoiler
4. Demonstration of the operation of disc harrow and cultivator
5. Demonstration of operation of leveller
6. Demonstration of operation of winches and trolley

7. Demonstration of operation of dozer, excavator and loader
8. Visit to tea factory and observation of various tea processing machines.
9. Demonstration of dismantling and assembling of various tea processing
10. machines.
11. Demonstration of maintenance of tea rollers.
12. Demonstration of working of drip and sprinkler irrigation equipment..
Planning irrigation system for a small farm / tea estate.

Suggested Readings

1. Jain, S.C. and Rai, C.R. 2008. Farm Tractor Maintenance and Repair. Standard Publishers Distributors, Delhi
 2. Jain, S.C. and Philip, G. 2003. Farm Machinery – An Approach. Standard Publishers Distributors, Delhi
 3. Kepner, R.A., Bainer, R. and Berger, E.L. 1978. Principles of Farm Machinery. John Wiley and Sons, New York.
 4. Srivastava, A.K., Goering, C.E., Roherbach, R.P. and Buckmaster, D.R. 2013. Engineering Principles of Agricultural Machines, 2nd edition. ASABE, St. Joseph, USA.
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BVAM-306 : Fabrication and Development of Farm Machinery Lab.

1. Handling of measuring instruments, steel tape, verniercaliper, micrometer, try-square, spirit level, height gauge, bevel protractor, marking blocks.
2. Identification of the equipment and machines required for the improved cultivation practices.
3. Systematic fabrication and development of simple equipment and machines required for the improved cultivation practices.
4. Identification of the equipment and machines required for various industries.
5. Systematic fabrication and development of simple equipment and machines required for various industries.
6. Development of jigs and fixtures for the large scale production of various machine parts.
7. Calculation of cost of fabrication and development.
8. Testing of the developed machine for its use in the farm / industries.
9. Design modifications and improvement for better acceptability and adoptability.
10. Practice on the development of multiple technical skills.
11. Practice on servicing and maintenance of various machines.
12. Practice on management of a fabrication, repair or servicing centre by visit to the sites.

Suggested Readings

1. S.K. Choudhury, A.K. Choudhury and N. Roy. Elements of Workshop Technology, Vol: I-II, Manufacturing Processes, Media Promoters & Publishers Pvt. Ltd.,
 2. W. A. J. Chapman and E. Arnold. Vol 1 and 2. Viva Low Priced Edition.
 3. B. S. Raghuwanshi. Workshop Technology. DhanpatRai and Sons.
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Semester -4

BVA-401 : Principles of Marketing and Accounts

- Unit 1* Marketing concepts, nature, scope and importance of marketing, Corporate orientation towards the market place, marketing tasks, the marketing environment scanning, Marketing mix, MIS, Marketing research – Importance, scope and steps in marketing, Research process.
- Unit 2* Consumer market and buyer behaviour, Social, cultural, personal and psychological factors affecting consumer behaviour, Maslow's theory of motivation, Buying motives, Market segmentation and market targeting.
- Unit 3* Product Concepts; New product development process, Product life cycle, Product mix strategies, Brand management, Pricing objectives, pricing policies and strategies, methods of fixing prices.
- Unit 4* Channel of distribution - Objectives of channels, Functions of channels, Retailer and wholesalers, Choice of distribution channel, Concepts of promotion- Personal selling, Sales process, Methods of sales promotion; Meaning and objectives of advertising.
- Unit 5* Marketing organization – evolution of marketing department, Organizing the marketing department, Marketing's relations with other department, New issues in marketing, Direct marketing, Consumerism, Marketing in non-profit organizations, Green marketing.

Suggested readings

1. Singh B.P., Management Concepts & Practices, DhanpatRai& sons, NaiSarak, Delhi.
 2. Naidu NVRand Krishna Rao T (2009). Management and Entrepreneurship, I.K. International Pvt. Ltd.
 3. Jane Eastham, Liz Sharples& Stephen Ball (2001). Food Supply Chain Management, Elsevier Science.
 4. Dwivedi R.S. Management – An Integrated Approach, National Publishing Co., Delhi.
 5. Small scale food entrepreneurship: A technical guide for food ventures, authored &
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BVA-402 : Advanced Foundation Course

Unit 1 Principles of custom hiring, Principles of management of land, labour, capital and investment, Repair of machines and machine management.

Unit 2 Converting ideas into products and patents, IPR.

Unit 3 Demand and supply.

Unit 4 Basic food laws, quality standards, testing and test procedures.

Unit 5 Basic plantation labour acts, custom and central excise rules and laws, factory act, Technical, non-technical and legal aspects.

Suggested Readings

1. Jane Eastham, Liz Sharples & Stephen Ball (2001). Food Supply Chain Management, Elsevier Science.
 2. Dwivedi R.S. Management – An Integrated Approach, National Publishing Co., Delhi.
 3. Small scale food entrepreneurship: A technical guide for food ventures, authored & published by Northeast Centre for Food Entrepreneurship
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BVAM-401 : Tractor and their Power Units - II

Unit 1 Working principle of hydraulic system, hydraulic system components, pumps, actuators, motors, valves, hoses, Hydrostatic transmission, Tractor hydraulic system, Position and draft control.

Unit 2 Working of clutch and power transmission system of tractor and other vehicles, Types of clutches, various components and working of single and dual clutch systems, Types of gear boxes, different components; speed ratio, Functions of a differential lock, PTO drive, its position and operational control

Unit 3 Steering geometry and front axle, Types of steering gear box on different makes of tractors, hydraulic steering, Power steering, Brakes, Classification of brakes, their working with emphasis on disc brake and hydraulic brake system, Steering and brake systems of various vehicles

Unit 4 Tyres, bias ply and radial ply tyres, Complete electrical system, starting, charging, ignition and lighting circuits, Electrical system troubles and rectification measures.

Unit 5 Recent trends in tractor and vehicle system designs, Establishment of repair and servicing workshop.

Suggested Readings

1. Jain, S.C. and Rai, C.R. 2008. Farm Tractor Maintenance and Repair. Standard Publishers Distributors, Delhi
 2. Jain, S.C. and Philip, G. 2003. Farm Machinery – An Approach. Standard Publishers Distributors, Delhi
 3. Kepner, R.A., Bainer, R. and Berger, E.L. 1978. Principles of Farm Machinery. John Wiley and Sons, New York.
 4. Srivastava, A.K., Goering, C.E., Roherbach, R.P. and Buckmaster, D.R. 2013. Engineering Principles of Agricultural Machines, 2nd edition. ASABE, St. Joseph, USA.
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BVAM-402 : Drafting, Estimation and Costing

- Unit 1* Elements of estimation, Quantity and specifications of required materials, Knowledge of waste and extra material requirement, Proforma for estimation.
- Unit 2* Elements of costing, Market value of materials, Labour cost, Production cost, Overhead cost, Profit and total cost.
- Unit 3* Method of costing, proforma for costing, Billing methods and terms of payments.
- Unit 4* Cost of operation of tractor, power tiller, farm machinery and other equipments, Cost of repair, servicing and overhauling of machines.
- Unit 5* Principles of custom hiring, Cooperative farming, Establishment of custom hiring centre.

Suggested Readings

1. Singh B.P., Management Concepts & Practices, DhanpatRai& sons, NaiSarak, Delhi.
 2. Naidu NVRand Krishna Rao T (2009). Management and Entrepreneurship, I.K. International Pvt. Ltd.
 3. Jane Eastham, Liz Sharples& Stephen Ball (2001). Food Supply Chain Management, Elsevier Science.
 4. Dwivedi R.S. Management – An Integrated Approach, National Publishing Co., Delhi.
 5. Small scale food entrepreneurship: A technical guide for food ventures, authored & published by Northeast Centre for Food Entrepreneurship
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BVAM-403 : Tractor and their Power Units Lab.- II

1. Dismantling, measurement of wear and tear, and assembling of clutch
2. system,
Study on the working of various types of gear box and gear selection

3. mechanism, servicing and maintenance.
4. Servicing and maintenance of differential system, final drive and rear axle.
Dismantling, measurement of wear and tear, assembling, adjustments of
5. various types of brake system.
Dismantling, measurement of wear and tear, assembling, adjustments of
6. various types of steering system.
7. Practice on adjustment of track width of tractor.
8. Study on the working of hydraulic system of tractor.
Practice on tractor operation along with various implements like tillage and
9. PTO operated implements.
10. Practice on electrical system of tractor and other vehicles.
Dismantling, measurement of wear and tear, and assembling of power tiller
11. and other power driven farm machinery.
To prepare a costing and estimate statement for a repair and servicing of
12. tractor and other vehicles.
Visit to vehicle repair workshops, KVK and mechanized farms, and report
submission.

Suggested Readings

1. Jain, S.C. and Rai, C.R. 2008. Farm Tractor Maintenance and Repair. Standard Publishers Distributors, Delhi
 2. Jain, S.C. and Philip, G. 2003. Farm Machinery – An Approach. Standard Publishers Distributors, Delhi
 3. Kepner, R.A., Bainer, R. and Berger, E.L. 1978. Principles of Farm Machinery. John Wiley and Sons, New York.
 4. Srivastava, A.K., Goering, C.E., Roherbach, R.P. and Buckmaster, D.R. 2013. Engineering Principles of Agricultural Machines, 2nd edition. ASABE, St. Joseph, USA.
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BVAM-404 : Drafting, Estimation and Costing Lab.

1. Practice on determination of stress, strain and strength of materials.
2. Practice on the determination of shearing stresses and bending moments.
3. Practice on the selection of shafts, bearings, keys and couplings.
4. Practice on drawing in AutoCAD : Views, drawing lines, circles, polygons
5. etc.
6. Practice on drawing in AutoCAD : Array and 2-dimensional drawings
7. Practice on solid modelling.
8. Drawing various machines in AutoCAD

9. Fabrication of machines in Workshop
 10. Cost estimation of the machine.
 11. Evaluation of machines under actual use situations.
 12. Design modifications and improvements.
- Final evaluation and demonstration of equipment.

Suggested Readings

1. Singh B.P., Management Concepts & Practices, Dhanpat Rai & sons, Nai Sarak, Delhi.
 2. Naidu NVR and Krishna Rao T (2009). Management and Entrepreneurship, I.K. International Pvt. Ltd.
 3. Jane Eastham, Liz Sharples & Stephen Ball (2001). Food Supply Chain Management, Elsevier Science.
 4. Dwivedi R.S. Management – An Integrated Approach, National Publishing Co., Delhi.
 5. Small scale food entrepreneurship: A technical guide for food ventures, authored & published by Northeast Centre for Food Entrepreneurship
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BVAM-405: Training in Farm Workshops / Tea industries / Training Centres

Training in tractor and vehicle repair workshop or tea industries or tractor training centres for 2-4 weeks. At the end of the training, student have to bring the certificate. They have to write the report of training and present the report of the training.

3rdYear
(B. Voc. degree in Farm Machinery and Power Technology)
Semester -5

BVA-501 : Discipline Centric Elective -I (One of the following)

- A Renewable Sources and Energy and Utilization
- B Waste Recycling Technologies
- C Farm Electrification

BVA-502 : Discipline Centric Elective -II (One of the following)

- A Surveying and Levelling
- B Irrigation and Drainage
- C Soil and Water Conservation

BVA-503 : Discipline Centric Elective -III (One of the following)

- A Sustainable Agriculture
- B Crop Care Technologies
- C Integrated Nutrient Management

BVA-504 : Open Elective

The student will take this course from the B.Voc. programme outside their discipline

BVA M-501 : Project in consultation with SSC and industries

A project will be undertaken by the group of students in consultation with the

industry partner. The project will aim at identification of a scientific problem in the industries and development and evaluation of suitable technologies to overcome the identified problem. It can also involve the identification of the mechanization gaps and bridging the gap by development of suitable machines.

Semester -6

BVA M-601 : Internship in Industries

Each student will be undergo internship in the selected industries for 15 to 18 weeks. He has to obtain the certificate of internship from the industries. A report will be written by the student and it is presented at the end of training period.
