Bachelor of Science

B.Sc. (Food Technology)

SYLLABUS

SURAJMAL AGARWAL PRIVATE KANYA MAHAVIDYALAYA

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Credit Structure

B. Sc. Food Technology

SEMESTER – I

S. No.	Course Code	Course Title	L-T-P	Credits
1.	BFT-101/102	Elementary Biology / Elementary Mathematics	2-0-1 3-0-0	3
2.	BFT-103	Elementary Chemistry	3-0-0	3
3.	BFT-104	Introductory Microbiology	2-0-1	3
4.	BFT-105	Professional Communication & Technical Writing	2-0-0	2
5.	BFT-106	Principles of Human Nutrition	3-0-0	3
6.	BFT-107	Basic computer application	2-0-1	3
		For Elementary Biology Group	**14-0-3**	**17**
		For Elementary Mathematics Group	**15-0-2**	**17**

SEMESTER – II

S. No.	Course Code	Course Title	L-T-P	Credits
1.	BFT-201	Elements of Statistics	3-1-0	3
2.	BFT-202	Environmental Studies	2-0-1	3
3.	BFT-203	Introductory Biochemistry	2-0-1	3
4.	BFT-204	Fundamentals of Food Technology	2-0-1	3
5.	BFT-205	Analysis of Food Quality & Safety	1-0-1	2
6.	BFT-206	Food Process Equipment	2-1-0	2
		Total	**10-1-5**	**16**

SEMESTER – III

S. No.	Course Code	Course Title	L-T-P	Credits
1.	BFT-301	Food Chemistry	2-0-1	3
2.	BFT-302	Baking & Confectionery Technology	2-0-1	3
3.	BFT-303	Principles of Economics	2-0-0	2
4.	BFT-304	Technology of Dairy Products	1-0-1	2
5.	BFT-305	Processing of Cereal, Pulses & Oil seeds	2-0-1	3
6.	BFT-306	Food Laws & Legislation	2-0-0	2
		Total	**11-0-4**	**15**

SEMESTER – IV

S.No.	Course Code	Course Title	L-T-P	Credits
1.	BFT-401	Principles of Food Preservation	2-0-1	3
2.	BFT-402	Processing of Spice and Plantation Crops	2-0-1	3
3.	BFT-403	Principles of Food and Dairy Microbiology	1-0-1	2
4.	BFT-404	Technology of Meat & Poultry Products	1-0-1	2
5.	BFT-405	Food Additives & Fermented Food Products	2-0-1	3
6.	BFT-406	Processing of Marine Products	1-0-1	2
		Total	**9-0-6**	**15**
		Industrial Training – I (4 week)	0-0-10	**S/ NS***

*** S – Satisfactory, NS – Non Satisfactory**

SEMESTER – V

S. No.	Course Code	Course Title	L-T-P	Credits
1.	BFT-501	Seminar	0-0-1	1
2.	BFT-502	Food Packaging Technology	2-0-1	3
3.	BFT-503	Energy Management in Food Industries	1-0-1	2
4.	BFT-504	Fruits & Vegetable Processing	2-0-1	3
5.	BFT-505	Technology of Beverages	2-0-1	3
6.	BFT-506	Project (Project Formulation)	0-0-2	2
		Total	**9-1-6**	**14**

SEMESTER – VI

S. No.	Course Code	Course Title	L-T-P	Credits
1.	BFT-601	Marketing of Food Products	2-0-0	2
2.	BFT-602	Functional & Minimally Processed Foods	1-0-1	2
3.	BFT-603	Quality Control in Food Industry	2-0-1	3
4.	BFT-604	Food Plant Sanitation & Waste Management.	2-0-1	3
5.	BFT-605	Entrepreneurship in Food Industries	2-0-0	2
6.	BFT-606	Project (Project Execution and Report)	0-0-4	4
		Total	**9-0-7**	**16**
		Industrial Training – II (4 week)	**0-0-10**	**S/ NS***

*** S – Satisfactory, NS – Non Satisfactory**

Marks Structure

B. Sc. Food Technology

SEMESTER – I

S. No.	Course Code	Course Title	Max Marks	Remarks
1.	BFT-101/102	Elementary Biology or Elementary Mathematics	100	70 (External) 30 (Internal)
2.	BFT-103	Elementary Chemistry	100	70 (External) 30 (Internal)
3.	BFT-104	Introductory Microbiology	100	70 (External) 30 (Internal)
4.	BFT-105	Professional Communication & Technical Writing	100	70 (External) 30 (Internal)
5.	BFT-106	Principles of Human Nutrition	100	70 (External) 30 (Internal)
6.	BFT-107	Basic computer application	100	70 (External) 30 (Internal)
7.	BFT-108	Practical based on Course no. 1 & 3	100	100 (External)
8.	BFT-109	Practical based on Course no. 4 & 7	100	100 (External)
		Total	**800**	

SEMESTER – II

S. No.	Course Code	Course Title	Max Marks	Remarks
1.	BFT-201	Elements of Statistics	100	70 (External) 30 (Internal)
2.	BFT-202	Environmental Studies	100	70 (External) 30 (Internal)
3.	BFT-203	Introductory Biochemistry	100	70 (External) 30 (Internal)
4.	BFT-204	Fundamentals of Food Technology	100	70 (External) 30 (Internal)
5.	BFT-205	Analysis of Food Quality & Safety	100	70 (External) 30 (Internal)
6.	BFT-206	Food Process Equipment	100	70 (External) 30 (Internal)
7.	BFT-207	Practical based on Course no. 2 & 3	100	100 (External)
8.	BFT-208	Practical based on Course no. 4 & 5	100	100 (External)
Total			**800**	

SEMESTER – III

S. No	Course Code	Course Title	Max Marks	Remarks
1.	BFT-301	Food Chemistry	100	70 (External) 30 (Internal)
2.	BFT-302	Baking & Confectionery Technology	100	70 (External) 30 (Internal)
3.	BFT-303	Principles of Economics	100	70 (External) 30 (Internal)
4.	BFT-304	Technology of Dairy Products	100	70 (External) 30 (Internal)
5.	BFT-305	Processing of Cereals, Pulses & Oilseeds	100	70 (External) 30 (Internal)
6.	BFT-306	Food Laws & Legislations	100	70 (External) 30 (Internal)
7.	BFT-307	Practical based on Course no. 1 & 2	100	100 (External)
8.	BFT-308	Practical based on Course no. 4 & 5	100	100 (External)
		Total	**800**	

SEMESTER – IV

S. No	Course Code	Course Title	Max Marks	Remarks
1.	BFT-401	Principles of Food Preservation	100	70 (External) 30 (Internal)
2.	BFT-402	Processing of Spice & Plantation Crops	100	70 (External) 30 (Internal)
3.	BFT-403	Principles of Food and Dairy Microbiology	100	70 (External) 30 (Internal)
4.	BFT-404	Technology of Meat & Poultry Products	100	70 (External) 30 (Internal)
5.	BFT-405	Food Additives & Fermented Food Products	100	70 (External) 30 (Internal)
6.	BFT-406	Processing of Marine Products	100	70 (External) 30 (Internal)
7.	BFT-407	Practical based on Course no. 1, 2 & 3	100	100 (External)
8.	BFT-408	Practical based on Course no. 4, 5 & 6	100	100 (External)
		Industrial Training – I (4 week).		*(Non Gradial)*
		Total	**800**	

SEMESTER – V

S. No.	Course Code	Course Title	Max Marks	Remarks
1.	BFT-501	Seminar	100	100 (Internal)
2.	BFT-502	Food Packaging Technology	100	70 (External) 30 (Internal)
3.	BFT-503	Energy Management in Food Industries	100	70 (External) 30 (Internal)
4.	BFT-504	Fruits & Vegetable Processing	100	70 (External) 30 (Internal)
5.	BFT-505	Technology of Beverages	100	70 (External) 30 (Internal)
6.	BFT-506	Project (Project Formulation)	100	70 (External) 30 (Internal)
7.	BFT-507	Practical based on Course no. 2 & 3	100	100 (External)
8.	BFT-508	Practical based on Course no. 4 & 5	100	100 (External)
Total			**800**	

SEMESTER – VI

S. No.	Course Code	Course Title	Max Marks	Remarks
1.	BFT-601	Marketing of Food Products	100	70 (External) 30 (Internal)
2.	BFT-602	Functional & Minimally Processed Foods	100	70 (External) 30 (Internal)
3.	BFT-603	Quality Control in Food Industry	100	70 (External) 30 (Internal)
4.	BFT-604	Food Plant Sanitation & Waste Management.	100	70 (External) 30 (Internal)
5.	BFT-605	Entrepreneurship in Food Industries	100	70 (External) 30 (Internal)
6.	BFT-606	Project (Project Execution and Report)	100	100 (Internal)
7.	BFT-607	Practical based on Course no. 2	100	100 (External)
8.	BFT-608	Practical based on Course no. 3 & 4	100	100 (External)
		Industrial Training – II (4 week)		*(Non Gradial)*
		Total	**800**	

FIRST SEMESTER

Elementary Biology (BFT-101)

Course Code: BFT-101

Course Outline **3(2 -0 –1)**

THEORY

Life; Living and non living; Origin of Life; Oparin's abiotic theory; Evolution; Unicellular Multicellularity Complex Tissue system, Branches of Biology; Cell; Introduction Botany; History of Botany; Brief introduction of branches of Botany; Morphology; Anatomy; Taxonomy; Physiology; Palaeo Botany; Introduction Zoology: Classification of Animal kingdom; Adaptation of animals; External Morphology of Frog; Internal Anatomy of Frog, Internal organs; Different internal systems; Introduction to Lower Botany; Algae, Fungi, Bacteria, Virus; Bryophyte; Pteridophyte; Scope/Application of Biology.

PRACTICALS

1. Study of various animal kingdoms.
2. To learn the external morphology of frog.
3. To study of internal organs of frog.
4. Study of internal anatomy of frog (internal organs and internal systems).
5. To study of anatomy and taxonomy of plant cells.
6. To study of physiology of plant cells.
7. To study of Unicellular system of plants tissue.
8. study of various Algae and fungi
9. Study of various Bacteria and Viruses.
10. Study of Bryophyte and Pteridophyte.

BOOKS

1. A Textbook of Elementary Biology.By Robert John Harvey Gibson(Author) Publisher: Nabu Press
2. Introduction to Biology: An Elementary Textbook and Laboratory Guide By Maurice Alpheus Bigelow(Author),Publisher: Nabu Press
3. Elementary Botany By: George Francis Atkinson Publisher: Nabu Press
4. An elementary text-book of botany By Sydney Howard Vines

5. Elementary Studies in Botany By John Merle Coulter, Publisher: Nabu Press

Elementary Mathematics (BFT-102)

Course Code: BFT-102

Course Outline **3(3 -0 –0)**

THEORY

Algebra; Theory of quadratic equations, Binomial theorem (for positive integral index only). Uses of Natural and Common Logarithms, Exponential series, Partial Fractions, Determinants (of order three only), Theory of Matrices (Addition, Subtraction), Product of Matrices, Transpose, Elementary idea of following: adjoint, Inverse of matrices by adjoint method, Solution of linear equations, Solution of inequalities, Permutation and combination; Trigonometry; Trigonometry functions, addition and subtraction formula, Double and half angle formula, Laws of sines and cosines, Solution of triangles, Height and distances, Real and complex numbers, Hyperbolic trigonometric functions, De –Moviers theorem; Coordinate Geometry; Distance between two points, Area of triangles, Straight lines (Parallel and at right angles); Calculus; Elementary Differentiation and Integration.

BOOKS

1. Calculus and analytic geometry by Thomas and finney.
2. A text book of engineering mathematics by Bali and Lyengar.
3. Higher Engineering Mathematics by B. S. Grewal.
4. A text book of Math. By R. D. Sharma Dhanpat Rai and Company.
5. Matrix K. C. Gupta and R P Singh studentes Friends and company.
6. Vector algebra and calculus by Sharma and Sharma.

Elementary Chemistry (BFT-103)

Course Code: BFT-103

Course Outline **3 (2-0-1)**

THEORY

Historical development and importance of organic compounds. Comparison of organic and inorganic compounds, the properties of atom Bonding and electronic structure of compounds amongst themselves an with other elements Aliphatic Compounds: Hydrocarbons and their sources, Preparation properties and importance of saturated and unsaturated hydrocarbon, Halogen derivatives of hydrocarbons, Alcohols, Ethers, Aldehydes and Ketones, Acids and their derivatives and amines Cyclic Compounds: Hyrocarbons, benzene and its homologues, Halogen derivatives alcohols and phenols, Aldehyde, Ketone, acids and amines, heterocyclic compounds Heterocyclic compounds having ring systems carbohydrates introduction, classification and reactions of mono, di and polysaccharide carbohydrates Lipids: Classification and general properties of fats, oils, soaps, detergents, waxes phospholipids and sterols Amino acids and proteins: Classification, properties sources, structure and colour reactions of proteins

PRACTICALS

1. Detection of elements in organic compounds
2. Test elements
3. Detection of groups inorganic compounds
4. Test of groups inorganic compounds
5. Determination of ferrous content in supplied sample using external indicator.
6. Determine chloride content in water using Mohar's salt.
7. Determine the iron content in water sample by spectrophotometry.
8. Determine pH of solution using pH meter and pH metric titration.
9. Determination of flash point
10. Dermination of equivalent weight.

BOOKS

1. A text book of organic chemistery by Arun Bahal . S. Chand & Company Delhi.

2. Organic chemistry, Morrison and Boyd.

Introductory Microbiology (BFT-104)

Course Code: BFT-104

Course Outline **3(2-0-1)**

THEORY

Systematic study of major groups of micro-organism of importance in food industry; Principles and methods of food preservation; Food spoilage and its causes. Food in relation to diseases; Sources and types of micro-organisms of milk; Starter culture; Roll of micro-organism in the manufacture of milk and milk products. Microbial spoilage and dairy products and their control; Isolation and identification of micro-organisms involved in food spoilage; Enumeration and diagnosis of food poisoning organisms; Isolation of micro-organisms from milk and milk products and their identification; Microbiological grading of milk and milk products**.**

PRACTICALS

1. Familiarity with equipment to be used in Microbiology Laboratory.
2. Cleaning, washing and sterilization of glass wares.
3. Observation of permanent slides to study the structural characteristics of common bacteria, fungi, algae & protozoa,
4. Staining techniques,
5. Preparation and sterilization of different media types.
6. Preparation of PDA and YPSS medium
7. Inoculation of PDA and YPSS medium and harvesting
8. Studies on batch fermenter operation.
9. Harvesting and recovery of enzyme
10. Freeze-drying of enzyme

BOOKS

1. Frazier, W.C. 1988. Food Microbiology. Tata McGraw Hill.
2. Blakebrough N. Biochemical and Biological engineering Sciences.
3. Murry Moo-young. Biomass Conversion Technology.

Professional Communication & Technical Writing (BFT-105)

Course Code: BFT-105

Course Outline **2(2-0-0)**

THEORY

Reading Comprehension- Factual- formulating translating global comprehension – language- in –use in terms of synonyms, collection in context, introduction to different types of writing – descriptive – narrative and exposition letter-writing-formal and informal –speech acts-norms of preparing introductory address, presidential address, vote of thanks; Integrated grammar by means of class exercise, common errors in English writing –use of cohesive devices – dialogue practice –orientation to different types of letters-performing different speech acts according to contexts – exercise based on examination like TOEFL, GRE and GATE.

BOOKS

1. The Bachelors of Arts by R.K. Narayan.
2. Alverez, Joseph A., The Elements of technical Writing, New York: Harcourt.
3. O' Conner, J.D., Better English Pronunciation, New Delhi University Book Stall.

Principles of Human Nutrition (BFT-106)

Course Code: BFT-106

Course Outline **3(3-0-0)**

THEORY

Food, Functions of food, nutrients and non-nutrients in foods, food groups. Composition and importance of following foods: Cereals, legumes and oilseeds, Fruits and vegetables, Milk and milk products, Eggs, meat, fish and poultry, Sugar and fats Nutritional value of foods, balanced diet, meeting nutrient needs, meal planning. Physiology of nutrition, digestive system, phases of digestion and absorption, metabolism as continuous life sustaining cellular process, delivering of nutrients through circulatory and lymphatic system, excretion of waste products via several routes, body composition. Macronutrients: Building blocks and energy sources, Water- its metabolism, distribution of body water, structural and regulatory functions. Proteins and amino acids: Classification, sources, functions and requirements, nitrogen balance, Deficiency of protein. Carbohydrates: Classification, sources, functions and requirements. Lipids and fatty acids: Classification, sources, functions ad requirements. Energy sources: Dietary carbohydrates, proteins, fats and alcohol. Food energy value. Three basic types of functions of energy: Basal metabolism, physical activity and thermogenesis and factors influencing them, Energy imbalance and weight.

BOOKS

1. Christian, J. L. and Gregor, J. L. 1985. Nutrition for Living. The Benjamin. Cummings Publishing House, Inc. 600p.
2. Groff, J. L. and Gropper, S. S. 2000. Advanced Nutrition and Metabolism. Wadsworth Thompson Learning, Australia. 584p.
3. Smolin, L. A. and Grosvenor, M. B. 1999. Nutrition: Science & Applications. Saunders College Publishing, New York. 597p.
4. Stipanuk, Martha. 2006. Biochemical, Physiological and Molecular Aspects of Human Nutrition. 2nd edition. Elsevier. New York. 1232p.

Basic Computer Application (BFT-107)

Course Code: BFT-107

Course Outline **3(2-0-1)**

THEORY

Interaction with personal computer components: Processor, motherboard, storage devices, multimedia components and scanners. Server and nodes, Networking components: switches/hubs, routers, gateway, modem, VSAT Windows basics, working with MS windows XP/Vista, Desktop components. Control panel, finding files and folders, windows explorer, creating new folders, system and hardware profile. My documents and recycle bin, virus scanners Accessories: Entertainment, communications and Internet, MS office tools. Electronic documentation through MS word: Opening/creating file, saving file, document preparation, editing, formatting, page layout, spell and grammar check. Inserting header/footer, table, text box, picture and object. Hyperlinking. Security: Password. Creating presentation through Power Point: slide layout, design, template and background. Inserting movies and sound. Inserting picture. Slide show: transition and animation. MS Excel basics, work book and work sheet, cell formatting. Data entry in work sheet. Chart wizard: title, axes, gridlines, legends, date label. Analyzing data: Correlation, Standard deviation, F-test, t-test. Developing skill for database preparation Using Outlook Express for e-mail uses: mail message, import/export, send/receive, updating address book. Setup e-mail accounts, setup multiple profiles Internet basics. Configuring TCP/IIP. Web addresses (URLs), using web browsers Netscape/Internet explorer for web surfing. Using search Engines for knowledge bases. Using file transfer protocol (FTP) and Telnet. Downloading files through FTP. FTP and Telnet through web browser Creating web page (Using MS front page): basic formatting, inserting picture, linking pages, mailto. Practice on web page creation

PRACTICALS

1. Basic concept of microprocessors and DOS commands.
2. Interaction with personal computer and other networking components. Processor, motherboard, storage devices, multimedia components, printers and Scanners.

3. Working with computers operating the computer system, windows basics windows explorer navigation creating using and finding folders my documents, Recycle bin and virus scanning.
4. Preparing the digital document using MS word Opening/creating file, saving file, document preparation, editing, formatting, page layout, spell and grammar check. Inserting object.
5. Creating presentation using Power Point slide layout, design, template and background. Inserting movies and sound. Inserting picture. Slide show: transition and animation.
6. Creating work book and work sheet using MS Excel cell formatting. Data entry in work sheet. Chart wizard: title, axes, gridlines, legends, date label. Data Analyzing.
7. Internet and E-mail Browsing through URLs E-Mail ID creation and using MS outlook Express setup multiple profiles, using search engines.
8. Using FTP and Telnet downloading files accessing remote accounts.
9. Creating web pages using Front Page formatting, inserting, linking pages.

BOOKS

1. Introduction to computer science by ITL education solutions Ltd.
2. Programming with C written by K. R. Venugopal and Sudeep R. Prasad.
3. Computer Fundamentals by P. K. Singh. Introduction to Computers by Peter Norton.

SECOND SEMESTER

Elements of Statistics (BFT-201)

Course Code: BFT-201

Course Outline **3(3-1-0)**

THEORY

1. Introduction to statistics: definition, functions, uses and limitations.
2. Classification and tabulation of data; qualitative and quantitative classification, discrete and continuous variables, frequency tables, grouped and ungrouped data.
3. Diagrammatic representation of data; one, two and three dimensional diagrams with application
4. Graphical representation of data; Histogram, frequency polygon, frequency curve, ogives
5. Measures of central tendency, introduction to basic concepts of logarithms, AM, GM, HM, median, mode with merits, demerits and uses, relationship between Am, GM and HM, quartile deviation from AM, median and mode, variance, standard deviation, coefficient variation
6. Measures of dispersion; range coefficients, inter quartile range, quartile deviation, coefficient of quartile deviation, mean deviation from AM, median and mode, variance, standard deviation, coefficient variation
7. Moments; raw moments, central moments for grouped and ungrouped data, relationship raw moments and central moments
8. Measures of skewness and kutosis. Definition of symmetrical distribution, skewness and kurtosis, relationship between mean, median and mode and between quartiles for symmetrical and skewed distributions
9. Probability theory. Introduction to simple problems of permutations and combinations, definition of random experiment sample space, events, mutually exclusive and equally likely events. Definition pf probability, simple problems based on probability, addition and multiplication theorem of probability, conditional events and independent events
10. Correlation and linear regression analysis; definition of correlation its types, scatter diagrams. Karl Pearson's formula of correlation coefficients, properties

of correlation coefficient, definition of regression, regression equations of Y on X and X on Y, relationship between correlation coefficient and regression coefficients. Problems based on correlation and regression

11. Discrete and continuous probability distributions; definition of random variable, discrete and continuous random variables probability distribution of random variable, concepts of discrete and continuous probability distribution, basic concept of binomial theorem, binomial distribution, normal distribution and applications
12. Analysis of variance; definition of analysis of variance, Introduction to sampling methods; definition of population, random sample, sampling verses complete enumeration, use of random number table for selecting a simple random sample, simple random sampling with and without replacements.

Environmental Studies (BFT-202)

Course Code: BFT-202

Course Outline **3(2-0-1)**

THEORY

Definition, Scope and Importance. Ecosystem, concept of an ecosystem, structure and function of an ecosystem, Producer, consumer and decomposes, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids, Introduction, types, Characteristic features, structures and function of the following ecosystems: forest ecosystem, grassland ecosystem, desert ecosystem and aquatic ecosystem; Social Issues and the Environment: from unsustainable to sustainable development, urban problems related to energy, water conservation, rain water harvesting, watershed management, resettlement and rehabilitation of people; its problem and concerns, Case studies. Environmental ethics, Climatic change, wasteland reclamation, consumerism and waste products. Environmental Protection Act. Air (Prevention and control of pollution) act. Issues involved in enforcement of environmental legislation. Public awareness. Natural Resources: forest resources, water resources, mineral resources, food resources, energy resources, land resources. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable life style. Biodiversity and its conservation: Introduction, definition, genetic, species and ecosystem diversity. Bio geographical classification of India, Value of diversity, consumptive use, productive use, social, ethical aesthet and option values. Biodiversity at global, national and local levels. India as mega-diversity nation. Hot-spot of biodiversity. Threat to biodiversity: habitat loss, poaching of wild life, man-wild life conflicts. Endangered and endemic species of India. Conservation of biodiversity, In-situ conservation of biodiversity. Environmental Pollution: definition, Causes effect and control measures of air pollution, water pollution, soil pollution, marine pollution, noise pollution, thermal pollution, nuclear hazards. Solid waste management: causes effect and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster Management : flood, earthquake, cyclone and landslides.

PRACTICALS

1. Identification and study of different Natural resources.
2. Determination of chloride in water sample.
3. Determination of Acidity and pH in water sample.
4. Determination of Alkalinity and hardness in water sample.
5. Determination of turbidity in water sample.
6. Identification of different tools for measurement of Environmental pollution.
7. Visit of different polluted sites to assess their effect on pollution, monitoring of pollutant in ecosystem.
8. Study of simple ecosystem- ponds, rivers, hill slopes.
9. Study of common plants, insects, (Herbarium file/ insect box)
10. Visit of local polluted site-urban/ rural/ agricultural/ industrial.
11. To study the different purification of industrial effluents and wastes.

BOOKS

1. Weiner, R.F. and Matthews, R., Environmental Engineering 4^{th} edition, Butterworth Heinemann, New York
2. Gupta, K.M., Environmental Studies, Umesh Publication, Delhi

Introductory Biochemistry (BFT-203)

Course Code: BFT-203

Course Outline **3(2-0-1)**

THEORY

An elementary course dealing with the constitution of living matter with carbohydrates , lipids, proteins nucleic acids, enzymes, minerals and vitamins, hormones, metabolism of biological constituents, pH and buffer, elementary idea of molecular biology and regulation.

PRACTICALS

1. Study on constitution of living matter with carbohydrates , lipids, proteins nucleic acids, enzymes, minerals and vitamins, hormones, metabolism of biological constituents.
2. Importance of pH and Buffer in biochemistry.
3. Study on biology with special reference to molecules of living matter.
4. Determination of glycerol content of lipids.
5. identification of different chemical groups of amino acids
6. Study of ion-exchange chromatography.
7. Study of various water soluble vitamins.
8. Study of various fat soluble vitamins.
9. Determination of various Nucleic acid.

BOOKS

1. Biochemistry by S Rastogi Publisher: Tata Mcgraw Hill
2. Biochemistry (SIE) (Schaum's Outlines Series) Publisher: Tata Mcgraw Hill
3. Biochemistry: International Edition by Jeremy M. Berg John L. Tymoczko Lubert Stryer Publisher: B. I. Publications Pvt. Ltd.

Fundamentals of Food Technology (BFT-204)

Course Code: BFT-204

Course Outline **3(2-0-1)**

THEORY

Scope of food processing in India; Introduction to food processing, food preservation, food packaging, food drying and dehydration, fruit and vegetable processing, processing of meat and meat products, processing of milk and milk products, processing of marine products. Important food industries in India; role of food technology in national economy.

PRACTICALS

1. Estimation of moisture content of food materials;
2. Determination of the composition of milk (specific gravity, acidity, pH);
3. Determination of the properties of milk (Fat content, total solids);
4. Study of Food processing equipments;
5. Study of plate heat exchanger;
6. Study of tubular heat exchanger;
7. HTST pasteurization of milk;
8. Study of different packaging materials;
9. Study of Flexible packaging;
10. Determination of drying characteristics of fruits, vegetables, meat and marine products.

BOOKS

1. Fellows, P. Food Processing Technology Principles and Practices. CRC Press, Boca Raton Boston New York Washington, DC.

Analysis of Food Quality & Safety (BFT-205)

Course Code: BFT-205

Course Outline **2(1-0-1)**

THEORY

Objective, function and importance of quality control, Grades and Standards, Description of different quality control system (Codex, TQM, USFDA, BIS, HACCP, ISO 9000 series); Cleaning and sanitation, Permitted food additives; Food adulteration and food safety. Chemical changes in foods during processing. Physical and rheological properties of foods. Changes in flavor components and natural food pigments during processing and storage. Sensory evaluation methods for foods. Enzyme inhibitors; lathyrogens; goitrogens; cyanogenic glycosides; phenolics; oxalates; phytates; alkaloids; carcinogens; polycyclic aromatic hydrocarbons; allergens.

PRACTICAL

1. Estimation of proximate principles (moisture, crude fiber, total ash, crude protein and fat).
2. Estimation of iron and calcium.
3. Estimation of vitamin C.
4. Estimation of sugars in fruits, starch in cereals and dietary fiber content of foods.
5. Physical testing of grains.
6. Estimation of gluten in wheat.
7. Detection of adulterant in milk: Water and starch.
8. Detection of mineral oil and argemone oil in edible oils.
9. Detection of adulterant in spices and condiments.
10. Sensory evaluation of foods using sensory score card and hedonic scale.
11. Establish HACCP plan for a food industry.

BOOKS

1. Yeshajahu Pomeranz and Clifton E. M.. 2002. Food Analysis: Theory and Practice
2. R.D King. 1984. Developments in Food Analysis Techniques -2
3. Fox, J. 1993. Quality through design: the key to successful product development. (London: Mc Graw Hill)

Food Process Equipment (BFT-206)

Course Code: BFT-206

Course Outline **2(2-0-0)**

THEORY

Design principles and parameters for food processing equipments, selection of materials. Design handling and milling equipments, dryers, heat exchangers, Pressure vessels, Optimization of design with respect of process efficiency, Design of fluid conveyance system, Design of evaporator, vapor separator and condenser. Equipments lay out and ventilation in food processing plants, computer assisted design of a heat exchanger, dryers and a storage system.

BOOKS

1. Phirke , P. S.2004. Processing and Conveying Equipment Design. Jain Brothers , New Delhi.
2. Joshi, M.V. Process Equipment Design, 2nd Edition, Mac Millan India Limited, Delhi, 1981
3. Perry, R.H. and Chitton, C.H. Chemical Engineering' Handbook, Mcgraw Hill Kogakusha Ltd. Tokyo, 5th Edition, 1973
4. Spivakovsky, A. and Dyachkov, V., conveyors and related equipment, translated by Don Danemanis, Peace Publishers, Moscow.
5. Backhurst, J.R. and Harker, J.H., Process Plant Design, Heinmann Educational Books, London, 1973

THIRD SEMESTER

Food Chemistry (BFT-301) **3(2-0-1)**

THEORY

Physico-chemical properties of foods. Physical properties- solutions, osmotic pressure, acids, bases, pH, buffers, boiling point, freezing point, colloids, viscosity, surface tension, emulsions. Water moisture content of food, bound water. Carbohydrates - structure, cooking properties & functions of starches dextrin's, cellulose, fibers, hemicellulose, pectins, gums in different foods, function of sugar in food browning. Lipids- classification, physical characteristics, structure and functions & effect on cooking properties of lipids in foods, rancidity. Proteins- types of food proteins, physical characteristics, structures, functions and effects on cooking properties of various animal & plant proteins, denaturation properties, proteins gels, pigments and color. Role and effects of cooking on chlorophyll's, myco-globin, hemoglobin, authocyamins, flavoroids, tannins, carotenoids, quinones, xyanthones, pectins. Use of synthetic colours in food. Flavour- sensation of taste, smell, visual appearance, flavour texture of food. Flavour compounds terpeniods, flavonoids, sulphur compounds & others volatile flavour compounds and their role in sensory evaluations. Enzymes- enzymes in food processing, enzymic and non enzymic browning.

PRACTICALS

1. Proximate analysis of foods, physico-chemical properties of foods,
2. Determination of Fats and Lipids,
3. Determination of starch and carbohydrates,
4. Determination of protein content in food materials,
5. Measurement of T.S.S., conductivity, pH, acidity etc.
6. Estimation of vitamins and anti nutritional factor,
7. Estimation of reducing sugar by Nelson-somogyi method,
8. Estimation of Non –reducing sugars by Nelson-somogyi method,
9. Determination of the ash content of food sample.

BOOKS

1. Lillian Hoagland Meyer, Food Chemistry

2. Chemical, Biological, and Functional Aspects of Food Lipids, Second Edition By Anna Kolakowska, Zdzislaw Z. E. Sikorski, Anna Kolakowsk

Baking & Confectionery Technology (BFT-302)

Course Code: BFT-302

Course Outline **3(2-0-1)**

THEORY

Technology of baking; dough rheology; equipments; baking of bread; Sponge goods; biscuits and cookies; flaky pastry; pie; Danish pastry; bakery decorations; Confectionery ; cocoa and chocolate manufacture; role of ingredients and additives; stages of sugar cookery; machinery; confectionery products; packaging.

PRACTICALS

1. Determination of Rheological properties of dough;
2. Study of various viscometric devices: Rotary viscometer; Toppler and Redwood viscometer;
3. Preparation of bakery items;
4. Texture measurement of bakery items;
5. Determination of sensory properties of bakery items;
6. visit to bakery; sugar confectionery;
7. stages of sugar cooking;
8. preparation of confectionery items;
9. Visit to confectionery unit.

BOOKS

1. S. Cauvain & L. Young, Bakery Prod. Manufacture & quality, Water control & Effect
2. Kingslee, John J, A Professional Text to Bakery and Confectionary

Principle of Economics (BFT-303)

Course Code: BFT-303

Course Outline **2(2-0-0)**

THEORY

Basic terms and concepts of Economics, Meaning and nature of Micro and Macro Economics, nature and scope of Agricultural Economics, its role and importance, characteristics of factors of production, measures to improve land productivity, Government policies Labour – division of labour, problems of unemployment under employment and disguised unemployment, capital formation in agriculture, forms of business organizations, Demand - law of demand – types of supply, law of supply – factors influencing supply, elasticity of supply. Price determination under different market situations. –Government policy Characteristic features of developed and under developed economics. International trade in Agriculture – exim policy – role of W.T.O., International Trade in Agriculture. Financial institutions and their role; RBI, IDBI, IMF, NABARD, SIDBI

BOOKS

1. K.K. Dravid – Economic Theory
2. Indian economy – Rudradutt and sundaram

Technology of Dairy Products (BFT-304)

Course Code: BFT-304

Course Outline **2(1-0-1)**

THEORY

Fluid Milk: Composition of milk and factors affecting it; Physico-chemical characteristics of milk and milk constituents, production and collection, cooling and transportation of milk. Packaging ,storage and distribution of pasteurized milk: whole, standardized, toned, double toned and skim milk. Test for milk quality and adulteration; UHT processed milk, flavored, sterilized milk. Cleaning and sanitation of dairy equipments; Cream: Definition, classification and physico-chemical properties of cream; Butter: Definition, classification, composition and methods of manufacture; Ice cream: Definition, classification, composition, constituents and their role. Preparation of mixes and freezing of ice cream, over run, judging, grading and defects of ice cream; Evaporated and condensed milk : Method of manufacture, packaging and storage. Roller and spray drying of milk solids, Instantization, flow ability dustiness, reconstituability, dispersability, wettability, sinkability. Manufacture of casein, whey protein, and lactose from milk or use in formulated foods.

PRACTICALS

1. Study of various plat form test of milk.
2. Study of composition of milk and various factors affecting it.
3. Study on physico-chemical characteristics of milk, milk constituents, cream etc.
4. Centrifugal separation of milk.
5. Study of vacuum pan evaporator.
6. Spray drying of milk.
7. Study of drum dryer.
8. Visit of milk pasteurizing units.
9. Procedure to test quality of milk to check its adulteration.
10. Study of manufacturing process of cream, ice cream, butter, condensed milk.

BOOKS

1. M.R. Adams and M.O. Moss. 2007**.** Food Microbiology.

2. James M Jay. 2000**.** Modern Food Microbiology.
3. W.C. Frazier. 1968. Food Microbiology.

Processing of Cereals, Pulses & Oil Seeds (BFT-305)

Course Code: BFT-305

Course Outline **3(2-0-1)**

THEORY

Structure and Processing characteristic of Cereal grains, Legumes and oilseeds, Post harvest, Post processing practices for their safe storage, Parboiling and Milling of paddy, Quality characteristics, Curing and aging of rice, Processed rice products, Wheat and its quality characteristics of milling into flour and semolina, Flour milling, Turbo grinding and air classification, Flour grades and their suitability for baking purpose, Assessment of flour quality and characteristics, Milling of Durum wheat, Macaroni products; Ingredients, Technology and quality parameters for baked products; Bread, Biscuits and cakes; breakfast cereals, Dry and Wet milling of corn, starches and its conversion products, malting of barley, Pearling of Millets, Milling of legume-pulses by traditional and improved processes; Processing of oil seeds for direct use and consumption, Oil and protein products, Processing of extracted oil refining, hydrogenation, interestrification, Processing of deoiled cake into protein concentrates and isolates; Textured protein, Functional protein preparations, peanut butter, Margarine and Spread.

PRACTICALS

1. Experimental milling, physico-chemical tests for flour quality of wheat,
2. Rheological properties of dough, test baking, physico-chemical tests of rice and evaluation of cooking quality,
3. Performance studies on cleaning and grading equipment used in grain,
4. Milling and parboiling of paddy,
5. Determination of shelling/hulling index,
6. Dhal milling,
7. Visit to dhal mills;
8. Preparation of protein concentrates and isolates,
9. Anti-nutritional factors in pulses and extruded products.

Books

1. Chakraverty, A., Mujumdar, A. S., Raghvan, G. S. V. and Ramaswamy, H. S. 2003. Handbook of Post Harvest Technology: cereals, fruits, vegetables, tea and spices. Marcen Dekker Inc., New York

Food Laws & Legislation (BFT-306)

Course Code: BFT-306

Course Outline **2(2-0-0)**

THEORY

Concept and significance of Food Legislation, Indian Food Laws and Legislation, Prevention of Food Adulteration (PFA), Beauro of Indian Standards (BIS), Agmark, Agricultural and Processed Food Products; Export Development Authority (APEDA), FSSAI, International Standardization and Organization (ISO), Codex Alimenterius Commission(CAC), Food Laws and legislation in EU, Middle East, SAARC and ASEAN.

BOOKS

1. Nutraceutical and functional food regulations in the united states and around the world – Debasis Bagchi

FOURTH SEMESTER

Principles of Food Preservation (BFT-401)

Course Code: BFT-401

Course Outline **3(2-0-1)**

THEORY

Introduction and historical developments in food processing and preservation; General Principles in food processing ; Methods of food processing ; Principles of food preservation ; Preservation by high temperature; Preservation by low temperature; Sun drying , Dehydration, freeze drying, dehydro freezing,; Preservation by chemicals; Preservation by fermentation and irradiation; Canning, can manufacture.

PRACTICALS

1. Estimation of water activity.
2. Study of processing and preservation equipments,
3. freezing and dehydration of fruits, vegetables and meat.
4. Preservation of syrups, squashes, juices, jams, jellies and pickles.

BOOKS

1. Fellows, P. Food Processing Technology Principles and Practices. CRC Press, Boca Raton Boston New York Washington, DC.
2. Jongen, W. M. F. 2002. Fruit and Vegetable Processing: Improving quality, Woodhead Publishing Ltd, England
3. Somogayi, L. P., Ramaswamy, H. S. and Hui, Y. H. 1996. Processing Fruits: Science and Technology, Vol 1. Biology, Principles and Applications. CRC Press, Florida
4. Smith, D. S., Cash, J. N., Nip, Y. K. and Hui, Y. H. 1997. Processing vegetables: Science and Technology. Technomic Publishing Company Inc, USA.
5. Dauthy, M. E. 1995. Fruit and Vegetable Processing. Food and Agriculture Organization of the United Nations, Rome

Processing of Spice and Plantation Crops (BFT-402)

Course Code: BFT-402

Course Outline **3(2-0-1)**

THEORY

Production and processing scenario of spice, flavour & plantation crops and its scope. Major Spices: (1) Post Harvest Technology composition, processed products of following spices (2) Ginger (3) Chilli (4) Turmeric (5) Onion and garlic (6) Pepper (7) Cardamom (8) aercanut, cashew nut, coconut. Minor Spices, herbs and leafy vegetables : tea rubber and oil palm. Spartans, Processing and Utilization All spice, Annie seed, sweet Basil. Caraway seed, Cassia, Cinnamon. Clove, Coriander, cumin, Dill seed. Fern seed nutmeg, malt, mint marjoram. Rose merry, saffron, sage. Savory, Thyme, Ajowan. Asartida, curry leaves. Tea- Types, Processing, quality control. Coffee& Cocoa: Processing. Vanilla and annatto processing. Flavours of minor spices. Flavour of major spices. Spice oil and oleoresins. Flavours of soft drinks Baking and confectionery. Standards specification of spices. Functional packaging of spices and spice products.

PRACTICALS

1. Identification and characterization of flavouring compounds of spices.
2. Extraction of oil from clove, pepper, cardamom-chili.
3. Extraction of oleoresins-Turmeric, ginger, pepper, clove.
4. Piperine estimation in pepper oleoresin.
5. Steam distillation of spices.
6. Determination of curumin content in turmeric.
7. Chemical analysis of spices moisture, valuable oil, specific gravity, refractive index, acid value.
8. Study of standard specification of spices.
9. Packaging study of spices and preparation of curry powder.
10. Visit to spice Industry.

Books

1. A. Chakravarty, A.S. Majumdar, G.S.V. Raghavan & H.S. Ramaswamy Hand Book of Post Harvest Technology, Cereals, Fruits, Vegetables, Tea & Spices

2. J.S. Pruthi Minor Spices and condiments crop management and Post Harvest Technology

Principles of Food & Dairy Microbiology (BFT-403)

Course Outline **2(1-0-1)**

THEORY

Introductory concepts. Role of intrinsic and extrinsic parameter that affect microbial growth of foods. Classification of new organism, Control of microbial population. Food Spoilage. Microbiology of foods fermentation or respiration; Mechanism of energy production oxidation and substrate level phosphorylation, Fermenters type, functions design and control, Fermentation - mechanism, conditions and factors affecting fermentation;

PRACTICALS

1. Introduction to lab equipment, instruments.
2. Isolation and identification of some important food borne microorganisms,
3. Microbiological grading of milk and milk products on the basis of SPC, DMC, MBR, Coliform test and Rapid platform tests.
4. Determination of antioxidants and polyphenols
5. Characterization and activity measurement of enzymes.
6. Estimation of protein content of various milk products.
7. Determination of lipids content of various milk products .
8. Preparation and inoculation of PDA.
9. Microbial tests for food quality.
10. Advanced techniques for determining food quality (PCR, HPLC, GC).

BOOKS

1. M.R. Adams and M.O. Moss. 2007**.** Food Microbiology.
2. James M Jay. 2000**.** Modern Food Microbiology.
3. W.C. Frazier. 1968. Food Microbiology.

Technology of Meat & Poultry Products (BFT-404)

Course Code: BFT-404

Course Outline **2(1-0-1)**

THEORY

Meat and poultry industries in India – kinds of meat animals and poultry birds – pre-slaughter care – methods of stunning – slaughtering – dressing of meat and poultry – post slaughter care and post-mortem inspection – classification and quality of meat – Aging, curing smoking, canning and irradiation preservation of meat, Freezing and dehydration of meat and meat products, curing agents and additives – meat products – formed and sectioned meat – sausage products, hygiene and sanitary conditions in a meat processing plant; Formation, structure, chemical composition and nutritive value of eggs – Collection, handling, grading and quality parameters of eggs – methods of preservation of egg and their products – spoilage of egg and their products – hygiene and sanitation, regulations; Recent development in meat and poultry processing, quality processing, quality and safety control measures, Planning, Layout design consideration in meat and poultry processing unit, export regulation of meat and poultry products.

PRACTICALS

1. Experiments in slaughtering, dressing of meat.
2. To study of Curing and preservation of meat and meat products
3. To study the canning, cooking, freezing, sausage making.
4. Estimation of quality of egg.
5. Preparation of whole egg powder.
6. Study of various dehydration methods of egg.
7. Preparation of value added meat products,
8. Freezing of meat
9. Visit to meat processing industries.

BOOKS

1. J. Gracey, David Collins & Robert Huey : Meat Hygiene

Food Additives & Fermented Food Products (BFT-405)

Course Code: BFT-405

Course Outline **3(2-0-1)**

THEORY

Scope, permitted food additives, General principles for the use of food additives. GRAS and international regulatory status (FAO, WHO, WTO) of food additives, functions, types, modes of action, consequences of use, risks and benefits of food additives. Nutritional additives, preservatives, antimicrobial agents, antioxidants, emulsifiers, enzymes and acidulates, flavoring agents and flavor enhancers. Sweeteners, natural and synthetic, coloring agents; Methods used for safety evaluation, food additives and hypersensitivity, Food fermentation, stock culture and inoculum preparation. Lactic acid fermentation of milk, vegetables, cereals and meat. Alcoholic fermentation of fruit juices, sugar and starch substrates. Vinegar fermentation, mixed fermentation of cereal legumes and milk. Malting, brewing, steeping, germination, kilning and curing. Chemical and biochemical changes during malting and mashing. Separation of wort, wort boiling and hops addition. Fermentation, separation, maturation, carbonation and packaging.

PRACTICALS

1. Study of properties and characteristics of different food additives,
2. Study of various chemical and organic preservatives,
3. Study of antimicrobial agents, antioxidants, in processed food,
4. Study of emulsifiers agent in processed food,
5. Enzymes and acidulates, flavoring agents and flavor enhancers.
6. Study of Sweeteners, natural and synthetic,
7. Determination Food colours and food additives
8. Study of BIS, FPO, Codex standards and specifications..
9. Lactic acid fermentation.and Alcoholic fermentation of fruit juices.

10. Acetic acid fermentation and alkaline fermentation.
11. Barley steeping and Germination, malting mashing and brewing.
12. To study the Physico-chemical changes in food during fermentation.
13. Preparation of fermented milk products (Curd and Yogurt).

BOOKS

1. Alfred Larry Branen, 1. CRC Press, Cleveland.
2. Rao, D.G. 2005 Introduction to Biochemical Engineering, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
3. Bailey, J.E. and Ollis, D.V. 1994 Biochemical Engineering Fundamentals, McGraw-Hill book Company, New Delhi

Processing of Marine Products (BFT-406)

Course Code: BFT-406

Course Outline **2(1-0-1)**

THEORY

Importance of fisheries, Classification of aquatic animals; Composition and Nutritional Quality of Fish; Transportation and storage of fish; Unit operations in fish processing, preservation by curing, chilling and freezing of fish, drying, fish products, canning of fish products, modified atmosphere packaging of fish and fish products; HACCP and quality assurance of sea food.

PRACTICALS

1. To study the drying behavior of fish and fish products.
2. To determine the physical properties of fish.
3. To determine the composition of fish and fish products.
4. To study the nutritional quality of fish.
5. To study the self life of the fish using different containers.
6. To study the storage behavior of the fish.
7. To study the preservation of fish by chilling and freezing.
8. Drying of fish.
9. Canning of Fish.
10. To study the quality control measures in fish processing

BOOKS

1. N.C. Flemming, S. Vallerga, N. Pinardi: Opertional Oceanography, Elsevier Publications
2. Principles of Aseptic Processing and Packing by Philip E. Nelson
3. Food packing and Shelf Life: A Practical Guide by Gordon L. Robertson

FIFTH SEMESTER

BFT-501 Seminar

Food Packaging Technology (BFT-502)

Course Code: BFT-502

Course Outline **3(2-0-1)**

THEORY

Principles of food packaging, Functions of food packaging, Packaging types, Chemical and physical properties of package materials, interaction between package and food, selection and evaluation of packaging materials and systems, package design criteria, printing, computers application in packaging, Symbols used in package and labels, Corrosion, waste engineering, CIP systems.

PRACTICALS

1. Estimation of shelf life of fresh and preserved food using various packages such a metal container, glass container and flexible packages;
2. Determination permeability of different plastic films;
3.
4. Determination of Thickness, substance weight of packaging materials
5. Determination of Strength properties of packaging materials
6. Estimation of protection against micro-organisms in various food packages; Identification of plastic films.
7. Determination of Water vapour and gas transmission rate of flexible packaging materials
8. Determination of water absorption capability of flexible packaging materials
9. Study of Packaging of fruits/vegetables;
10. Study and identification and chemical resistance of plastic films
11. Estimation of shelf-life of packaged food.

BOOKS

1. Robertson G. L. 2005. Food Packaging: Principles and Practice. Marcel Dekker, New York, Basel, and Hong Kong. 2nd edition.
2. Food Packaging by Standey Sacharow and Roger c. Griffin
3. Blakistone B. A. 1999. Principle and Application of Modified Atmospheric packaging of Foods, ASPEN publication, Chapman & Hall, New York

Energy Management in Food Industries (BFT-503)

Course Code: BFT-503

Course Outline **2(1-0-1)**

THEORY

Energy: Basic concepts, energy sources, renewable and non renewable, energy auditing, management of energy sources, efficiency and utilization, solar energy, drying of agricultural food products, water heating, solar distillation, power generation through photovoltaic system, fuel efficiency and performance of furnaces. Biomass gasification, application in food industry; Heat energy recovery and waste heat utilization, energy from vegetable and municipal solid waste, wind energy for pumping and electrics power generation.

PRACTICALS

1. Study of solar dryer and solar stills and its comparative performance.
2. To study various solar distillation plants, solar water heaters and its efficiencies.
3. Study of various types of solar photovoltaic cells and design of solar based electrical systems.
4. Study of various types of gasifies, bio-mass gasifies and efficiencies.
5. Study of various types of solid waste management systems, its cost economics and efficiency.
6. Determining the efficiency of various types of wind turbines and energy generators.
7. Energy audit study and management strategies in food processing plants.
8. Identification of energy efficient processing machines and visit to related food processing industry.

BOOKS

1. Handbook of water and energy management in food processing, Edited by J Klemes and R Smith and J-K Kim, Woodhead Publishing June 2008
2. Pimental D. 1980. *Handbook of Energy Utilization in Agriculture*. CRC Press.
3. Rai GD. 1998. *Non-conventional Sources of Energy*. Khanna Publ.
4. Twindal JW & Anthony D Wier 1986. *Renewable Energy Sources*. E & F. N. Spon Ltd.
5. Verma SR, Mittal JP & Surendra Singh. 1994. *Energy Management and Conservation in Agricultural Production and Food Processing*. USG Publ. & Distr., Ludhiana.

Fruits & Vegetable Processing (BFT-504)

Course Code: BFT-504

Course Outline **3(2-0-1)**

THEORY

Unit operations; receiving, washing, grading, peeling, size reduction, blanching, sulphiting / sulphuring, syruping/brining, exhausting, processing and packaging; Processing technology of the manufacture of new products from fruits and vegetables; beverages, preserved, sauces, pickles, soups and others; Preservation technologies; Packaging requirements; Spoilage of processed fruits, vegetables and their control; Nutritional evaluation of processed foods; Plant layout and hygiene; Fruit and vegetable plant layout, design, personal hygiene, plant sanitation and waste disposal; Quality control in fruits and vegetables processing industry.

PRACTICALS

1. Equipment for fruits and vegetable processing
2. Plant-layout of food processing industry.
3. Can seaming operation.
4. Preparation of fruit juices, squashes, syrups and ready to served beverages.
5. Canning of fruits and vegetable.
6. Preparation of jams, jellies, marmalade, preserved, and candies.
7. Preparation of pickles, chutneys, and tomato products.
8. Drying of fruits and vegetables, quality control of processed products.
9. Visit to fruit and vegetable processing factories.
10. Freezing of foods and Processing of mushroom.

BOOKS

1. Verma, L. R. and Joshi, V. K. 2000. Post Harvest Technology of Fruits and Vegetables: Handling, Processing, Fermentation and Waste Management. Indus Publishing Company, New Delhi

2. Chakraverty, A., Mujumdar, A. S., Raghvan, G. S. V. and Ramaswamy, H. S. 2003. Handbook of Post Harvest Technology: cereals, fruits, vegetables, tea and spices. Marcen Dekker Inc., New York
3. Jongen, W. M. F. 2002. Fruit and Vegetable Processing: Improving quality, Woodhead Publishing Ltd, England
4. Somogayi, L. P., Ramaswamy, H. S. and Hui, Y. H. 1996. Processing Fruits: Science and Technology, Vol 1. Biology, Principles and Applications. CRC Press, Florida
5. Smith, D. S., Cash, J. N., Nip, Y. K. and Hui, Y. H. 1997. Processing vegetables: Science and Technology. Technomic Publishing Company Inc, USA
6. Dauthy, M. E. 1995. Fruit and Vegetable Processing. Food and Agriculture Organization of the United Nations, Rome

Technology of Beverages (BFT-505)

Course Code: BFT-505

Course Outline **3(2-0-1)**

THEORY

Introduction, classification, Beverage industry in India, Traditional beverages; Manufacturing technology of mineral water and carbonated drinks; water quality, treatment and fortification process, Bottling, Packaging, storage and transportation, fruit beverages; squash, cordial, nectar, crush, alcoholic beverages; Milk beverages, selection and economics of different beverages packaging materials, selection, operation and maintenance of beverage machines / equipments, Automation in beverage industries, quality control and safety in beverage industries, Waste management in beverage industries, Marketing of beverages.

PRACTICALS

1. Preparation of different beverages.
2. Effect of different ingredient on the quality of beverages..
3. Preparation of syrups.
4. Preparation of squash, cordial and nectar.
5. Study of carbonated and non carbonated beverages.
6. Study of alcoholic beverages and determination of alcohol content.
7. Sensory evaluation of beverages.
8. Chemical and microbiological analysis of different beverages.
9. Visit to beverages Industries.

BOOKS

1. Barnard Devis, Andrew Lockwood, Food and Beverage Management, Elsevier Publications

SIXTH SEMESTER

Marketing of Food Products (BFT-601)

Course Code: BFT-601

Course Outline **2(2-0-0)**

THEORY

Nature of products. Cost concepts, cost curves and short run and long run equilibrium. Returns to scale and Economics of scale. Project preparation and feasibility analysis. Financial management. Demand, markets, marketing, market structure, marketing management and pricing strategies of firms. Marketing environment and Consumer buying behavior. Market segmentation, market measurement, market plan, marketing promotion, management of distribution and market research. Market Information System, export and government regulations, GATT and WTO.

BOOKS

1. **Megginson, L.C., Byrd, M.J. and Megginsion, W.L.** Small Business Management: An Entrepreneur's Guide.

Functional & Minimally Processed Foods (BFT-602)

Course Code: BFT-602

Course Outline **2(1-0-1)**

THEORY

Foods and its functions, Composition of foods, general and specific for different foods of plant and animal origin. Restoration, enrichment, fortification and supplementation of foods, Effect of processing on components, properties and nutritional value of foods. Basic tastes, threshold tests for basic tastes, subjective and objective sensory evaluation, different types of tests. Instrumental tests for sensory attributes - colour, texture and odour. Starch, hydrocolloids and gums: occurrence, functions in food systems, properties, gelatinization, retro gradation and modified starches. Fermentation technology: different fermented products. Browning in foods: Enzymatic and non enzymatic- mechanism, method of prevention, relationship to health. Sugar and jaggery: Principles of sugar crystallization, Fats and oils: Properties, manufacture, uses in food systems (as cooking media and shortening). Rancidity-types, mechanism and prevention. Uses of fat replacers in processed foods.

PRACTICALS

1. Sensory Analysis: Different types of sensory tests for basic tastes and sensory attributes of products.
2. Starch gelatinization: factors affecting and measurement of viscosity.
3. Functional properties of proteins: Water and fat absorption, emulsion and foaming properties, (preparation of cakes).
4. Fermentation: Fermented products.
5. Sugar cookery: stages and use in Indian sweet preparations.
6. Preparation of caramel and its usages in food processing.
7. Use of oils and fats: as shortening and as frying media, effect of frying on physico-chemical properties.
8. Study of various value added products of jaggery.
9. Preparation of alcoholic and non alcoholic beverages (Fruit wines)

BOOKS

1. Desroiser N. W. & Desroiser J. N. 1977. The Technology of Food Preservation. AVI Publication.
2. Potty V. H. and Mulky M. J. 1993. Food Processing. Oxford & IBH Publishing House.
3. Srilakshmi B. 2001. Food Science. New Age International.

Quality Control in Food Industry (BFT-603)

Course Code: BFT-603

Course Outline **3(2-0-1)**

THEORY

Hygiene regulation, central of airborne contamination HACCP implementation, Microbiological contral methods, Instrumental measurements of sensory attribute of foods; appearance, color, volume, density and specific gravity, Rheological and textural characteristics, Textural profile analysis. To relation between instrumental and sensory analysis of food quality attributes.

PRACTICALS

1. Methods of evaluation of sensory quality of food products.
2. Evaluation of color and rheological attributes of food products.
3. To study the microbiological examination of food.
4. Study the hazard analysis and premises design.
5. Preparation of HACCP control chart.
6. HACCP case studies.
7. Study of BIS, FPO and codex standards and specifications.
8. Study the various quality and safety aspects adopted by food industry.
9. Detection and estimation of food additives and adulterants.
10. Develop the relationship between objective and subjective methods.

BOOKS

1. Yeshajahu Pomeranz and Clifton E. Meloan. 2002. Food Analysis : Theory and Practice
2. R.D King. 1984. Developments in Food Analysis Techniques -2
3. R.P Srivastav and Sanjeev Kumar. 2003. Fruits and vegetable preservation Principles & Practices
4. Official methods of analysis of AOAC

Food Plant Sanitation & Waste Management (BFT-604)

Course Code: BFT-604

Course Outline **3(2-0-1)**

THEORY

Sanitary design of food process equipment, Selection of sanitizing agents for cleaning, packaging sanitation, food storage sanitation, transport sanitation and water sanitation. By-products obtained from dairy plant, egg & poultry processing industry and meat industry. Characterization of food industry wastes e.g., BOD, COD and total organic content, floatable and suspended solids in water, pretreatment, secondary treatments of solid waste, advanced techniques activated bio-filtration, biological fluidized bed reactor, advanced waste water treatment system (AWT); micro trainers treatment and disposal of sludge, sand filters, removal of nitrogen, phosphorus, sulphur, physical chemical treatment process.

PRACTICALS

1. Flow process chart of food plant.
2. Waste utilization processes.
3. Various treatments for waste disposal analysis of cleaners & sanitizers.
4. CIP Cleaning**.**
5. Exercise on stepped grate and fixed grate rice husk furnace.
6. Study of waste fired furnace.
7. Study of briquetting machine.
8. Preparation of alcohol from waste materials.
9. Study of gasification of organic waste.
10. Study of generation of energy from anaerobic digestion.

BOOKS

1. Verma, L. R. and Joshi, V. K. 2000. Post Harvest Technology of Fruits and Vegetables: Handling, Processing, Fermentation and Waste Management. Indus Publishing Company, New Delhi
2. **Mooyong, M**. Bio-mass Conversion Technology : Principles and Practices
3. **Shuler, Michael L. and Kargi, Fikret** Bio-process Engineering Basic Concepts

Entrepreneurship in Food Industries (BFT-605)

Course Code: BFT-605

Course Outline **2(2-0-0)**

THEORY

Identification of Business opportunities, market survey, project formulation, selection of product, choice of technology, financial institutions, fund flow analysis, functional ratio, techno-economic feasibility of project, costing and pricing, industrial sickness and remedies.

BOOKS

1. Deshpande M.V. Entrepreneurship of small-scale growth and management
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Project **4 (0-0-4)**

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