

I Year I Semester B.Tech. (Food Technology)

Course No.	Title	Th+P
FC/DC-111 (Opt.NC)	Organic Chemistry	2+1
FC-112	Bio-chemistry	2+1
FE-111	Engineering Drawing	0+1
FE- 112	Workshop Practice	0+2
FE-113	Fluid Mechanics and Hydraulics	2+1
FM/DM - 111	Fundamentals of Microbiology	2+1
FT-111	Principle of Food Processing	2+1
FT-112	Processing of Milk and Milk Products	2+1
FBM-111	Economic Analysis	2+0

FC/DC 111 (Opt)

Organic Chemistry

3 (2+1) NC

Sem. I

Unit-I

Hydrogen bonding: Concepts of hydrogen bonding inter and intra molecular hydrogen bonding in alcohol, carboxylic acids and other molecule. Hydrophobic interactions: Elementary idea of hydrophobicity and its importance in the structure of proteins. Alcohols: Important properties of mono, di and trihydric alcohols (Glycol and Glycerol)

Unit-II

Aldehydes and Ketone : Reactions of aldehydes and ketones. Importance of carbonyl compounds in food flavors. Carboxylic acids: Ionization constant and strength of carboxylic acids. Important reactions of carboxylic acid, Derivatives: Esters, Amides, Lactones their preparation and reactions. Amines: Basic character of amines, important reactions.

Unit-III

Phenols: Acidic character of phenols and effect of nuclear substituents on it. Reactions in phenols. Substituted carboxylic acid: important reactions of halogen substituted, Keto and Hydroxy acids. Zwitter-ion forms, its properties viz. melting point and volatility. Amino Acids and Peptides: Synthetic and natural amino acids General properties of amino acids. Definition and classification of proteins. Primary, secondary, tertiary and quaternary structure of Proteins.

Unit-IV

Carbohydrates: Definition, Classification and isomerism. Derivation of structure of Glucose, open chain and ring structure, evidences for ring structure stereochemistry and stability of anomers. Reactions of monosaccharides. Fatty acids and Lipids: Definition and classification. Important reaction of fatty acids (saturated and unsaturated) Structure and properties of Neutral lipids, phospholipids and cholesterol.

Practical:

Systematic identification of Organic Compounds: Aliphatic and Aromatic character, Instauration.

Detection of elements (Nitrogen, Sulphur and Halogens).

Detection of functional groups (Alcoholic, Phenolic, Carboxylic, Carbonyl, Aldehyde, Ketonic esters, Amino, Amide, Nitro etc.).

Preparation of derivatives: Dinitrophenylhydrazone, Oxime and Osazone.

Qualitative test for Amino Acids and Proteins: Biuret test, Million's test, Nitroprusside Test, Ninhydrin test, Xanthoproteic test, Hopkin'scole reaction.

Detection of Carbohydrates (reducing & non reducing sugars) by: Molisch / Orcinol/ Resoreinol/ Silver mirror test.

Detection of lipids and phospholipids

Unit-I

Biochemistry & its scope, Cellular Biochemistry, Carbohydrates- Occurrence, Classification & Structures, Physicochemical and Metabolic functions Metabolism.

Unit-II

Proteins - Occurrence, Classification & Structures, Physicochemical & Metabolic functions, Metabolism, Lipids- Occurrence, Classification & Structure, Physicochemical and metabolic functions, Metabolism.

Unit-III

Nucleic Acids- Properties, structure & Metabolism. Vitamins and Minerals- Chemistry and Metabolic functions.

Unit-IV

Enzymes - Chemical Nature and nomenclature. Classification, sources and properties, Mechanism of action, coenzyme and prosthetic groups

Practical: Safety measures in the laboratory. Preparation of various solutions and buffers. Qualitative & quantitative determination of carbohydrates. Qualitative & quantitative determination of Amino acids. Qualitative & quantitative determination of Proteins. Qualitative & quantitative determination of Lipids .Qualitative & quantitative determination of vitamins. Isolation of enzymes from various sources. Isolation of DNA from Plant sample.

DE/FE 111

Engineering Drawing 1(0+1)

Sem. I

Drawing of lines, lettering and dimensioning types of lines, types, types of lettering, types of dimensioning. Drawing of scales, Plain scale, diagonal scale, comparative scale and Vernierscale. Drawing of projections; Orthographic projections, methods of projections. Drawing of screw threads; Types of threads and terminologies used in lit. Screw fastening: Types of nuts, types of bolts, stud, locking arrangements for nuts and Foundation bolt. Drawing of rivets and riveted joints forms of rivetheads, types of riveted; joints, failure of riveted joints. Drawing of welded joints: Forms of welds, location and dimensions of welds. Drawing of keys, cotter joint, pin joints types of keys, types of cotter joints, pin joints. Drawing of shaft couplings: Rigid couplings, loose couplings, flexible couplings universal coupling. Drawing of shaft bearings. Journal bearings, pivot bearings, collar bearings.

FE/DE112

Workshop Practice 2(0+2)

Sem. I

Introduction to workshop practice, safety, care and precautions in workshop. Wood working tools and their use, Carpentry and pattern making. Mould material and their applications. Heat treatment processes: hardening, tempering, annealing, normalizing etc.

Metal cutting. Soldering & Brazing, Electric arc welding, Gas welding. Smithy and forging operations, tools and equipment. The bench : Flat surface filing, Chipping, Scraping Marking out, Drilling and Screwing. Use of jigs and fixtures in production. Introduction to following machine tools: (a) Lathe (b) Milling machine (c) Shaper and planer (d) Drilling and boring machines (e) Grinder (f) CNC machines. Simple exercises in Filing and Fitting, Chipping and Hack sawing, Chiseling, Tapping and Smithy practice, Simple exercises in Arc, Gas, & Argon welding. Simple exercises in Soldering, Brazing, Basic joints in carpentry

Unit –I

Units and dimensions, Properties of fluids. Static pressure of liquids: Hydraulic pressure, absolute and gauge pressure, pressure head of a liquid. Pressure on vertical rectangular surfaces. Compressible and non compressible fluids. Surface tension, capillarity. Pressure measuring devices, simple, differential, micro, inclined manometer, mechanical gauges, Piezometer.

Unit II

Floating bodies: Archimedes principle, stability of floating bodies. Equilibrium of floating bodies. Metacentric height. Fluid flow: Classification, steady uniform and non-uniform flow, Laminar and turbulent, continuity equation, Bernoulli's theorem and its applications. Flow through pipes: Loss of head, determination of pipe diameter. Determination of discharge, friction factor, critical velocity. Flow through orifices, mouthpieces, notches and weirs, Vena contracta, hydraulic coefficients, discharge losses, Time for emptying a tank. Loss of head due to contraction, enlargement at entrance and exit of pipe.

Unit III

External and internal mouthpieces, types of notches, rectangular and triangular notches, rectangular weirs. Venturimeters, pitot tube, Rota meter. Water level point gauge, hook gauge.

Unit IV

Dimensional analysis: Buckingham's theorem application to fluid flow phenomena. Froude Number, Reynolds number. Weber number and hydraulic similitude. Pumps : Classification, reciprocating, centrifugal pump. Pressure variation, work efficiency. Types of chambers, selection and sizing.

Practicals : Study of different tools and fittings. Plotting flow rate versus pressure drop with U-tube manometer. Verification of Bernoulli's theorem. Determination of discharge coefficient for Venturi, Orifice, V-Notch. Verification of emptying time formula for a tank. Determination of critical Reynolds number by Reynold's apparatus. Study of reciprocating, centrifugal and gear pump. Calibration of Rota meter. Study of different types of valves. Problems on following topics: Pressure, capillarity and surface tension. Floating bodies, Liquid flow, venturimeter, orifice, weir, flow through pipes, pumps.

Unit -I

Microbiology history and scope; contributions of Leeuwenhock, Pasteur and Koch. Principle of microbiology: Light Microscopy (Bright field, dark field, phase contrast, fluorescence); preparation and staining of specimens; electron microscopy.

UNIT –II

Microbial taxonomy: principles; numerical taxonomy; major characteristics used in taxonomy; classification according to Bergey's manual of systematic bacteriology. Structure and functions of prokaryotic cells; difference between prokaryotes and eukaryotes.

UNIT-III

Microbial growth and nutrition: the growth curve; factors affecting growth of microorganisms, estimation of bacterial growth; bacteriostatic and bactericidal agents; the common nutrient requirements and nutritional types of microorganisms.

UNIT-IV

Bacterial genetics; DNA as the genetic material; structure of DNA; bacterial mutations (spontaneous and induced); genetic recombination- (transformation, transduction, conjugation). Micro flora of air, soil and water: methods for controlling microorganisms in air; water as carrier of pathogens.

Practical: General instruction for microbiological laboratory. Microscope- simple and compound; Microbiological equipments; autoclave, hot air oven, incubator, centrifuge, colorimeter, laminar airflow, membrane filter. Simple staining- methylene blue; crystal violet; negative staining. Differential staining (Gram, spore, acid fast). Mortality of microorganisms; hanging drop technique. Measurement of microorganisms by micrometry. Preparation of commonly used growth media liquid and solid: simple and differential media. Isolation technique for microorganisms- Streak & pour plate Enumeration of microorganisms in air and soil. Enumeration of microorganisms in water: total viable count, coliform (MPN).

UNIT-1

Sources of food, scope and benefit of industrial food preservation, perishable, non perishable food, causes of food spoilage. Preservation by salt & sugar – Principle, Method, Equipment and effect on food quality.

UNIT-2

Thermal processing methods of preservation – Principle and equipments :Canning, blanching, pasteurization, sterilization, evaporation. Use of low temperature – Principal, equipment and effect on quality. Chilling, cold storage, freezing. Preservation by drying dehydration and concentration – Principle, Methods, Equipment and effect on quality :Difference, importance of drying & dehydration over other methods of drying and dehydration, equipments and machineries, physical and chemical changes in food during drying and dehydration .Need and Principle of concentration, methods of concentration – Thermal concentration, Freeze concentration, membrane concentration, changes in food quality by concentration.

UNIT-3

Preservation by radiation, chemicals & preservatives. Definition, Methods of Irradiation, Direct & Indirect effect, measurement of radiation dose, dose distribution, effect on microorganisms. Deterioration of Irradiated foods- physical, chemical and biological; effects on quality of foods.

UNIT-4

Preservation of foods by chemicals, antioxidants, mould inhibitors, antibodies, acidulantes etc. Preservation by fermentation- Definition, Advantages, disadvantages, types, equipments. Recent methods in preservation : Pulsed electric field processing, High pressure processing, Processing using ultrasound, dielectric, ohmic and infrared heating. Theory, equipments and effect on food quality.

Practical: Demonstration of various machineries used in processing. Demonstration of effect of blanching on quality of foods. Preservation of food by heat treatment- canning. Canning of fruits and vegetables. Preservation of food by high concentration of sugar i.e. preparation of jam. Preservation of food by using salt- Pickle. Preservation of food by using acidulants i.e. pickling by acid, vinegar or acetic acid. Preservation of food by using chemicals. Preservation of Bread, Cake using mold inhibitors. Preservation of coconut shreds using humectants. Drying of pineapple slices, apple slices in cabinet drier. Demonstration on drying of green leafy vegetables. Drying of Mango/other pulp by foam mat drying. Drying of semisolid foods using roller dryers. Drying of foods using freeze-drying process. Demonstration of preserving foods under cold v/s freezing process. Processing foods using fermentation technique i.e. preparation of saurcraut.

FT-112 Processing of Milk & Milk Products 3(2+1) Sem. I

UNIT-1

Milk: Definition, Composition of Milk from different species, Colostrum. Effect of heat on milk. Processing of milk. Pasteurization by L T H T and HTST and UHT – Filtration, UF & RO, Clarification, Cream separation, homogenization and heat processing

UNIT-2

Classification of milk products. Manufacture of butter and butter oil (Ghee). Fermented milks. Preparation of Yoghurt and Cheese. Ice-cream – Method of manufacture.

UNIT-3

Manufacture of indigenous milk products – Ghee, Khoa, Channa, Paneer, Dahi and Shrikand. Indian milk confectionary – Khoa and Channa based sweets.

UNIT-4

By products of Dairy Industry – Their utilization. Packaging and storage of milk and milk products – Defects – Standards.

Practical: Sampling and analysis of milk – Sp. gravity physico chemical properties and composition, DMC and DYE reduction tests, presence of adulterants and preservatives. Standardization of milk for markets. Clarification and separation of milk. Heat processing of milk – Pasteurization. Preparation of butter and Ghee. Ice-cream preparation. Preparation of Dahi, Shrikhand, Lassi etc. Preparation of khoa and khoa based sweets. Preparation of channa, paneer and chana based sweets. Visit to Dairy plant

FBM/DBM 111 Economic Analysis 2(2+0) Sem. I

UNIT-1

Basic concepts-wants, goods, wealth, utility, consumption, demand and supply, Consumer behaviour-law of diminishing marginal utility and equi-marginal utility, cardinal and ordinal utility approach for consumer's behaviors.

UNIT-2

Theory of demand-law of demand, demand schedule, demand function, determinates of demand, individual consumer demand and market demand, demand forecasting, elasticity of demand, price elasticity, income elasticity and cross elasticity, Consumer's surplus.

UNIT-3

Theory of production- concepts of firm and industry, basic factors of production and their role, production function for a single product, nature of production function, laws of returns. Concepts of costs-fixed and variable costs, short run and long run costs, average and marginal costs, economics and diseconomies of scale.

UNIT-4

Concept of market- types of market, pricing and output under different market situations, market price and normal price, price determination under perfect Competition, monopoly, oligopoly and monopolistic competition. National income – GDP, GNP, NNP, disposable personal Income, per capita income, inflation. Economic features and characteristics of dairy sector in India. Dairy development strategy with special emphasis in post- independence era and Operation Flood Programme

I Year II Semester (Food Technology)

Course No.	Title	Credit
FC-121	Food Chemistry I	3(2+1)
FE/DE-121	Heat & Mass Transfer	3(2+1)
FE/DE-122	Principles of General Engineering	2(1+1)
FE/DE-123	Thermodynamics	2(1+1)
FM-121	Food Microbiology	3(2+1)
FT-121	Post-Harvest Management of Fruits & Vegetable	3(2+1)
FT-122	Cereal Processing	3(2+1)
FBM-121	Co-operation , Marketing and Finance	3(2+1)

FC-121

Food Chemistry – I

3(2+1)

Sem. II

UNIT-I

Nature Scope and development of food chemistry: Moisture in foods; Role and type of water in foods, Functional properties of water, water activity and sorption isotherm, Molecular mobility and foods stability. Dispersed systems of foods; Physicochemical aspects of food dispersion system, a) Sol b) gel c) foam d) emulsions. Rheology of diphase systems.

UNIT-II

Carbohydrates; Functional characteristics of different carbohydrates, Changes of carbohydrates on cooking, Modification of carbohydrates, Dietary fibres and carbohydrates digestibility. Enzymes in food industry; Carbohydrases, Proteasase, Lipases.

UNIT-III

Proteins in foods; Functional characteristics of proteins and amino acids, Pure proteins of plant and animal origin with their functional characteristics, Processing induced, physical, chemical and nutritional changes in protein, Chemical and enzymatic modification of protein.

UNIT-IV

Lipids in foods: Role and use of lipids /fat, Physicochemical aspects of fatty acids in natural foods, crystallization and consistency, Chemical aspects of lipid oxidation, thermal decomposition, Chemistry of frying Technology of fat and oil processing; a) Refining, b) Hydrogenations c) Inter etherification d) Safety use of oils and fats in food formulation.

Practical: Determination of moisture content of foods using different methods. Studies of absorption isotherms of different foods. Swelling and solubility characteristics of starches. Rheological properties of diphase systems. Determination of crude proteins by microkjeldhal method. Determination of essential amino acids i.e. Lysine, tryptophan, methionine etc. Isolation of egg and milk protein. Preparation of protein isolate and concentrate of plant proteins. Determination of acid value, saponification value and iodine number of fat/ oil. Assay of amylases, papain and lipases

Unit I

Basic heat transfer process, thermal conductivity, convective film co-efficient and Stefan Boltzman's constant and equivalent radiation co-efficient, Overall heat transfer co-efficient, physical properties related to heat transfer. Working principles and application of various instruments for measuring temperature. One-dimensional steady state conduction: Theory of heat conduction, Fourier's law, Derivation of Fourier's equation in Cartesian co-ordinates, linear heat flow through slab, cylinder and sphere. Heat flow through slab, cylinder and sphere with non-uniform thermal conductivity. Concept of electrical analogy and its application for thermal circuits, Heat transfer through composite walls and insulated pipelines.

Unit II

One dimensional steady state heat conduction with heat generation: Heat flow through slab, hollow sphere and cylinder with uniform heat generation, Development of equations of temperature distribution with different boundary conditions. Steady-state heat conduction with heat dissipation to environment: Introduction to extended surfaces (FINS) of uniform area of cross-section. Equation of temperature distribution with different boundary conditions. Effectiveness and efficiency of the FINS.

Unit III

Introduction to unsteady state heat conduction. Convection: Forced and free convection, use of dimensional analysis for correlating variables affecting convection heat transfer, Concept of Nusselt number. Prandtl number, Reynolds number, Grashoff number, Some important empirical relations used for determination of heat transfer coefficient.

Unit IV

Heat Exchangers: General discussion, fouling factors, jacketed kettles, LMTD, parallel and counter flow heat exchangers, Shell and tube and plate heat exchangers, Heat exchanger design. Application of different types of heat exchangers in dairy and food industry. Fick's Law of diffusion, steady state diffusion of gases and liquids through solids. Equimolar diffusion. Mass transfer co-efficient and problems on mass transfer.

Practical :

Determination of thermal conductivity: milk, solid dairy & food products. Determination of overall heat transfer co-efficient of: Shell and tube, plate heat exchangers and Jacketed kettle used in Dairy & Food Industry. Studies on heat transfer through extended surfaces. Studies on temperature distribution and heat transfer in HTST 11pasteurizer. Design problems on heat exchangers. Study of various types of heat exchangers. Design problems on Mass Transfer

Unit I

Alternating current fundamentals: Electromagnetic induction magnitude of induced E.M.F. Alternating current, R.M.S. value and average value of an alternating current. Phase relations and vector representation. A.C. series and parallel circuits, Concept of resonance, polyphase alternating current circuits, three-phase concept, Star and delta connections, star delta transformation, Energy measurement.

Unit II

Transformers: Fundamental of transformer, Theory, vector diagram without load and with load, Losses, voltage regulation and efficiency of transformer, auto-transformer. Alternators: Elementary Principles, Construction and different types of alternators, E.M.F. in alternators, circuit breakers.

Unit III

Induction motors : Fundamental principles, production of rotating fields, construction, Rotor winding-squirrel cage and phase wound rotors, Analysis of current and torque, starting of induction motors, Motor housing, selection of motor and its controls.

D.C. Machines: Construction and operation of D.C. generator, Types of generators, various characteristics of generator, D.C. motors, torque-speed characteristics of D.C. motors, Starting and speed control of D.C. motors.

Unit IV

Electric Power Economics: Maximum demand charge, Load factor and power factor correction. Measuring Instruments: Classification of instruments, Elements of a generalized measurement system, static and dynamic characteristics.

Practical:

Study of voltage resonance in L.C.R. circuits at constant frequency; (a) Star connection-study of voltage and current relation (b) Delta connection-study of voltage and current relation. Measurement of power in 3-phase circuit; (a) For balanced loads (b) For unbalanced loads, by wattmeter and energy meters. Polarity test, no-load test, efficiency and regulation test of single phase. Voltage and current relation in a 3-phase transformer of various kinds of primary and secondary connection systems. Starting of induction motor by the following starters: (i) D.O.L. (ii) Manual star- delta (iii) Automatic star-delta (iv) Manual auto-transformer. Starting of slip-ring induction motor by normal and automatic rotor starters. Test on 3-phase induction motor, determination of efficiency, line current, speed, slip, power factor at various outputs. Determination relation between the induced armature voltage and speed of separately excited D.C. generator. Magnetization characteristic of D.C. generator. Study the starter connection and starting reversing and adjusting speed of a D.C. motor. Study of various measuring instruments.

Unit I

Basic concepts: systems, processes, cycles, energy, The Zeroth Law of Thermodynamics. Ideal gases: Equation of state, Compression and expansion of gases. The first Law of Thermodynamics: Internal energy, enthalpy.

Unit II

The second Law of Thermodynamics: Thermodynamic temperature scale, Carnot cycle, entropy, reversibility, availability. Air Cycles: Otto, Diesel, dual efficiencies, Plotting the cycles on various thermodynamic planes viz., p-V, T-S, p-h diagram; etc.

Unit III

IC Engines: Two stroke and four stroke cycles, construction, injection and ignition of fuel, Performance of IC engines. Fuels: Chemical properties, air for combustion, Calorific value and its determination, Burners, firing of fuels. Renewable energy sources.

Unit IV

Properties of steam: Wet, dry saturated, superheated steam, Use of steam tables and Molier charts. Steam generators : Fire tube boilers, Water tube boilers. Boiler mountings and Boiler accessories. Draught : Natural, forced, fan, jet, Measurement of Height of chimney. Condensers. Layout of pipe-line and expansion joints. Boiler trial: Codes, Indian Boiler Regulation acts. Air Compressors: Reciprocating, Single and two stage air compressors.

Practical:

Application of thermodynamics in engineering problems. Study of 2-stroke engine and 4-strokes engines. Performance tests on I.C. engines. Determination of dryness fraction of steam. To study the boiler installed in Model Plant, Water softening plant, Lancashire boiler, Locomotive boiler, Babcock & Wilcox boiler, Electrode boiler, Boiler mounting and steam-line layout and steam traps. Visit to sugar mill/rice mill or plant with steam utilization. Study of Solar water heater and biogas plants and appliances

UNIT-I

Microbial spoilage of foods, Chemical changes caused by microorganisms, Principles of Food Preservation. Control of microorganisms by use of low and high temperature. Asepsis, water activity, drying, preservatives, radiation and pressure for control of microorganisms.

UNIT-II

Microbiology of milk and milk products. Sources of contamination, spoilage and prevention. Microbiology of fruits and vegetables. Sources of contamination, spoilage and prevention. Microbiology of cereal and cereal products. Sources of contamination, spoilage and prevention.

UNIT-III

Microbiology of meat and meat products. Sources of contamination, spoilage and prevention. Microbiology of fish and other sea foods. Sources of contamination, spoilage and prevention. Microbiology of poultry and eggs. Sources of contamination, spoilage and prevention.

UNIT-IV

Microbiology of sugar and sugar products. Sources of contamination, spoilage and prevention. Microbiology of salts and spices. Sources of contamination, spoilage and prevention. Microbiology of canned foods. Sources of contamination, spoilage and prevention.

Practical: Isolation of molds from foods. Microbial examination of cereal and cereal products. Microbial examination of vegetable and fruits. Microbial examination of meat and meat products. Microbial examination of fish and other sea foods. Microbial examination of Eggs and poultry. Microbial examination of milk and milk products. Microbial examination of sugar, salts and spices. Thermal Death Time determination.

FT-121 Post-Harvest Management of Fruits & Vegetables 3(2+1) Sem. II

UNIT-1

Post harvest technology of fruits and vegetables: An over view of concept and science, importance of loss reduction, role in export, economy, and employment generation.

UNIT-2

Morphology, structure and composition of fruit and vegetable.- Physical, Textural characteristics, structure and composition. Maturity standards; Importance, methods of Maturity determinations maturity indices for selected fruits and vegetables. Harvesting of important fruits and vegetables. Fruit ripening- chemical changes, regulations, methods.

UNIT-3

Storage practices: Control atmospheric, Bead atmosphere, hypotactic storage, cool store, Zero emerge cool chamber, stores striation. Commodity pretreatments - chemicals, wax coating, prepackaging. Physiological post harvest diseases chilling injury.

UNIT-4

Handling and packaging of fruits and vegetables ; Post Harvest handling system for citrus, mango, banana, pomegranate, tomato, papaya and carrot packaging house operations. Principles of transport and commercial transport operations.

Practical: Studies on morphological features of some selected fruits and vegetables. Studies of maturing indices. Studies of harvesting of fruits and vegetables. Determination of RQ. Studies of export of pre cooling and storage of fruits and vegetables. Studies on wax coating on apples, papaya, citrus, mango, aonla. Studies on use of chemicals for ripening and enhancing shelf life of fruits and vegetables. Studies of regulations of ripening of banana, mango, papaya. Studies on various storage systems and structures. Studies on prepackaging of fruits. Studies on prepackaging of vegetables. Studies on physiological disorders - chilling injury of Banana and custard apple. Visit to commercial packaging house – grape, mango and pomegranate. Visit to commercial storage structures- Onion, garlic and potato.

FT-122

Cereal Processing

3(2+1)

Sem. II

UNIT-1

Present status and future prospects of cereals (Rice, Wheat, Corn, Sorghum, Rye); Morphology of Rice: Physical properties; Density, Bulk density, Angle of repose, Hardness, asperity, porosity, stack of milling and moisture on physical properties. Chemical composition, Distribution of nutrients and Aroma of rice. Drying of paddy: general principles and methods of drying, cracking phenomenon - prevention.

UNIT-2

Methods of drying, batch type, continuous type driers. Milling of rice: i) Conventional Milling ii) Modern milling iii) Advantages and disadvantages of milling machineries. iv) By products of rice milling. Parboiling of rice: Aging of rice: Enrichment: - Need of Enrichment, Methods of enrichment, Enrichment levels, fortification of amino acids. -Processed Foods from rice: Breakfast cereals, flakes, puffing, canning and instant rice.

UNIT-3

Wheat: Morphology, Physico-chemical properties, Wheat Quality, Wheat Milling. Corn: Morphology, Physico-chemical properties, Corn milling, Milling fractions and modify starches.

UNIT-4

Barley: Morphology, Physico-chemical properties and processing (Malting) Sorghum: Morphology, Physico-chemical properties, Milling, Malting, Pearling and industrial utilization. Millets – Oat / Rye: Importance of Millet, composition, processing of millets for food uses.

Practical: Morphological characteristics of cereals. Physical properties of cereals. Chemical properties of cereals. Determination of colour of cereals. Parboiling of Paddy. Cooking quality of rice, Milling of rice, Conditioning of wheat. Production of sorghum flakes. Production of Popcorns Preparation of sorghum Malt. Determination of Gelatinization Temp. By amylograph. Extraction of oil from rice bran. Visit to Cereal processing unit.

FBM-121

Co-operation, Marketing and Finance

3(2+1)

Sem. II

UNIT-1

Co-operation–philosophy and principles: History of Indian Co-operative movement, Co-operative credit structures in regional level and their study and singly window systems. Marketing – importance in economic development. Classification of Markets, Marketing functions, Market functionaries. Marketable and Marketed surplus, Marketing costs, margins and price spread.

UNIT-2

Problems in marketing of agricultural commodities – perishables, grains, oilseeds and processed foods. Remedial measures for problems in Agricultural marketing. Agricultural marketing institutions, Regulated markets, Co-operative marketing societies, MARKFED, NAFED, Ware Housing Corporation, Food Corporation of India.

UNIT-3

Nature of agricultural product prices, Agricultural price policy and need for price stabilization. Methods of fixation of MSP for agricultural commodities. Commission on agricultural costs and prices. Finance–nature and scope: Credit – meaning, definition and classification. Credit analysis and repayment plans. History of financing Agriculture in India.

UNIT-4

Commercial banks – Nationalization of Commercial banks, Lead Bank scheme, Regional Rural Banks, Scale of finance, higher financing agencies – RBI, NABARD, AFC, ADB, World Bank. Insurance and credit guarantee corporation of India. Crop Insurance. Contract farming – strategy and scope

Practical: Study of a regulated market, Study of a vegetable market, Study of a fruit market, Study of a cattle market, Computation of market costs, margins and price spread, Study of Andhra Pradesh State Warehousing Corporation , Study of Central Warehousing Corporation, Study of Food Corporation of India, Study of MARKFED, Study of functioning of a commercial bank , Study of a regional rural bank, Study of food processing enterprise, Formulation of project reports for financing food Industry, Working out repayment plans, Study of Primary Agricultural Credit Society, Study of Farmers' Service Society

II Year I Semester B. Tech. (Food Technology)

Course No.	Title	Credit
FE/DE-211	Refrigeration & Air Conditioning	2+1
FM-211	Fermentation & Industrial Microbiology	2+1
FT-211	Fruits and Vegetable Processing	2+1
FT-212	Legumes & Oil Seeds Technology	2+1
FT-213	By Products Technology	2+1
FT-214	Bakery & Confectionary Products	2+1
FT-215	Food Aditives	2+1

FE/DE-211 Refrigeration & Air Conditioning 3(2+1) Sem.II

Unit I

Basic refrigeration cycles and concepts: Standard rating refrigerating machines, Elementary vapour compression refrigeration cycle with reciprocating, rotary and centrifugal compressors. Theoretical vapour compression cycle, Departure from theoretical vapour compression cycle, representation on T- and p-h diagrams, Mathematical analysis of vapour compression refrigeration system.

Unit II

Refrigerants: Primary and secondary refrigerants, common refrigerants (Ammonia, Freon), Brine, their properties and comparison. Multiple evaporator and compressor systems: Applications, One compressor systems: dual compression, comparison of system, Control of multiple evaporator system, Working and mathematical analysis of above systems. Refrigeration equipments: Compressor, Condenser, evaporator, Cooling tower, spray pond, Basic elements of design, Construction, operation and maintenance, balancing of different components of the system.

Unit III

Refrigeration Controls: Low side and high side float valves, capillary tube, thermostatic expansion valve, automatic expansion valve, solenoid valve, High pressure and low pressure cutouts, thermostat, overload protector, common defects and remedies. Refrigeration Piping: Purpose, materials, joint and fittings, water and brine pipe size selection. Absorption Refrigeration Systems: Simple vapour absorption refrigeration systems, Practical absorption system, Refrigerant absorbent combinations Absorption cycle analysis.

Unit IV

Psychrometry: definition, properties of air-vapour mixtures, Psychrometric charts, Processes involving air vapor mixtures, Dehumidification, humidifiers, Humidity measurements, humidity control. Wet bulb, dry bulb temperature dew point temperature. Cooling load calculations: Types of loads, design conditions for air cooling, air conditioning loads. Cold storage: Types of cold storage, Types of loads in cold storage, Construction of cold storage. Insulating materials and vapour barriers.

Practical: Study of tools used in installation of a refrigeration plant including charging and detection of leaks. To study different parts and learn operation of bulk milk cooler. Study of different parts and learn the operation of a refrigeration plant/ice plant using ammonia refrigerant. Study of different parts and learn the operation of a vapor absorption refrigeration plant. Dismantling and assemble an open compressor and a sealed unit. Study different parts and refrigeration controls of the following (a) Refrigerator (b) Water cooler (c) Deep Freezer (d) Compare their cooling coils and other systems. To find out the rating (cooling rate) at different suction temperatures (temperature differences) and air handling capacity of the air cooling unit. Plotting the practical refrigeration cycle on a pressure enthalpy diagram and to compare it with a theoretical refrigeration cycle. Study different parts and operation of a (a) Air washer, (b) Room cooler, (a) Air conditioner, (d) Chemical dehumidifiers, (e) Cooling. Plotting of psychometrics process: Sensible heating & cooling. Dehumidification & cooling and heating & humidification. Study of different humidity indicating, recording and controlling devices. Problems on cold storage. Visit to cold storage.

FM-211 Fermentation & Industrial Microbiology 3(2+1) Sem. III

UNIT-1

Microbes as friend's primary secondary screening and the organizations involved microbiological work. Industrially important secondary metabolites, organic acids, citric acid, antibiotics, probiotics, therapeutic and medicinal value.

UNIT-2

Bacteriocins Nisin, biocolours carotenoids, B-carotene, lycopane, Angkak, plant growth regulators from microbes gibberellins, IAA etc. hormones, production of microbial enzymes Downstream processing of enzymes and application of microbial enzymes.

UNIT-3

Microbial polysaccharides, types of polysaccharides and their applications xanthan, Dextran and pullulan, production of amino acids, vitamins, bioinsecticides. Plant cell cultures and metabolites, production of SCP, Safety of SCP, bakers yeast.

UNIT-4

Fermentation Technology – Types, Food based fermented products, Biochemical changes, Microbial standards. Industrial fermentors and accessories. Economic feasibility studies of few products advances in strain improvements of for high yields of metabolites, Blue green algae. Mushrooms – production, preservation and quality.

Practical: Production of dextran/xenthan/pullulan. Plant cell culture. Production and assay of nisin from Lactic acid bacteria. Single Cell Protein production. Bakers yeast effect in Bread Preparation. Mushroom Production. Preparation of food based fermented product. Production of ethyl alcohol from molasses & whey by yeast. Production of lactic acid from synthetic (lactose broth) and natural (whey) media using homo fermentative & hetero fermentative lactic acid bacteria. Production & analysis of whey beverages. Production & assay of single cell protein. Educational tour to food processing & fermentation industries.

FT-211 Fruits and Vegetable Processing 3(2+1) Sem. III

UNIT-1

Production and processing scenario of fruits and vegetable: India and World. Scope of Fruit and Vegetable Preservation Industry in India. Present status, constraints and prospectus. Overview of principles and preservation methods of fruits and Vegetables.

UNIT-2

Commercial processing Technology of Following fruits and vegetables. Mango: Pulp, RTS, Squash canned Mango pulp. Toffee amchur, pickle Mango Powder, bar. Banana: Wafers, puree, dried banana powder. Papaya: Jam, Candy RTS, Nectar, Squash, and Papain. Pomegranate: Juice, Squash, syrup, Anardana, Dalimbmanuka, Anargoli. Guava; Jelly, Cheese, Juice, Canned guava, Squash, Toffee. Grape: Raisin, Juice, Wine. Fig: Pulp, dried fig, Toffee Powder, bar fig.

UNIT-3

Commercial processing technology of Citrus Fruits: Jelly, Marmalade RTS Squash, candy. Aonla; Preserve, Jam, Candy, Juice, Squash, powder, Dried shreds, chuenprash, pickle, chutney sauce, sweets. Tamarind: Pulp, Powder, Toffee, Bar, RTS, Slab Jamun: Jelly, RTS, Syrup, wine, Wood apple: Jelly, Marmalade.

UNIT-4

Commercial processing technology of Tomato: Ketchup, sauce, puree, soup, chutney, pickle, Ginger: Preserve, Candy, dried, Ginger pickle, RTS, Syrup. Onion: Dried Onion, Powder. Garlic: Dried Garlic, Powder, Oil. Potato: Wafer; starch, Papad, Carrot: Preserve, candy,

Pickle, Jam. Cauliflower and cabbage: Dried cauliflower and cabbage, Sauerkraut, Pickle Leafy vegetables; Dried Leafy Vegetables. (Spinach, Fenugreek, Coriander leaves, Curry leaves). Bitter gourd: Pickle, Dried bitter gourd

Practical: Canning of Mango/Guava/Papaya. Preparation of Fruit Jam: Apple/Mango/Guava/Papaya/Aonla/Strawberry. Preparation of fruit Jelly: Wood apple, Sweet orange/mandarin/Guava/Tamarind. Preparation of fruit marmalade: Ginner Marmalade. Preparation of fruit preserve and candy. Preparation of fruit RTS and candy Preparation of fruit squash. Preparation of fruit syrup. Preparation of grape raisin, dried fig and dried banana. Preparation of Anardana and dalmabmanuka. Preparation of papain /guava cheese. Preparation of pickle, mixed pickle. Preparation of dried ginger. Preparation of Amchur. Preparation of dried onion and garlic, Preparation of Banana and Potato wafers, Preparation of dehydrated leafy vegetable

FT-212 Legumes & Oil Seeds Technology 3(2+1) Sem. III

UNIT-1

Present status and future prospectus of Legumes and Oil seeds Morphology of legume. Classification and types of legumes and pulses. Chemical composition and nutritional value. Anti-nutritional factors, their chemistry, methods of removal of anti-nutritional factors.

UNIT-2

Processing of legumes of Food uses: Home scale, Cottage Scale and commercial methods of dehulling. Modern techniques in Dal mills. Processing of Red gram, Bengal gram, Green gram, Black gram. Dal milling – Principle, methods, equipments and effect on quality. Principle products, Dry and Wet milling of pulses, Fermented Products of legumes. Soaking – Principles, Methods of soaking - Sprouting, Puffing, Roasting & Parboiling of Legumes, Physical and Bio-chemical changes during these processes. Cooking quality of dhal – methods, factors affecting quality of dhal and cooking of dhal. Quick cooking dhal, Instant dhal.

UNIT-3

Introduction, Present and future prospects of oil seeds, chemical composition and characters of oil seed and Oils, Anti-nutritional factors, elimination Methods. Post Harvest Technology of Oil seeds, Handling Drying, Storage, Grading, Pretreatments, cleaning, Dehulling, Size reduction and flaking.

UNIT-4

Oil extraction: Traditional Methods, Ghani, Power Ghanis, Expellers - Principle of Expeller, structure design of expeller. Solvent extraction process: Principle, Pretreatment - Breaking, Cracking, flaking. Extraction principles, factors affecting the extraction process. Desolventization. Refining of Oils - Degumming, neutralization, bleaching, filtration, deodorization, their Principles and process controls. New Technologies in oil seed processing, utilization of oil seed meals of different food uses. High protein Product, like protein concentrate and isolates.

Practical : Physical properties of Legumes and Oil seeds. Estimation of protein. Estimation of Fat Methods and Principles of dehulling; Application Oil & Application Red Earth slurry. Dal Milling Process. Antinutritional factors, Methods of Elimination. Soaking studies. Sprouting of legumes. Cooking quality of Dal. Fermented product of legumes- Dosa, Idli, Wada, Dhokala, etc. Extraction of oil by expeller press. Production of protein rich product. Visit to Dal Mill and oil extraction plant.

FT/DT-213 By Products Technology

3(2+1)

Sem. III

UNIT-1

Present status, availability and utilization of food by products in India & abroad. Associated economic and pollution problems. Management of agriculture wastes and agro based industrial wastes.

UNIT-2

Utilization of by products from food: fruits & vegetables processing industry, cereals and oil seeds. Utilization of by products of agro based industries in various sectors. Fermentation of by products from sugar and bakery industry.

UNIT-3

Utilization of Dairy by products such as whey, Butter milk and ghee residue.

UNIT-4

Utilization of by products of meat, poultry and fish processing industry.

Practical: Extraction of banana fiber, Use of crop residue for production of cellulose, Use of mango kernels for manufacture of starch, Production of protein from organic waste, Extraction of volatile oil from organic waste, Utilization of butter milk powder in bakery, Utilization of ghee residue

FT-214 Bakery & Confectionary Products

3(2+1)

Sem. III

UNIT-1

History, Traditional confectionary goods, Types of confectionary, classification. Basic Technical considerations, TS, TSS, pH, acidity, ERH, Sugar, Invert Sugar, Glucose syrup, RH, Crystallization. Raw Materials: Sugar, Sugar qualities, Physical, Chemical, Optical properties. Sugar grinding, Dextrose, Fructose, Lactose, caramel, maltose, Honey, sorbitol, xylitol, Iso malt, soy maltose, Polydextrose, Lactitol, Maltitol. Whipping, Release agent, thickeners, Acidulents, Flavours, for confectionery, emulsifiers and other additives, starch derivatives, colours used in confectionary. Production of glucose syrup, Acid hydrolysis, enzyme hydrolysis.

UNIT-2

Cocoa Processing: Cocoa bean, processing, roasting, Fermentation, Production of Cocoa butter
Cocoa powder, its quality. Chocolate Processing: Ingredients, Mixing, Refining, Conching,
Tempering, Molding, Cooling, Coating, Fat bloom.

UNIT-3

High Boiled Sweets: Introduction, Composition, Properties of high boiled sweets, preparation of
high boiled sweets, Traditional, batch and continuous Method of preparation. Different types of
higher boiled sweets, Recipes. -Caramel: Definition, Composition, Factors affecting quality of
caramel, caramel Manufacture process, batch type, continuous types, checking of faults in
caramel. Toffee: Definition, Composition, types of toffee Ingredient and their role. Batch and
Continuous method of toffee. Fondant: Fudge/Creamy: ingredients, Methods, Productivity.
Lozenges: Definition recipe, Method of Manufacture, Compositions, factors affecting quality,
Industrial production, checklist of faults. Tablets: Definitions, recipe, composition, wet
granulation, Slugging, Manufacture of Tablet, and Checklist of tablet faults. Marshmallow and.
Nougat: Definition, composition, recipe, and method of manufacture. Nougat. Panning: Process,
types of Panning, soft and hard panning. Quality of confectionery, Standards and regulations,
Packaging requirements of confectionary, economics and marketing of confectionary goods.

UNIT-4

Bakery Products, Role of Bakery ingredients (major and minor), From Hard Wheat: Bread:
Processes of bread making mainly straight and sponge, role of each ingredient, quality control.
Testing of raw material. Testing of final product. Bread faults, staleness, ropyness. Baked
Products from soft wheat: Cookies, crackers, Biscuits, Cakes: Types, ingredients, Process,
Causes, remedy. Other bakery Products: Pizza, Pastry and its Types. Macaroni Products:
Including spaghetti, Noodles, Vermicelli-Process. Nutritional improvement of bakery
Products. Setting of bakery Unit, Bakery norms. Specifications for raw
materials. Packaging. Marketing of Products. Project report on bakery. Visit to wheat milling
Industry. Visit to Bakery.

Practical: Classification of wheat based on physico-chemical properties. Conditioning of
wheat. Milling of wheat. Quality Testing of flour: Falling number and α - amylase activity,
Sedimentation value, Pelshenke value, Farinograph, Mixograph, Extensiograph, Alveograph.
Manufacture of Bread, Types, Faults, remedies, shelf life bread, quality of bread Biscuits,
cookies, crackers, buns: Types and quality. Other baked products- Pastry, pizza. Extruded
Products from wheat: Vermicelle, noodles etc. Physical properties of sugar. Production of invert
sugar. Determination of Moisture in Sugar. Determination of Reducing Sugar. Preparation of High
boiled sweets. Preparation of Toffee. Preparation of Groundnut Chikki. Preparation of Candid
Food. Preparation of decorative cake. Preparation of Chocolate. Preparation of Traditional Indian
Confection. Visit to Confectionary Industry. Project report on bakery. Visit to wheat milling
Industry. Visit to Bakery.

FT-215

Food Additives

3(2+1)

Sem. III

UNIT-1

Intentional and unintentional food additives, their toxicology and safety evaluation. Naturally occurring food additives.

UNIT-2

Food colour (natural and artificial). Pigments their importance and utilization as food colour.

UNIT-3

Taste and flavour inducer, potentiator. Food preservatives and their chemical action.

UNIT-4

Role mode of action salt, chelating agents stabilizers and thickeners, polyhydric alcohol, anticaking agent, firming and colouring agent, flour bleaching agent, antioxidants, non-nutritional sweetness and antimicrobial agents.

Practical: Evaluation of GRAS aspect of food additives. Identification of food colour by TLC. Isolation and identification of naturally occurring food pigments by paper and TLC. Spectrophotometric method of total chlorophyll (A&B). Determination of diacetyl content of Butter. Role mode of action of chelating agent in fruit juice. Role and mode of action of stabilizer and thickener in frozen dairy products. (Ice-cream). Role and mode of clarifying agent in fruit juices. Role and mode of antioxidant in frozen fish. Role of leavening agent in baked food product.

II Year II Semester B.Tech. (Food Technology)

Course No.	Title	Credit
FC-221	Food Chemistry-II	2+1
FE-221	Food Processing Equipment -I	2+1
FT/DT-221	Packaging Technology	2+1
FT-222	Food Quality	2+1
FT/DT-223	Plant Management & Pollution Control	2+1
FT/DT-224	Environmental Studies	2+1
FT-225	Extrusion Technology	1+1
FT-226	Processing of Spices and Plantation Crops	1+1

FC-221 Food Chemistry –II 3(2+1) Sem. II

Unit-I

Chemistry of food flavour; Philosophy and definitions of flavour, Flavourmatics / flavouring compounds, Sensory assessment of flavour, Technology for flavour retention. Modification of food using enzymes; Role of endogenous enzymes in food quality, Enzymes use as processing aid and ingredients.

Unit-II

Food additives and Technology; General attributes , Buffer systems/ salts / Acids, Chelating agents and sequestrants, Antioxidants, Antimicrobial agents, Non-nutritive and low calorie sweeteners, Stabilizer and thickeners, Fat replacers, Texturizers and improvers. Pigments in animal and plants kingdoms; Heme pigments, Chlorophyll, Carotenoids, Phenolic and flavonoids, Betalins, Effect of processing on pigment behavior Technology for retention of natural colours of food stuffs.

Unit-III

Food colorants; Regulatory aspects, Properties of certified dyes, Use of regulatory dyes, Colour losses during thermal processing. Vitamins and minerals; Requirements, Allowances, Enrichment, Restorations, Fortifications, Losses of vitamins and minerals Optimization and retention of vitamins and minerals.

Unit-IV

Food toxicology; Inherent toxicants, Terms in toxicology, Safety evaluation using traditional and modern approach, Contaminants, Pesticidal residues, Toxicology and public health.

Practical:

Preparation of mineral solution by using ash and tri acid method (dry and wet oxidations). Estimation of calcium.

Determination of phosphorus.

Determination of iron.

Estimation of magnesium.

Estimation of tannins and phytic acid from food.

Determination of vit.A (Total carotenoids).

Determination of ascorbic acid by dye method.

Determination of Thiamin and Riboflavin.

Determination of food colors.

Assessment of hydrocolloids as food additives.

Assessment of various pectinases from fruits and vegetables

FE-221

Food Processing equipment-1

3(2+1)

Unit I

Material handling: Material handling machines and conveyors. Pretreatment unit operations: Cleaning, Dehulling and Dehusking, Sorting & Grading, Peeling, Mixing and Forming. Size reduction and separation. Agitation and Mixing. Bread moulders, Pie and biscuit formers, confectionery moulders.

Unit II

Extrusion : Extrusion cookers, cold extrusion, single and twin screw extrusion. Low pressure and high pressure extrusion. Engineering properties of Food materials. Its significance in equipment design, processing and handling of food products. Hygienic design of Food processing equipment. Sanitary requirement, Sanitary pipes and fittings. Rheology and texture of food materials: Concept of rheology, elastic, plastic and viscous behaviour, visco elasticity, rheological models and constitutive equations. methods of texture evaluation, subjective and objective measurements. Aerodynamic and hydrodynamic characteristics. Application to separation, pneumatic handling and conveying.

Unit III

Evaporation : Principles of evaporation, types and selection evaporators, mass and energy balance. Design of single and multiple effect evaporators, recompression heat and mass recovery and vacuum creating devices. Fouling of evaporators and heat exchangers. Drying : Principles of drying, drying rate kinetics, Classification, mass and energy balance. Different types of dryers and components - roller, spray, tray, compartment, fluidized bed etc.

Unit IV

Introduction of biochemical Engineering : Kinetics, product yield. Engineering of Gas liquid mass transfer in microbial system. Concept of thermo bacteriology : Arrhenius analogy, its application in design. Determination of heat resistance of micro organisms. Analysis of Thermal Resilience Duration mathematics of conduction heating. Thermal processing: Blanching, Pasteurizations and Sterilization - principles, different methods and equipments. Processing in containers, process time, T-evaluation, Design of batch and continuous sterilization. Design and analysis of fermenter.

Practical: Study of texture analyzer and its working. Stress-strain behavior of different food materials. Determine flow parameters of Newtonian, non newtonian food products by : Capillary tube, viscometer, Hakke's viscometer, Rotational viscometer and Falling Ball viscometer. Determine electric conductance of a given Food sample. Study of evaporator, dryer, sterilizer. Design problems on evaporators. Design problems on Dryers. Design problems on Freezers. Numerical problem on Thermo bacteriology (D, Z, & F).

UNIT-1

Introduction: Importance of packaging, History of Package development & package material. Current status of Packaging industry in India & Abroad.

UNIT-2

Characteristics of Packaging materials-Paper (Paper board, corrugated paper, Fiber board), Glass, metal, Plastic foils & Laminates, retort pouches, Packaging forms. Neutral material like straws, waxes. Store ware, textile & wood. Development in new packaging materials including biodegradable films and edible package.

UNIT-3

Legal requirements of packaging materials and product information. Packaging forms and adhesives used in packaging. Packaging of milk and milk products. Packaging of fruits & vegetables, meat & fish products. Disposal of waste packaging materials

UNIT-4

Modern Packaging techniques- Aseptic packaging, modified atmosphere packaging (MAP), Eco-friendly packaging, Principles and methods of packaging, Sterilization, coding and Labeling of food packages, Micro processor controlled systems employed for A.P., Packaging conditions and quality assurance aspect of AP Packaging equipments like wrapping, cartooning form fill seal & shrink wrapping.

Practical:

Identification of packaging material and foil, Flame hot wire test, Testing of paper and paper boards- Percentage moisture, Grease resistance, water absorptiveness, Gram mage, Tearing resistance, Bursting strength and tensile strength

Tensile of glass bottles resistance to thermal shock, Testing of plastic and laminates: thickness, water vapor, transmission rate, bursting strength, oxygen transmission rate, tensile strength and tearing resistance, Per pack of food, Packaging of fruits & vegetables, meat & fish products, Shelf life determination of packed food., Packaging of different dairy products, Field visit to factories manufacturing packaging materials & food products.

FT-222 Food Quality 3 (2+1) Sem. II

UNIT-1

Food quality and its role in food industry; Definition of Food quality, Role of food quality in Food Industry. Quality attributes; Classification of quality attributes, Color and gloss: Definition, Different colors, color measurement by spectrophotometer, muncell color system, lovibondtintometer, role in food qualities. Role of viscosity and consistency in food quality. Size and shape: Production, role in Food industry Measurements: weight, volume, weight-volume ratio, length, width, diameter, symmetry, curvature, area.

UNIT-2

Defects: Classification, Genetic- physiological defects- Structural, off color, character, Entomological Defects: holes, Scars, lesions, off coloring, curled aves, pathological defects. Mechanical defects, Extraneous or foreign material defects. Measurement of defects: Improving visibility by dilution, white background, color differences, standardization of conditions, reference standards, counts and measures, isolation of defects by floatation, elution, electronic sorting, Internal defects. Quality of raw materials: Physical, Chemical and microbial quality. Quality of products during processing & after processing color, taste, texture, flavour, appearance. Factors influencing the Food qualities: Soil, field practices, harvesting practices, procedures, packaging, transportation, storage, conditions, processing conditions, packaging and storage conditions of finished products. Recording and reporting of quality.

UNIT-3

Flavour: Definition and its role in food quality, Taste, classification, taste qualities, relative intensity, reaction time, effect of disease, temperature, and taste medium on taste, basic tastes, interaction of tastes. Odour: definition, Classification, neutral - mechanisms, Olfactory abnormalities, odor testing, techniques, thresholds, odor intensities, olfaction. Visual, Auditory, Tackle and other senses, Vision, audition, oral perception other than taste. Factors influencing sensory measurements: Attitudinal factors, motivation psychological errors in Judgment, relation between stimulus and perception adaptation. Correlation of sensory and instrumental analysis. Legal and other related standards

UNIT-4

Quality Measurements: Laboratory measurement: types of tests, panel selection and testing environment, serving procedures, instruction to judges, Difference tests, directional difference tests, classification of difference tests, two-sample tests, three sample tests, multisampling tests, comparison of procedures, ranking, scoring, hedonic scaling, dilution procedures, descriptive sensory analysis, contour method, other procedures, Consumer measurement: Factors influencing acceptance and preference, objectives of consumer preference studies, information obtained from consumer study, factors influencing results from consumer surveys, Methods of approach, development of the questionnaire, types of questionnaires, serving procedures. Comparison of laboratory panels with consumer panels. Limitations of consumer survey.

Practical: Sensory evaluation of product. Quality evaluation of raw materials. Quality evaluation of product for colours, size, shape. Sensory evaluation of product for taste. Market testing of products. Evaluation of food standards. Determination of color by using Lovibond tintometer. Visit to food factory to know sensory evaluation problems. Consumer study for food quality. Visit to fruit & Vegetable market for quality assessment.

FT/DT-223 Plant Management & Pollution Control 2 (2+0) Sem. II

UNIT-1

Production Management. Definition, Function and structure of Production Management, Production planning & Control, Work study and measurement motion and time study, Plant Operations. Efficiency factors losses, Financial and Managerial efficiency Provision for Industrial Legislation in India, Particularly in dairy industry.

UNIT-2

Personnel Management. Manpower planning, recruitment, training, transfer, promotions policies, Job specifications, Job evaluation, Job enhancement, Job enrichment, MBO, working conditions.

UNIT-3

Safety hazards, hazards prevention security for plant machinery and the employees, Plant Maintenance. Prevention & Break-down maintenance Spare parts inventory, tools & lubricants etc.

UNIT-4

Food hygiene, personnel hygiene, plant hygiene, water quality etc. Cleaning and Sanitation – different type of cleaning and sanitizing agents, Effluent treatment: Type, degree and treatment of waste.

Practical :Flow process charts of different milk products. Identification of steps of material losses on Dairy plants. Identification of hazardous processes and equipments, safety and precautions. Identification and uses of common lubricants. Waste Utilisation processes. Various treatments in waste disposal. Analysis of cleaning agents and sanitizers. Reports and records maintenance of dairy plant. Operational precautions. CIP cleaning

FT/DT-224 Environmental Studies 3(2+1)

Sem. II

UNIT-1

The Multidisciplinary nature of environment studies: Definition, Scope and importance, Need for public awareness. Natural Resources: Renewable and non renewable resources: Natural resources and associated problems: forest resources: Use and over exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. Water resources: Use over utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Mineral resources: Use and exploitation, environmental effects of existing and using mineral resources, case studies. Food resources: World food problems, changes caused by agriculture and overgrazing effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources, case studies. Land resources: Land as a resources, land degradation, man landslides, soil erosion and desertification. Role an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyle.

UNIT-2

Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem, Producers, Consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids. Introduction, types, characteristics features, structure and function of the following ecosystem- forest ecosystem, grassland ecosystem, desert ecosystem, aquatic ecosystems (ponds, streams, lakes, rivers, oceans, and estuaries).

Biodiversity and its conservation: Introduction- definition: genetic, species and ecosystem diversity. Biogeographically classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels. India as a mega diversity nation. Hot spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In situ and Ex-situ conservation of biodiversity.

UNIT-3

Environmental Pollution: definition, causes, effects and control measures of- Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards. Solid waste management : causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Role of an individual in prevention of pollution. Pollution case studies. Disaster management: floods, earth quake, cyclone and landslides. Social issue 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 problems and concerns case studies.

UNIT-4

Environment ethics: issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. Wasteland reclamation. Consumerism and waste products. Environment protection act. Air act. Water act, wildlife protection act, forest conservation act, issues involved in enforcement of environmental legislation. Public awareness. Human population and the environment: population growth, variation among nations, population explosion-family welfare programme, environment and human health, human rights, value education, HIV/AIDS, women and child welfare, role of information technology in environment and human health, case studies.

Practical : Visit to a local area to document environmental assets- river/forest/grassland/hill/mountain, Visit to local polluted site- Urban/Rural/Industrial/Agricultural, Study of common plants, insects, birds, Study of simple ecosystems-pond, river, hill slopes etc, Case studies under different units.

FT-225 Extrusion Technology2(1+1)

Sem. II

UNIT-1

Food proteins; Types, sources, Availability, need, properties etc. Food problems, Role, Means for increasing food supply. Amino acid fortification of foods ; Cereals, infant foods, bread, baked products.

UNIT-2

Legumes and oilseed foods ; Isolate, concentrate, and substitute to milk, variation in composition and nutritive value. Meat Analog; Commercial development, nutritional aspect, marketing aspect. New protein foods; TOFU, Miso, Texturized vegetable protein, hydrolyzed vegetable protein, formulation and quality control.

UNIT-3

Extrusion Technology; Importance, principles of extrusion cooking, methods of extrusion cooking. Extruders; Types of extruders, single screw, twin screw their applications, effect of dependent and independent variables on the product quality.

UNIT-4

Extruded products; Raw materials, process of manufacture, properties, quality, evaluation, packaging requirement, marketing.

Practical: Physicochemical properties, functional properties of proteins, protein rich products, weaning foods, beverages, Texturized Products, Protein rich bakery products, Type of food extruders, preparation of extruded products, Factors affecting extrusion cooking, Moisture content, Diameter, Temperature, Pressure, screw speed, time, quality evaluation of these products.

FT-226 Processing of Spices and Plantation Crops

2(1+1) Sem. II

UNIT-1

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) Chill (4) Turmeric (5) Onion and garlic (6) Pepper (7) Cardamom (8) aercanut, cashew nut, coco nut.

UNIT-2

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.

UNIT-3

Tea- Types, Processing, quality control. Coffee& Cocoa: Processing. Vanilla and annatto-processing.

UNIT-4

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.

Practical: Identification and characterization of flavouring compounds of spices. Valuable oil determination.Extraction of oil from clove, pepper, cardamom-chili. Extraction of oleoresins-Turmeric, ginger, pepper, clove. Piperine estimation in pepper oleoresin.Steam distillation of spices.Determination of curumin content in turmeric. Chemical analysis of spices moisture, valuable oil, specific gravity, refractive index ,acid value. Study of standard specification of spices.Packaging study of spices.Preparation of curry powder. Visit to spice Industry

III Year I Semester B.Tech. (Food Technology)

Course No.	Title	Credit
FC-311	Technique of Food Analysis	1+2
FE/DE-311	Instrumentation & Process Control	2+1
FE-312	Food Processing Equipment-II	2+1
FM/DM -311	Food & Dairy Biotechnology	2+1
FT/DT-311	Sensory Evaluation	2+1
FT-312	Specialty Food	2+1
FBM/DBM-312	Computer Programming	1+1
Seminar-311	Seminar	0+1

FC-311 Techniques in Food Analysis 3(1+2) Sem. I

Unit-I

Nature and concepts of food analysis; Rules and regulations of food analysis, Safety in laboratory, sampling techniques. Principles and methodology involved in analytical techniques: PH Meter and use of ion selective electrodes –Spectroscopy,Ultra violet visible, florescence, Infrared spectro, Atomic absorption and emission, Mass spectroscopy, Nuclear magnetic resonance and electron spin resonance.

Unit-II

Chromatography –Adsorption, Column, Partition, Gel-filtration, Affinity, Ion-exchange, Size-exclusion method, Gas liquid, high performance liquid chromatography.

Unit-III

Separation techniques-Dialysis, Electrophoresis i) Paper ii) DS gel electrophoresis iii) Immuno electrophoresis Sedimentation, ultrafiltration, ultracentrifugation, Iso-electric focusing, Isotopic techniques, Manometric techniques. Principles and methodology involved in analysis of foods; Rheological analysis, Textural profile analysis of foods.

Unit-IV

Immuno assay techniques in food analysis; Isotopic and Non-isotopic immuno assay, Enzyme-immuno assay. Evaluation of analytical data ; Accuracy and precision, Statistical significance, Co-relations regression, Computers for data analysis and result interpretation. Sensory analysis of food; Objective method, Objective method.

Practical:

Analysis of heavy metals using atomic absorption spectrophotometer.

Estimation of phytic acid using spectrophotometer.

Separation of amino acids by two-dimensional paper chromatography.

The identification of sugars in fruit juice using TLC.

Separation of pralines by Ion-exchange chromatography.

Molecular weight determination using sephadox-gel. I

dentification of organic acids by paper electrophoresis.

Gel-electrophoresis for analytic techniques.

Quantitative determination of sugars and fatty acid profile by GLE.

FE/DE-311 Instrumentation & Process Control 3(2+1) Sem.I

Unit I

Absolute and secondary instruments, Types of secondary instruments, Essentials of indicating instruments, Constructional details of indicating instruments. Principle of induction type instruments- shaded pole method and two pole methods, compensation for frequency and temperature errors. Induction type voltmeter, Ammeter, advantage and disadvantages, induction type single phase watt hour meter , their errors and remedies, Numerical, wattmeter, power fractometer, etc.

Unit II

Characteristics of Instruments and Measuring Systems: Elements of generalized measuring system, static calibration, accuracy, sensitivity, reproducibility, static errors, dead zone, drift in measuring instruments. Analog and digital representation of signals,.

Unit III

Factors influencing the choice of Transducers. Mechanical Input Transducers: Level, Pressure, Flow, Velocity and Humidity- Resistive, Capacitive and Inductive, Dielectric system for humidity measurements. Temperature

Unit IV

Transducers: Resistive, inductive, capacitive and thermoelectric transducer. Magnetic Transducers: Systems based on induction and magnetic effects on moving charges, Transducers based on permeability variation.

Practical :Preparation and calibration of thermocouple; study the construction and working of Bourden pressure gauge. Study the mechanism of pH meter and its electrodes. Study a pressure transducer. Study a Proximity sensor. Study of the different parts and working of Rotameter. Study the different parts and working of pressure switch. Study the different parts of an indicating instrument. Study the different parts and their working of single phase induction type watt-hour meter. Visit to a microprocessor controlled dairy plant.

FE-312 Food Processing Equipment-II 3(2+1) Sem. I

Unit I

Mechanical Separations: Centrifugation, liquid-liquid centrifugation, liquid- solid centrifugation, clarifiers, desludging and decanting machines. Filtration: Principles involved in filtration. Pressure and vacuum filtration. Expression: batch and continuous type. Baking, Roasting and Frying equipment. Extraction and Leaching, Crystallization and Distillation: Basic principles involved.

Unit II

Water activity and states:Raoult's Law. Water sorption Isotherms - Hysteresis. Water activity measurement method. Water binding and its effect on enzymatic and non-enzymatic reactions and food texture. Control of water activity and moisture. Permeability: Theoretical considerations. Permeability of gases and vapours. Permeability of multilayer materials. Permeability in relation to packaging requirement of foods. Shelf life : Calculation of shelf life. shelf life requirements,

Unit III

Deteriorative reactions. Accelerated testing. Transport properties of barriers. Simulations of product - package environment interaction. Shelf life simulation for moisture, oxygen, and light sensitive products. Freezing of Foods : Types of freezers including, ice cream freezers, Freeze concentration and freeze drying. Freezing curves, phase diagrams, methods of freeze concentration, design problems. Membrane processes : Ultra filtration, Reverse osmosis, Electrodialysis, per-evaporation and micro filtration.

Unit IV

Cleaning and sanitation of food equipments and contains: can, crate, bottle, washing, CIP and COP cleaning. Microwave and Dielectric & Infrared heating :Physical parameters. Heat transfer phenomenon. Equipment and application. Irradiation - Principle and its equipments, Blending and pulverization equipments.

Practical: Lab demonstration on state of water. Demonstration of equilibrium sorption isotherms. Determination of gas transmission rate. Determination of Water vapour permeability of packages. Evaluation of properties of films to determine their suitability as containers for foods. Shelf life calculations for food products. Study of freezers. Study of CIP plant.

FM/DM-311 Food and Dairy Bio-Technology 3(2+1) Sem.I

UNIT-1

Definition, scope and historical development of biotechnology, achievement and future application: structure of DNA and RNA.

UNIT-2

DNA replication, protein synthesis, genetic code, mutations: Vectors, cloning strategies in bacteria and animals, DNA technology.

UNIT-3

Protoplast fusion & Tissue culture in dairy cultures. Application of biotechnology in food and dairy industry, dairy effluents.

UNIT-4

Genetic manipulation of dairy starters for improved attributes of commercial value. Dairy enzymes and whole cell immobilization. Ethical issues related to use of genetically modified foods.

Practical :

Visit to bio technology lab , Mutant isolation by replica plating technique, .Mutant isolation by gradient technique, Isolation of plasmid and genomic DNA from bacteria , Preparation of competent cell, Transformation by conjugation in E.coli, PCR technique demonstration ,Testing the anti microbial activity of the culture & culture filtrate

FT/DT-311

Sensory Evaluation

3(2+1)

Sem.I

UNIT-1

Introduction: Introduction to sensory evaluation and rheological measurements of food & food products. Definition and importance of sensory evaluation in relation: to consumer acceptability and economic aspects. Role of primary sensor in sensory evaluation of food. Factors affecting food acceptance and Terminology related to sensory evaluation.

UNIT-2

Requirements of sensory evaluation. Basic principles: Senses and sensory perception, Mouth food characteristics of the food product. Physiology of sensory organs, Classification of tastes and odours, threshold value factors and affecting senses, visual, auditory, tactile and other responses. Methodology of flavour evaluation, physical, chemical and sensory methods.

UNIT-3

Fundamental rules for scoring and grading of food and food products. Procedure of quality: Panel selection, screening and training of judge. Factors influencing sensory measurements. Sensory tests- Types of tests paired comparison, due-trio and triangle test, ranking, scoring and Hedonic scale and descriptive tests.

UNIT-4

Sensory evaluation of meat & poultry product, fish & fish product, processed foods, bakery & confectionary product, fruit & vegetable products, milk & milk products. Packaging for better preservation of sensory quality of processed food. Tristimulus colour measurement in foods. National & international standards for sensory evaluation. Setting up of a quality evaluation lab.

Practical: Determination of threshold value for basic tastes, Determination of threshold value for various odours , Sensory evaluation of flavoured foods, Selection of judging panel, Training of judges, Judging & grading of canned food products , Judging & grading of juices,squash& concentrate, Judging & grading of pickles &marmalader,.Judging & grading of meat & meat products,Judging& grading of milk & milk products i.e. Butter,Ghee,Cheese& icecream

FT-312

Specialty Food

3(2+1)

Sem. I

UNIT-1

Need and scope of specialty foods: Specialty food based on ease in preparation cost health benefits; Functional foods, Convenience food, Health care and medical benefits, Nutritional status, Low cost foods.

UNIT-2

Specialty foods based on sources; Cereals and millets, Legumes and pulses, Fruits and vegetables, Animal food sources, By product based, Non conventional foods. Specialty foods based on process; Innovative process technology, Food additives basis, bioactive components, Novel nutraceuticals products, Packaging techniques, Adaptable technology basis, fast and PET foods.

UNIT-3

Specialty food based on genetics; genetically modified foods, transgenic foods, Biotechnological aspects of detoxification. Proprietary foods.Supplementary foods.Specialty foods based on growing condition - organic, inorganic farming.

UNIT-4

Therapeutic foods; Modification of diets in disorders, feeding purposes Disease oriented of different organs ex: digestive tract, liver, cardiovascular system, kidney, metabolic disorders, allergy, endocrine disorders. Specific consumer oriented foods; Defence persons, Space astronaut, High altitude mountain climbers, Disaster situation – crises, care, maintenance.

Practical: Preparation of specialty foods based on ; Functionality, Convenience, Low cost, Nutritional purpose. Preparation of specialty food using locally available foods crops, fruit and vegetables few products. Assessment of byproduct for preparation of value added specialty food. Isolation of phytochemical/ bioreactive agent of plant sources and their utilization in proprietary foods. Preparation of specialty food as per requirement of; Location, Nature of work, Status of worker. Evolution of food cultivated under organic conditions.

UNIT-1

Problem solving with computers, flowchart and algorithm development

UNIT-2

Data types variables, constants, arithmetic and logical expressions

UNIT-3

Input/output statements, conditional statements, control structures

UNIT-4

Arrays, functions, structures, unions.

Practical : Understand different Components of Computer System. Write a C program to calculate volume of a prism having trapezoidal base. Write a program, which can input a positive integer (≤ 10000000) and print it in reverse order. For example 9875674 to 4765789. Write a program to calculate sum of squares of all odd integers between 17 to 335. Exclude integers divisible by 7. Ohm's law is $I=V/R$, Write a program to calculate I from given n sets of V and R. Write a program e to generate the Cartesian coordinates of points (x,y for the values of ranging from 0,5,10,15 ----- 90. title and label the output. Write a program to calculate the resultant focal length f, when f1 and f2 are placed in contact. Used formula is $f= (f1+f2)/(f1xf2)$. Compute for following pairs of focal lengths. F1= 10,-8,-6,-1 +8, +10; f2= 0.5,-0.4, +0.4, +0.5 Write a program to sort an array of N elements in ascending order. Write a program to evaluate following series to calculate $\cos x$
 $\cos x= 1x^2/2+x^4/4+x^6/6+ \dots$ Compare the calculated value with the one by using library function. Write a program which reads in indefinite number of Name, Marks1, Marks2, Marks3 from keyboard and store them in a file along with total marks, Percentage marks and Grade in a file.

III Year II Semester B.Tech. (Food Technology)

Course No.	Title	Credit
FE/DE-321	Principles of Dairy and Food Machine Design	2+1
FE/DE-322	Food & Dairy Plant Design & Layout	2+2
FM-321	Food Safety And Microbiological Standards	2+1
FT-321	Egg, Fish & Meat Technology	3+1
FT-322	Quality Assurance and Certification	2+1
FBM/DBM -321	Business Management & International Trade	2+0
FBM/DBM-322	Entrepreneurship Development & Communication Skill	1+1
FBM/DBM-323	IT Application in Dairy & Food Industry	1+1

DE/FE- 321 Principles of Dairy and Food Machine Design 3(2+1) II

Unit I

Basic concepts in Statics and Dynamics. Force Systems. Equilibrium condition, friction, Law of friction, Second moments of inertia, Parallel axis theorem. Dynamics : Equation of motion.

Translation and rotation of a Rigid body, work and mechanics of materials : Stress-Axial Load classification Strain-Hooke's law, stress-strain diagram, Poisson's Ratio : Shearing Stresses. Torsion, Torsion formula, Angle to Twist of circular members. Power transmission shear force and bending moments, Shear in Beams, Bending Moment in beams.

Unit II

Pure bending of beams, Flexural stress shearing stresses in beams relations between centre, Torsional and flexural loads. Machine Design : Procedures, Specification, strength, design factor, factor of safety selection of factor of safety.

Unit III

Materials and properties. Static strength, ductility, hardness, fatigue, designing for fatigue conditions. Theories of failure, Stresses in elementary machine parts, Design of a drive system. Design of length and thickness of belt. Bearing : Journal and Anti-friction bearings. Selection of ball, tapered roller and thrust bearing. Springs, helical and leaf springs. Energy stored in springs. Design and selection of springs.

Unit IV

Strength of material – engineering materials, material science, use of various metals, including plastic glass, etc. in food industry, selection and specification – material design, concepts and manufacturing of various equipments and machineries for food processing plant – characteristics properties and uses of common building materials i.e. stone, brick, lime, cement, paints and varnishes etc.

Practical: Engineering Statics & Dynamics. Work and Energy. Linear and Angular Momentum. Stress-strain diagram evaluation of elastic constants. Power transmission. Shear force and bending moment diagrams. Flexural stresses. Shearing stresses in Beams. Fits and tolerances. Design stresses in elementary machine parts. Design of shafts, axles keys Springs, Couplings, Bearing. Studies of building material, property and characterization. Studies on engineering materials. Construction and properties. studies of machine design of food processing plant.

DE/FE-322

Food & Dairy Plant Design and Layout 4(2+2)

Unit I

Introduction of Dairy & Food Plant design and layout. Type of products, perishable nature of milk, reception flexibility. Classification of dairy & food plants, Location of plant, location problems, selection of site.

Unit II

Dairy building planning, Process schedule, basis of dairy layout, importance of planning, principles of dairy layout. Space requirements for dairy & food plants, estimation of service requirements including peak load consideration. General points of considerations for designing dairy & food plant, floor plant types of layouts, service accommodation, single or multilevel design. Arrangement of different sections in dairy & food plants, sitting the process sections, utility/service sections, offices and workshop.

Unit III

Arrangement of equipment, milk piping, material handling in plants, Common problems, office layouts-flexibility. Development and presentation of layout, model planning, use of planning table in developing plot plan and detailed layout.

Unit IV

Choice of building construction materials, floors, general requirement of dairy floor finishes, floors for different section of dairy & food plant. Foundations, walls doors and windows, Drains and drain layout for small and large dairies. Ventilation, fly control, mold prevention, illumination in dairy & food plants.

Practical: Building symbols and convention layouts for small, medium and large size dairy & food plants. Design and layout of: Milk collection/chilling centre; Fluid milk plant (small, medium and large); Single product dairy (i) Cheese, (ii) ice-cream, (iii) butter and (iv) ghee. Composite dairy & food plant. Vegetable processing plant, fruits processing plant, multi product food plant.

UNIT-1

Dietary Toxins: Naturally occurring in food- Endogenous toxin, exogenous toxin. Microbial toxins ; i) Bacterial, ii) Mold.

UNIT-2

Intrinsic toxin produced during processing and storage. Metal as toxin – sources, conditions, causes and Elimination.

UNIT-3

Pesticidal residues as toxin ; i) chlorinated ii) Non – chlorinated. Non – Permitted food additives.

UNIT-4

Microbial standards of processed and preserved foods. Risk assessment and management during food preparation.

Practical : Estimation bacterial toxins from food samples.(Different types of foods). Estimation of fungal toxins from food samples. (Different types of foods). Heavy metal detection (lead) .Risk assessment and management determination. HACCP for food industries by taking few models. Study of national and international microbial quality standards. Visit to export oriented food processing industry.

FT-321 Egg, Fish & Meat Technology 4(3+1) Sem. II

UNIT-1

Sources and developments of meat and poultry industries in India and importance of meat and meat industries in national economy. Muscle structure, chemical composition and physico-chemical properties of meat muscle.

UNIT-2

Abattoir design and layout.Pre-slaughter transport & care and anti mortem inspection. Slaughtering of animals and poultry, post-mortem inspection and grading of meat. Factors affecting post-mortem changes, properties and shelf life of meat.

UNIT-3

Egg structure: Composition, quality characteristics, processing and preservation of eggs. Processing and preservation of meat- mechanical deboning, aging or chilling, freezing, pickling, curing, cooking and smoking of meat. Meat tenderization. Meat emulsions. Technology of manufacture of meat and poultry products.Meat plant sanitation and safety.By-products utilization.

UNIT-4

Types of fish, composition, structure and post mortem change in fish and quality evaluation. Handling of fresh water fish.Processing and preservation of fish canning, smoking, chilling and freezing of fish.Salting, sun drying and salt curing of fish.Fish sausages Freeze-drying of fish/shrimp.Radiation processing and safety. Fish fermented products. Fish protein concentrates.Marine oils and fish meals.Marine algal products.Production of fish and sea foods & utilization fish by-products.MFPO and BIS specifications of fish and fish products.

Practical: Pre-slaughter operations of meat animals and poultry birds. Slaughtering and dressing of meat animals.Study of post-mortem changes.Meat cutting and handling.Evaluation of meat quality.Preservation of meat by different methods and preparation of meat and poultry products.Evaluation of quality and grading of eggs.Preservation of shell eggs.Experiments in by-products utilization.Anatomy and dressing of fish.Quality evaluation of fish. Preparation of sun dried and salt cured fish, fish sausages. Chilling and freezing of fish. Preparations of fish protein concentrate.Preparation of fishmeal.Preparation of marine oils and various fish products.Utilization of fish by-products.Preparation of marine algal products.

FT-322 Quality Assurance and Certification 3(2+1) Sem. II

UNIT-1

Quality inspection, quality control, quality management and Quality Assurance.

UNIT-2

Total quality management; Good Manufacturing Practices, Good Agricultural Practices, Good Laboratory Practices, Quality Management systems QSS. Quality Circles, SQC., ISO System.

UNIT-3

HACCP, Principles, Implementation. Plan Documentation, types of records.Auditing, Surveillance; Audit, Mock audit, third party quality certifying audit, Auditors and Lead auditors.

UNIT-4

Certification, Certification procedures, Certifying bodies, Accrediting bodies, International bodies.

Practical: Quality Assurance procedure. T&M, GMP, GAP documentation. Preparation Quality Policy & documentation (Quality Manuals). Preparation of Laboratory manuals. Application of HACCP to Products. Preparation of documentation and records. Auditing- Surveillance, Mock audit. Visit to units implementing GMP, GAP. Visit to units with ISO systems. Visit to units with HACCP certification.

FBM/DBM-321 Business Management & International Trade 2(2+0) Sem.II

UNIT-1

Concept of marketing; Functions of marketing; concepts of marketing management; scope of marketing management; marketing management. Process; concepts of marketing- mix, elements of marketing- mix. Market Structure and Consumer Buying Behaviour: Concept of market structure, marketing environment, micro and macro environments. Consumers buying behaviour, consumerism.

UNIT-2

Marketing Opportunities Analysis: Marketing research and marketing information systems; Market measurement- present and future demand ; Market forecasting; market segmentation, targeting and positioning. Allocation and marketing resources. Marketing Planning Process. Food and Dairy Products Marketing.

UNIT-3

Product policy and planning : Product-mix; product line; product life cycle. New product development process. Product brand, packaging, services decisions. Marketing channel decisions. Retailing, wholesaling and distribution. Pricing Decisions. Price determination and pricing policy of milk products in organized and unorganized sectors of dairy industry. Promotion-mix decisions.

UNIT-4

Advertising; How advertising works; Deciding advertising objectives, advertising budget and advertising message; Media Planning; Personal Selling, Publicity; Sales Promotion. Food and Dairy Products Marketing. International Marketing and International Trade. Salient features of International Marketing. Composition & direction of Indian exports; International marketing environment; Deciding which & how to enter international market; Exports- Direct exports, indirect exports, Licensing, Joint Ventures, Direct investment & internationalization process, Deciding marketing Programme; Product, Promotion, Price, Distribution Channels. Deciding the Market Organization; World Trade Organization (WTO)

FBM/DBM-322 Entrepreneurship Dev. & Communication Skill 2(1+1) Sem.II

UNIT-1

Communication Skills: Structural and functional grammar; meaning and process of communication, verbal and non-verbal communication; listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures.

UNIT-2

Reading and comprehension of general and technical articles, précis writing, summarizing, abstracting; individual and group presentations, impromptu presentation, public speaking; Group discussion. Organizing seminars and conferences.

UNIT-3

Entrepreneurship Development: Assessing overall business environment in the Indian economy. Overview of Indian social, political and economic systems and their implications for decision making by individual entrepreneurs. Globalisation and the emerging business / entrepreneurial environment. Concept of entrepreneurship; entrepreneurial and managerial characteristics; managing an enterprise; motivation and entrepreneurship development; importance of planning, monitoring, evaluation and follow up; managing competition; entrepreneurship development programs; SWOT analysis, Generation, incubation and commercialization of ideas and innovations.

UNIT-4

Government schemes and incentives for promotion of entrepreneurship. Government policy on Small and Medium Enterprises (SMEs) / SSIs. Export and Import Policies relevant to horticulture sector. Venture capital. Contract farming and joint ventures, public-private partnerships. Overview of horti inputs industry. Characteristics of Indian horticultural processing and export industry. Social Responsibility of Business.

Practical: Listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures. Reading and comprehension of general and technical articles, précis writing, summarizing, abstracting; individual and group presentations.

FBM/DBM-323 IT Application in Dairy & Food Industry 2(1+1) Sem.II

UNIT-1

Importance of Computerization and IT in dairy industries.Computers,

UNIT-2

Operating.Environments and Information Systems for various types of dairy Industries, Principles of communication.Role of Computer in Optimization; Introduction to Operation.Research. A Computer Oriented Algorithmic approach: Queuing systems and waiting models, PERT CPS and CPM.

UNIT-3

Dairy Process Modeling and Simulation.Introduction to SCADA & INTELUTION. CAD and CAM in Dairy Industries: Instrumentation, Process control.

UNIT-4

Inventory control, Automation, Robotics, Expert Systems and Artificial Intelligence, Instrumentation

Practical: Applications of MS Excel to solve the problems of dairy technology: Statistical quality control, Sensory evaluation of food. Chemical kinetics in dairy processing.Use of word processing software for creating reports and presentation. Familiarization with the application of computer in dairy industries: Milk plant, Dairy units, Fruit & Vegetable processing unit. Familiarization with software related to dairy industry. Visit to Industry and knowledge of computer application in the same

IV Yr. I Semester B.Tech.(Food Technology)

	Experiential Learning and Hands on Training	5+20
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IV Yr. II Semester B.Tech.(Food Technology)

	In Plant Training	5+25
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