SEMESTERWISE DETAIL SYLLABUS

SEMESTER I

(AP101) MATHEMATICS-I **Credit 3(3+0)**

Differential Calculus: Indeterminate forms, curvature, Taylor's Series expansion, Asymptotes -Partial differentiation: Euler's theorem, Taylor's series for Function of two variables, Maxima- Minima for Function of two Variables, Lagrange's multiplier.

Integral Calculus: Application of intervals, Double and triple integrals, Gamma and Beta functions

Infinite series: Convergence and Divergence of Series, tests of Convergence Alternating Series, Absolutely and Conditionally Convergent Series, Uniform Convergence.

(AP102) ENGINEERING MECHANICS **Credit 3(2+1)**

Composition and resolution of coplanar forces: Equilibrium of a force system under coplanar forces. Moments and couples. Equilibrium of rigid bodies under coplanar forces. Analytical and graphical methods.

Simple and perfect pin-jointed trusses and frames : Determination of support reactions and member forces. Method of joints, method of sections and graphical methods.

Centres of gravity of plane and composite sections : Moments of inertia. Centre of mass and mass moment of inertia. Relevant theorems.

Flexural members : Simple beams. Types of loads and support condition, shear force and bending moment. Relation between shear force and bending moment. Diagrams for axial force, shear force and bending moment for beam.

Equilibrium of systems with friction : Rough inclined plane, ladder, bearings, screw, simple lifting machines like screw jacks. Low of a machine and its efficiency. Reversible and non reversible machines.

Dynamics of a particle : Equations of motion. Newton's second law and D'Alembert's principle. Impulse and momentum, work power and energy. Laws of Conversion of energy and momentum.

Rigid bodies in linear and rotational motions : Super elevation. Fly wheels engineering problems. Concepts of balancing of rotating masses.

Vibration of simple mechanical system like springs : Free end damped vibrations. Natural frequency and resonance.

Elasticity : Hooke's law, axial and lateral stresses and strains. Poisson's ratio. Relations between moduli of elasticity and rigidity, and bulk modulus. Stepped and tapered bars. Composite sections. Temperature stresses.

(AP103) INTRODUCTION TO FOOD ENGINEERING Credit 3(2+1)

Present state of Food Industry in India and Abroad: Prospects for future growth in India.

Classifications and compositions of food: Plant foods-Cereals and Millets, Legumes and Pulses, Vegetables fruits, nuts and oilseeds, condiments and spices. Animal foods – eggs, milk and its products, meat and meat products, poultry sea foods. Soft drinks. Semi Processed and ready to eat food.

Introduction to units operation and equipment and machinery deployed in food processing industry : Cleaning, grading, decorticating, disinte-grating, trimming, peeling, cutting balancing, pulping, size reduction, separation.

Drying evaporation : Forming, heat exchangin, mixing, distillation, extraction, filteration, and centrifugation, material handling, pumping and packaging.

Food deterioration : Deterioration of food by micro organisms, food enzymes, insects, parasites and rodents, temperature, moisture, oxygen, light and time.

Food preservation and processing : Preservation and processing by heat, cold, chill storage, deep freezing, drying, concentration, fermentation radiation. Effect of heat and cold on micro organisms.

Marketing of foods and foods product and statutory laws and requirements of foods.

(AP104) LANGUAGE & COMMUNICATION SKILL Credit 2 (2+0)

Introduction: Importance of language and communication skills in the engineering profession.

Spoken and conversional English: Main features; agreement, disagreement, likes, dislikes and enquiries; debate and discussion.

Basic sentence patterns in English: agreement between subject and verb; proper use of pronouns, adjectives and adverbs; proper use of phrases and clauses. Some basic rules of composition.

Concept of register; development of vocabulary; reference skills – dictionary, thesaurus, indexing, contents, glossary; reading of selected texts and discussion; vocabulary building tasks.

Note-taking and note-making; linkage, development of paragraphs; cohesion, coherence and style.

(AP105) ENGINEERING DRAWING & GRAPHICS Credit 2(1+1)

Construction and use of scales, lettering, construction of plane geometrical figures, parabola, hyperbola and ellipse, special plane curves, cycloid, epicycloids, hypocycloid, involutes and spirals, helix and simple loci, orthographic projection of points, lines, their traces and inclination, projection of solids like prism, cylinder, cone, pyramid meter section and development of solids. Construction of isometric scales, isometric projections of simple objects, selection of solids and developments of surfaces.

(AP106) BASIC CIVIL ENGINEERING Credit 3(2+1)

Role of Civil Engineering in the field of engineering, technology and infrastructure.

Elements of surveying: Surveying and levelling – definition; geodetic survey and plane survey; scales, plans and maps. Chain survey; traverse survey; compass traverse survey.

Levelling: General terms used in leveling. Methods of leveling. Contour survey. Area measurement by a planimeter.

Elements of building construction : Materials of construction,; building components and their requirements; building systems; design loads. Building drawing conventions; plan, elevation and section. Elementary building bye-laws; building classification.

Elements of transportation engineering: Environment and ecosystem; water quality criteria; domestic and industrial wastes and treatment, Air and Energy related pollution, Solid waste management, Environmental protection and legislation.

(AP107) BASIC MECHNICAL ENGINEERING Credit 2(1+1)

Introduction and scope: Basic materials of manufacture, their properties and applications.

Measuring and gauging: Basic measuring instruments and gauges.

Metal bench work and wood working: Tools, processes and their applications. Wood working machines.

Principles and applications of conventional manufacturing processes : Foundry, special casting, welding, rolling, forging, extrusion, wire drawing, sheet metal working metal machining. Introduction to non-conventional manufacturing processes. Surface treatment and finishing processes.

Plastics : Properties, applications and processes.

Engineering drives : Fundamentals of belt, rope and chain drives; gears and gear trains, reciprocating and intermittent drives; Bearing, clutches and brakes.

Internal combustion engines : Classification; working of petrol and diesel engines; performance characteristics.

Steam Generators : Fire-tube, water-tube and package boilers; boiler mountings and accessories.

Introduction to steam and gas turbines, condensers, air compressors and vacuum pumps

Introduction to refrigeration and air-conditioning systems.

(AP108) GENERAL CHEMISTRY **Credit 2(1+1)**

Physical Properties of Liquid : Refractive Index, Surface tension, Viscosity, Optical Rotation, Effect of temperature on the properties.

Phase Rule : Explanation of terms involved in phase rule. Fractional distillation of ideal and non-ideal solutions containing two volatile liquids. Azeotropic mixture of Ethanol, Partition law, Crystallization.

Adsorption : Types of Adsorption and their characteristics, Freundlich, Langmuir and Gibbs's adsorption isotherms, Ion-Exchange resins; application.

Colloids : Types of colloidal systems; Methods of preparations of sols and emulsions, dialysis, Optical properties, Electrophoresis; application.

pH : pH scales : Measurement methods; Electrodes of pH meter.

SEMESTER II

(AP201) MATHEMATICS-II **Credit 2(2+0)**

Partial Derivatives: Partial differentiation, total differentials and its application to errors and approximation, total derivatives, chain rule, Taylor's and Maclaurin's series for functions of two variables, Euler's theorem, maxima and minima, methods of Langrange's multipliers.

Multiple Integrals: Double Integral, Evaluation, Change of order of integration, change to polar co-ordinates, evaluation of triple integral, multiple integral in cylindrical and spherical polar coordinates, application to finding area and volume.

Vector Calculus: Vector and scalar fields, vector differentiation, gradient, divergence, curl. Line, surface and volume integrals, Gauss, Stoke's and Green's theorem (without proof), applications.

Integral functions: Gamma, Beta and error functions – definitions, their relationships and properties. Elliptic integral of first and second kind.

(AP202) FLUID MECHANICS **Credit 3(2+1)**

Fluid Properties : Definitions of a fluid, continuum, properties of fluid density, specific weight, specific volume, specific gravity, bulk modulus of elasticity, vapour pressure, surface tension, capillary, viscosity, dynamic and kinematic viscosity.

Fluid statics : :Pressure at a point, basic equation of fluid statics, units and scales of pressure measurements, pressure measurements, forces on immersed plane and curved surface, buoyant force, stability of floating and submerged body.

Relative equilibrium, uniform linear acceleration of a liquid in horizontal and vertical direction.

Fluid-flow concepts and basic equations : Flow characteristics, definitions, concepts of system and control volume. Continuity equation. velocity potential and stream function, flow net, circulation vortex flow, Euler's equation of motion along a stream line, integration of Euler's equation of motion. Bernoulli equation, reversibility, irreversibility and losses. Application of energy equation to steady fluid flow situation. Orifice meter, venturimeter, nozzle meter, pitot tube, notches and weirs. Momentum equation orifice and mouthpiece, applications of linear momentum equation, moment of momentum equation.

Dimensional analysis and dynamic simlitude : Dimensions and unit, dimensional homogeneity and dimensional less ratios. The Pi Theorem, discussion of dimensionless parameters, similitude, models studies.

Viscous effects : Fluid resistance : Laminar incompressible steady flow through circular tubes. Reynold's number. Velocity distribution in turbulent flow. Resistance to turbulent flow in closed and open conduits, steady incompressible flow through simple pipe systems. Steady uniform flow in open channels, transport phenomena, boundary layer concepts, boundary layer growth over a flat plate. Boundry layer thicknesses, drag on immersed bodies.

Compressible fluid flow : Perfect gas relations, fundamental equations, continuity, energy and momentum equation, speed of a sound wave, Mach number, propagation of sound wave, stagnation properties, shock waves.

(AP203) FOOD CHEMISTRY **Credit 2(1+1)**

Moisture in Foods : Structure, Properties, Interactions, water activity and stablity, moisture determination

Lipids : Classifications, Structures, physical and chemiccal properties, rancidity and its taste, margarine and importacne in diets. Hydrogenation, lipolysis, auto oxidation, refining of oils, role of food lipids in flavour.

Carbohydrates : Carbohydrates : Functions , reactions and properties of simple and complex carbohydrates, selection of natureal or modified carbohydrates for incorporation in to processed foods.

Protein : Nutrietives and supplimentry value of food proteins, chemical reactions and interactions of amino acids and proteins, denaturation and its implications, functional properties of food proteins, modifications of food proteins in processing and storage and its implications

Pigments : Natureal pigments in foods and their retension in processed foods, certified colours and regulation aspects.

Minerals : Chemical properties, main elements and trace elements in different food flavour : flavouring constituents in foods, development of process and reaction flavour volatiles. Natural and synthetic flavourings.

Food Additives : Definitions, uses and functions of : acids, bases, buffer systems, salts and chelating/sequestering agents, masticatory substances. Low calory and non-nutrietive sweeteners, anti oxidents, emulsifying and stabilizing agents, anti caking agents, thickners, firming agents. Flour bleaching agents and bread improvers. Anti micro bial agents/class-I and class-II preservatives, clarifying agents.

(AP204) BASIC MICROBIOLOGY **Credit 2(1+1)**

Introductionof microbiology : Brief hystory and recent advances

Micro scopy : Principle and type of micro scopes. Staining and staining techniques. Reproduction in micro organisms

Microbial growth : Estimation of bacterial growth, factors affecting icrobial growth

Cultivation of micro organisms : Batch and continuous cultivation, nutritional requirements, type of media, isolation and enumeration of micro organisms. Micro flora of air, food, soil. Control of micro organisms- physical and chemical methods. Preservation of micro organisms. Introduction to microbial genetics.

(AP205) FOOD ENGINEERING & THERMODYNAMICS Credit 3(2+1)

Fundamental concepts and definitions related to thermodynamics :

Ideal and real gases : Concepts of ideal gas,characteristics equation of gas. Universal and characterstics gas constant. Enthalpy and specific heat, deviationof real gas from ideal gas, compressible factor and the VanderWaal's equation of state for real gas

Laws of thermodynamics :
Zeroth law : concepts of temperature. Equality of temperature, Zeroth law of thermodynamics.

First law : First law of thermodynamics. Concepts provesses, flow processes and control volume, flow work, steady flow energy equation, mechanical, mechanical work in a steady flow process, throttling process, application of first law to open systems.

Second law : Essence of second law, thermal reservoir, heat engines and thermal efficiency, COP of heat pump and refgerator, definition of available and non available energy, statement of second law, carnot cycle, Camot's theorem, Clausius in equality, concept of entropy, Entropy change for ideal gases

Thermodynamics relations : Maxwell's equations, thermodynamic properties relation for a pure substance, Joule-Kelvin effect, Clausius-Clapeyron equation, Gibbs phase rule, types of equilibrium, conditions of stability

Fuels and combustion : Solid, liquid and gaseous fuels, calorific value and its determination, air requirement for complete combustion.
Properties of pure substance (steam)

Psychrometric chart : Psychrometric parameters and their relationships, psychrometric properties of air. Mixing of air streams, heating and cooling processes, humidification and de-humidification processes.

(AP206) COMPUTER APPLICATION Credit 2(1+1)

Introduction to computer application packages, use of computer application software packages like windows base word processing, FOXPRO, LOTUS, Hardware graphics, MSOFFICE etc.

Introduction to C++, Information management such as DATA storage/ retrieval validation, security, manipulation presentation and report generation. Email, Network connections.

Practical:

Study of different Window Base software like word processing, hardware graphics, and statisticals packages.

Practical with FOXPRO, LOTUS.

Execute and prepare programme in C++.

(AP207) FOOD NUTRITION AND BIOCHEMISTRY Credit 3(2+1)

Enzymes : Nomenclature, classification and specificity of enzymes and co factors, enzyme kinetics. Factors affecting the rate of enzyme catalyzed reactions, regulations and control of enzyme action.

Application of enzymes in Food Processing : Endogenous enzymes and their roles in modification of foods, enzymes added to foods during processing – sources, conversions Catalyzed and specific applications

Vitamins and hormones : Classification, occurence, structure, steriod , hormones, relationship between vitamins and hormones in terms of their biological role.

Metabolic Pathway : Carbohydrates, proteins and fats, Catabolism and anabolism
Food and its functions, role of nutrients, effects of deefficient or excess intake of the individual essential nutrients. Recommendation dietry intakes and its uses. Factors affecting nutritional requirement of an individual.

General Causes of Loss of Nutrients : Nutritional changes during processing and storage and their implications on qualtiy of foods. Potentiality undesirable constituents foods. Restoration, enrichment, fortification and supplementation of foods

Digestion, Absorption : Assimilation and transport of nutrients in human beings
Balanced diets for individual. Therapeutic diets for people suffering various ailments and disorders. Functional foods.

(AP208) MACHINE DESIGN Credit 3(1+2)

Basic principles, materials & manufacturing consideration in design, marking stresses, fatigue and endurance limit, ISI codes, design of basic machine parts like shafts, keys, spines, couplings, lever etc, design of joints, design and selection of machine components like gears, bearings and belts, complete analysis. Design and drawing of simple machine units, factor of safety, stress concentration, riveted joint, cotter and knuckle joint.

SEMESTER III

(AP301) FOOD ENGINEERING UNIT OPERATION Credit 3(2+1)

Introduction: Structure and composition of food grains. Engineering properties of agricultural materials; physical, Mechanical and thermal properties.

Cleaning, Grading and separation: Screening; type of Screens; revolving; shaking; rotary; vibratory; horizontal; perforated metal, wire mesh; ideal and actual screen. Screen effectiveness; Air screen cleaners; Screen analysis; Fineness Modules; Crushing efficiency; Size reduction producers; Grading – Size, colour and specific gravity grading; Separation- Magnetic; Energy requirement in reduction.

Drying & Dehydration: Utility of drying; Equilibrium moisture content; heat of vaporization; Drying theory; Method of drying; Types of dryers.

Storage: Direct and indirect damages; Sources of infestation and control; Traditional, Improved and Modern storage structures;Storage of agricultural perishable; controlled and modified atmospheric storage,

(AP302) REFRIGERATION AND AIR CONDITIONING Credit 3(2+1)

Principles of refrigeration effect, carnot cycle, bell column cycle, vapour compression cycle, temperature-entropy diagram, pressure-enthalpy charts, effects of dry compression-wet compression under cooling, super heating, actual vapour compression cycle, vapour absorption cycle, electrolux, centrifugal and steam jet refrigeration systems, thermoelectric refrigeration systems, vortex tube and other refrigeration systems, ultra low temperature refrigeration.

Type and functions of air conditioning, physiological principles in air conditioning humidification and dehumidification, room dehumidifiers.

Calculation of cooling and heating loads.

Air distribution and duct design methods, fundamentals of design of complete air conditioning systems.

(AP303) ELECTRONICS AND INSTRUMENTATION Credit 2(1+1)

Electronic devices and their characteristics, study of rectifiers, amplifier, oscillators, operational amplifier, multivibrators, digital circuit, sequential and combination systems.

A/D and D/A conversion, Thyristors and their application. Modulation and inverters.

Introduction to microprocessor, programming of microprocessor, using assembly language, application of microprocessor in data acquisition and control of agricultural engineering processes.

Introduction to generalized instrumentation system, Absolute and secondary measurements, accuracy, precision, sensitivity and errors in measurements. Primary sensors and transducer. An instrumentation and measurement of humidity, temperature, moisture contents, fluid flow, pressure, force, strain, resistance strain gauges, torque.

(AP304) BIO-WASTE MANAGEMENT & RENEWABLE ENERGY Credit 3(3+0)

World Energy Resources; solution to energy problem

Fuel value, Biomass characteristics, Solar energy

Basic of solar energy availability, Solar Desalination, Solar cookers, Solar Refrigeration, Solar Dryer, Solar Ponds, Solar Water Heater, Solar Thermal Power Plant, Solar Photovoltaic, Solar Pumps.

Aerobic activated sludge process, Tricking filter, Aerated lagoons, Waste stabilization ponds, and anaerobic – Fludized bed filters, Up flow anaerobic sludge – blanket process (USABP) Fermebtation, Biomass Availability , Energy from biomass, Gasification, Biogas plants, Solid and liquid waste handling.

Need for waste management, Types of waste from food industries, concept of organic pollution and impect on stream quality, Economics of waste treatment plant

(AP305) PROCESS EQUIPMENT DESIGN Credit 3(3+0)

Materials for fabrication : Mechanical properties, materials, corrosion, protective coating , corrosion prevention linings for chemical plants and equipment. Choice of materials.

Design considerations : Introduction, stresses created due to static and dynamioc loads, design stress, elastic instability, combined stresses and theories of failure, fatigue, brittle fracture, creep, temperature effects, radiation effects, effects of fabrication method, economic consideration.

Design problems : Heat Exchangers, Pressure vessel design, Evaporators design, Agitators design and filters design.

Process Hazards and safety measures in equipment design : Introduction, hazards in process industries, analysis of hazards, safety measures. Safety measure in equipment design, pressure relief devices.

(AP306) TECHNOLOGY OF FOOD GRAINS Credit 3(2+1)

Supply chain of food grains, Hydrothermal treatment of grains, Physico-thermal properties, biochemical properties, physico-chemical properties, effect of different factors on the change of various properties.

Parboiling and milling of paddy, Quality characteristics, curing and ageing of rice, processed rice products.

Wheat and its quality characteristics for milling in to flour and semolina. Flour milling, Turbo grinding and air-classification. Flour grades and their suitability for baking purposes. Assessment of flour quality and characterization. Milling of Durdum wheat.

Dry and wet milling of corn, Starches and its conversion product, malting of barlely, pearling of millets.

Milling of pulses traditional dry milling commercial milling. Modern methods of milling.

Processing of oil seeds for direct use and consumption, oil expulsion and extraction oil and protein products. Processing of extracted oils Refining, hydrogenation. interesterification. Processing of deoiled cakes in to proteins concentrates and isolates. Textured protein products, Functional protein preparations.

(AP307) FOOD RHEOLOGY AND SENSORY EVALUATION Credit 2(2+0)

Introduction : Mechanical properties of foods, Mechanical models to visualize behavior of foods, basic and rheological considerations and their applications to foods.

Sensory characteristics of food : Color and appearance, texture and mouth feel, aroma overall taste.

Sensory evaluation methods : Sensitivity tests; Discrimination tests; Qualitative tests; Quantitative tests; Consumer tests; Score card development, Requirement of tests systems for measuring food texture, types of texture instruments and their operating mechanism, calibration, performance of test and measurement of test parameters. Interpretations of test result.

Rheological Attributes : Textural properties of fruits and vegetables; Dough, Pasta and baked products, dairy products. Meat and their instrumental measurement.

SEMESTER IV

(AP401) POST HARVEST ENGINEERING OF CEREALS, PULSES & OILSEEDS **Credit 3(2+1)**

Introduction to post harvest operation to process cereals, pulse, oilseeds moisture content, cleaning and separation. Principle, methods of parboiling, physical- chemical change during parboiling. Nutritional and cooking qualities. Grain milling operations. Rice milling, milling of wheat, corn, pulses and spices. Handling equipment for a grain market. Indigenous and modern oil extraction process and machinery. Developments in oil extraction. Utilization of by products of cereals, pulses, oil seeds and spices. Packaging of cereals, pulses and oil and their products.

(AP402) SEED TECHNOLOGY AND PROCESSING **Credit 3(2+1)**

Seed Production technology: General Principles, Nucleus and seed Foundation and certified seed hybrid seed testing: sampling for purity, germination, viability, vigour-procedure and standard techniques.

Factors affecting viability and vigor of seed. Heat and Moisture damage. Seed certification standards, Legislation and inspection. Basic seed processing operations - Machines and plants for cleaning separating and Grading; seed treatment; seed packaging and Storage; handling marketing and distribution. Seed industry in India and their role in agriculture development.

(AP403) ENVIRONMENTAL CONTROL ENGINEERING **Credit 3(2+1)**

Engineering for rural living and development, Design, construction and cost estimation of farm structures for rural housing. Animal shelters, Dairy farm fertilizers, fodder produce, fencing and implement sheds, planning for a rural communities center.

House for cows, buffalo poultry, piggery and goatery etc.

Rural roads, their construction and cost, repair and maintenance.

Rural water supply, sources of water supply, norms of water supply for human being and animals. Drinking water standards and water treatment suitable to rural community.

(AP404) POST HARVEST ENGINEERING OF HORTICULTURAL CROPS
Credit 3(2+1)

Principles of drying mechanism of drying of solids, drying rate curves etc. Engineering technology in food processing for rejected foods of commercial importance for plant and animal origin.

Properties of food and vegetables, process parameters and equipment for sorting, washing, handling, peeling, slicing, blanching, mixing and handling, chilling: packages: transportation storage and preservation technology. Application of quality control techniques.

(AP405) STATISTICS **Credit 2(2+0)**

Statistics: Static - population parameter, Arithmetic, Weighted, Geometric and Harmonic means, mode and Median for ungrouped and grouped data. Frequency Distribution. Standard Deviation. Mean Deviation and co-efficient of variation. Simple and Multiple Comulation Coefficients. Time series analysis and sampling.

Fitting Equations to data. Normal equation -Regression co-efficient. Curvilinear regression, Tests of Significance's' test and 'x' test. Distribution- types, normal poison and binomial Distribution, Confidence levels.

(AP406) FOOD PLANT MANAGEMENT **Credit 3(2+1)**

Boiler: Properties of steam, boiler types, accessories to boilers, pressure vessel design, heat transfer in boiler, design of fire tube and water tube boilers, economizer, drought in boilers, performance of boilers, flue gas analysis, water treatment for boilers. Water treatment for microbiological safety Cleaning of processing plants: Chemistry, microbiology, CIP

Wastewater treatment: Analysis of oxygen demand, BOD, analysis of gas transfer, aerobic and anaerobic decomposition of wastewater, biochemical reaction kinetics, analysis of biological, design of reactors, effects of recycle, design of trickle filters.

(AP407) PACKAGING TECHNOLOGY **Credit 2(2+0)**

Function of Packaging, Packaging materials, their structural Qualities, Effect of these Materials on Packed commodities, Methods of Package testing and their Performance evaluation, scope of locally available packing materials in industry. Economics of packaging indigenous methods of packaging food products their merits and demerits scope for improvements, rent developments in packaging systems and equipment

SEMESTER V

(AP501) DAIRY AND FOOD ENGINEERING **Credit 3(2+1)**

Dairy development in India. Engineering properties of milk and milk products, preservation and processing principles. Market milk and manufacturing of various dairy products. Unit processes and related equipment such as clarifiers and separators. Homogenizes, Pasteurizer and processing of milk. Ice cream freezers. Butter churns and cheese making equipments. Dairy of milk and milk products. Dairy plant design and layout; plant sanitation and hygiene. Dairy plant management. Study of specifications, design and operation of sanitary pumps. Clarifiers, centrifuge, homogenizes, pasteurizers. Milk chillers, butter churn. Evaporator and spray and drum, dryers, freeze dryer. Can washers, bottle washers and filters. Composition and approximate analysis of food products. Deterioration in factory and their controls. Physical, chemical and biological methods of food preservation. Water activity and its control changes undergone by the food components during processing. Flow process chart of processing various agricultural produce like milk, meat, poultry, and fish. Identifications of common unit operations in all these processes. Physical unit operations; freezing thermal processing, dehydration, humidification and dehumidification. Properties of air, water, vapor, mixture, psychrometry

(AP502) BAKERY AND CONFECTIONARY **Credit 3(2+1)**

Materials of Baking : Ingredient from wheat & other grains, Liveners and yeast foods, Shortenings, Emulsifiers & Antioxidants, Sweeterners & malt syrup. Ingredients from milk & eggs. Fruits, Vegetables & Nuts. Spices, Flavors & Colours.

Formulae and Processes : Unleavened bakery products, Products leavened with water vapor, Air leavened products, Chemically leavened sweet goods, Yeast leavened plain bread & rolls, Continuous, Semi continuous & expedited dough Adjuncts; washes, glazes, icing & Marsh mallow, Adjuncts : streusels, pastes, filling, etc.

Equipment & Engineering : Bulk handling of ingredients, weighing & metering equipment, mixers & mixing, Divding, rounding, sheeting & laminating, Fermentation enclosures & brew equipment, Forming & moulding bread like products. Forming cookies & crackers, Forming other products, Ovens & Baking, Fryers & Frying, Pans, Panhandling equipment & slicer, Applicators for adjuncts, Packaging materials & equipment.

Quality Assurance : Raw Material and Finished Product.

Other Technical considerations:
Preservation methods, Computerization in plant laboratory, Sanitation & Safety.

Packaging system for Bakery and Confectionary product manual and automated plant

Application of Rheology :

- In bread industry
- In cookie and cracker industry
- In pasta industry
- in breakfast cereal industry

Influence of extrusion processing on in line rheological behavior structure & Function of wheat starch.

(AP503) ENTERPRENEURSHIP **Credit 3(3+0)**

Who is an Entrepreneur? Soft skill for Entrepreneurs, Profile of the Food Processing Sector in India, Planning a small Scale unit and Whom to APproach for What, Business Opportunity Identification. Market Survey tools, Schedule and Techniques of Data collection, Business Plan Format for Tiny and Small Enterprises. Assessing Techno-Economic Viability of project, Break Even Analysis.

(AP504) FOOD STANDARDS AND QUALITY ASSURANCE **Credit 3(2+1)**

Laboratory Requirements: Layout and requirements of quality control analysis
Statutory and Optional Food Standards: F.P.O., P.F.A., Agmark, Apha, FDA, B.I.S. ,Quality control, quality assurance and total quality management (TQM) :
Quality, Quality policy, Quality analysis .Food Plant Sanitation **:** General aspects - importance of sanitation- General programs for plant sanitation including measures to prevent rodent and insect infestation. Indian Specifications regarding general and specific hygiene conditions required in a dairy and canning industry. Cleaning in Place (CIP) concepts of ISO 9000, 14000 and HACCP. Sampling and estimation for quality evaluation Statistical quality control : Probability and Distribution theory, Testing of Hypothesis, Linear Models.

(AP505) TECHNICAL REPORT WRITING **Credit 3(2+1)**

Grammar : Language in use in terms of synonyms, antonyms, acronyms etc., Word-blending, Common-error and Correct English Usage's, Types of Writing, -stress on technical/ scientific Writing, Dissertation or Thesis Writing, Study of International Standard of Technical Report Writing, Review of literature models, reference-cards preparation etc.

Communication: Different Speech Acts, Public Speaking and Seminar Presentation.

Applied Topics: Guidance in particular Competitive Exams Such as GMAT, GRE, TOEFL, and BSRB Etc.

(AP506) ELECTIVE - I **Credit 3(2+1)**

&

(AP507) ELECTIVE - II **Credit 3(2+1)**

- **MEAT AND POULTRY TECHNOLOGY**

INTRODUCTION : Meat animals and meat production, potential of meat and meat products in the Indian context.

COMPOSITION, STRUCTURE OF MEAT :
Composition of meat and nutritive value, mutton, pork, beef, poultry. Structure of meat muscle. Chemical and bio chemical changes in meat colour, on set of rigorn mortis. Factors of spoilage, chemical and microbial spoilage. Grading of meat and meat cuts. (Whole-sale, retail cuts)

PRESERVATION OF MEAT :
Methods of preservation-Thermal preservation, sterilization low temperature storage-Artificial tenderization and ageing, storage of meat above freezing point, storage of meat below freezing point, changes in frozen storage. Preservation by lowering moisture Drying and de-hydration, freeze drying, Preservation by direct microbial inhibition irradiation, antibiotics. Preservation by curing and smoking. Packaging of meat and meat products.

EGG AND POULTRY:
Introduction & production in India. Egg: structure, composition and nutritive value of egg, Transportation and grading of egg. Increase in shelf life of shell egg by physical and chemical method, Albumin and yolk; Changes due to freezing of albumin and yolk. Dehydrated egg powder, frozen egg.

POULTRY PROCESSING AND OTHER PRODUCTS:
Slaughtering and bleeding, scalding, de-feathering, evisceration, chilling, packaging and storage. Sources and uses of bone meat, gelatine, casing, plasma and lard.

QUALITY CONTROL:
Quality control measures in Meat and Poultry industries. Packaging system for Meat and Poultry product.

- **FISH TECHNOLOGY**

HEAT PROCESSING OF FISH :

Canning of fish in oil (e.g. canning of sardines and mackerels). Canning of prawns in brine. Spoilage of canned fish prawns (visual defect in stored cans and products, honey

combing and formation of struvite crystals). Quality control and standards in canned fish and prawns.

SALT CURING AND DRYING OF FISH:

Quality requirements for salt of curing of fish, Methods of salt curing of fish (Pickle cure, brine cure and kench cure) Process of sun drying of salted fish. Process of mechanical dehydration of salted fish. Comparison of sun drying and mechanical dehydration (Advantages and Limitations of both). Microbiological Spoilage of salt cured fish and measures to prevent spoilage.

FISH PRODUCTS AND BY-PRODUCTS:

Specialized fish product and by-products of seafood processing industry. Process of production of fish sausage, Process of production of fish fingers; Production of fish pickle and prawn pickle; Production of fish flakes; Production of fish fingers, Packaging and storage of fish products.

QUALITY CONTROL:

Quality control measures in Fish industries. Packaging system for Fish product.

- **SUGAR TECHNOLOGY**
- **GREENHOUSE TECHNOLOGY**

- **STORAGE TECHNOLOGY**

Food behavior and spoilage in storage, conditions for storage of perishable products: Economics, aspects of fruit and vegetable storage, functional requirements, of storage, control of temperature and relative humidity inside storage, calculation of refrigeration load; modified Atmospheric storage and control of its environment, air movement inside, MAS, storage sanitation.

Storage of grains: Destructive agents, respiration of grains, moisture and temperature changes in stored grains; conditioning of environment inside storage through natural ventilation, mechanical ventilation, artificial drying, grain storage structures such as Bukhari, Morai, Kothar, silo design, control of environment inside silo.