

Engineering and Management Institute of India

Diploma in Engineering & Technology

FOOD TECHNOLOGY SYLLABUS

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Department of Food Technology Engineering

Vision:-

To strengthen the region through imparting superior quality technical education and research; which enables the fulfillment of industrial challenge and establish itself as a Centre of Excellence in the field of Food Technology Engineering.

Strength of Material (FTE-2.1)**UNIT-I**

Simple Stresses & Strains : - Elasticity and plasticity – Types of stresses & strains–Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio & volumetric strain – Elastic moduli & the relationship between them – Bars of varying section – composite bars – Temperature stresses. Strain energy – Resilience – Gradual, sudden, impact and shock loadings.

UNIT –II

Shear Force and Bending Moment Diagrams: - Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, u.d.l., uniformly varying loads and combination of these loads – Point of contra flexure.

UNIT – III

Flexural Stresses: - Theory of simple bending – Assumptions – Derivation of bending equation: $M/I = f/y = E/R$ Neutral axis – Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I, T, sections. Shear Stresses: Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular, I, T sections.

UNIT – IV

Thin Shells:- Definition – Thin and thick cylindrical shell Failure of thin cylindrical shell subjected to internal pressure Derivation of Hoop and longitudinal stress causes in a thin cylindrical shell subjected to internal pressure simple problems change in dimensions of a thin cylindrical shell subjected to internal pressure -problems Derivation of tensile stress induced in a thin spherical shell subjected to internal pressure simple problems change in diameter and volume of a thin spherical shell due to internal pressure.

UNIT –V

Torsion of Circular Shafts: - Theory of pure torsion, Derivation of torsion equations: $T/J=q/r=N\theta/L$ Assumptions made in theory of pure torsion-Torsional moment of resistance – Polar section modulus – Power transmitted by shafts. Thin Cylinders: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and volumetric strains – changes in dia, and volume of thin cylinders.

Reference Book: -

1. Strength of Materials by (R.K. Bansal ,Laxmi Publications 2010).
2. Strength of materials by (Sadhu Singh.Khanna Publications).
3. Strength of Materials by (S.Timshenko)

Fluid Mechanics (FTE-2.2)**UNIT-I**

Fluid statics: - Dimensions and units: physical properties of fluids-specific gravity, viscosity and its significance, surface tension, capillarity, vapor pressure. Atmospheric gauge and vacuum pressure –measurement of pressure. Manometers- Piezometer, U-tube, inverted and differential manometers. Pascal's law, hydrostatic law. Buoyancy and floatation: Meta center, stability of floating body. Submerged bodies. Calculation of metacenter height. Stability analysis and applications.

UNIT –II

Fluid kinematics: - Introduction, flow types. Equation of continuity for one dimensional flow, circulation and vorticity, Stream line, path line and streak lines and stream tube. Stream function and velocity potential function, differences and relation between them. Condition for irrotational flow, flow net, source and sink, doublet and vortex flow.

Fluid dynamics: - surface and body forces –Euler's and Bernoulli's equations for flow along a stream line, momentum equation and its applications, force on pipe bend.

Closed conduit flow: - Reynold's experiment- Darcy Weisbach equation- Minor losses in pipes- pipes in series and pipes in parallel- total energy line-hydraulic gradient line.

UNIT – III

Boundary Layer Theory:- Introduction, momentum integral equation, displacement, momentum and energy thickness, separation of boundary layer, control of flow separation, Stream lined body, Bluff body and its applications, basic concepts of velocity profiles.

Dimensional Analysis: - Similitude and modelling – Dimensionless numbers.

Performance of hydraulic turbines: - Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbine, cavitation, surge tank, water hammer. Hydraulic systemshydraulicram, hydraulic lift, hydraulic coupling. Fluidics – amplifiers, sensors and oscillators. Advantages, limitations and applications.

UNIT – IV

Basics of turbo machinery:- hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes.

of turbo machinery:- hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes.

UNIT –V

Centrifugal pumps: - classification, working, work done – manometric head- losses and efficiencies- specific speed- pumps in series and parallel-performance characteristic curves, cavitation & NPSH.

Hydraulic Turbines:- classification of turbines, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies, hydraulic design –draft tube- theory functions and efficiency.

Reference Book: -

1. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, Kotaria & Sons.
2. Hydraulic Machines by Banga & Sharma, Khanna Publishers.

Instrumentation and Process Control (FTE-2.3)**UNIT-I**

Operational aspect of instrument system control and requisites: - Analytical balance and spring balance, load cell, moisture measurement cells for granular material, infrared, transmission measurement of moisture.

UNIT –II

Low pressure measurement by McLeod Gage and Pirani Gage: - Temperature measurement by bi-metal thermometers – resistance thermometers, thermistors and thermocouples. Radiation and optical pyrometers; Flow measurement by magnetic flow meters.

UNIT – III

Control system: - Open and closed loop system, transfer function of open loop and closed loop control systems; Block diagrams; Laplace transform; Response of a control system; Stability; Feedback

UNIT – IV

Controller mode: - Root locus plot, Modulation, Final control, Controllers, Control valve, Application of control in heat exchangers, distillation column.

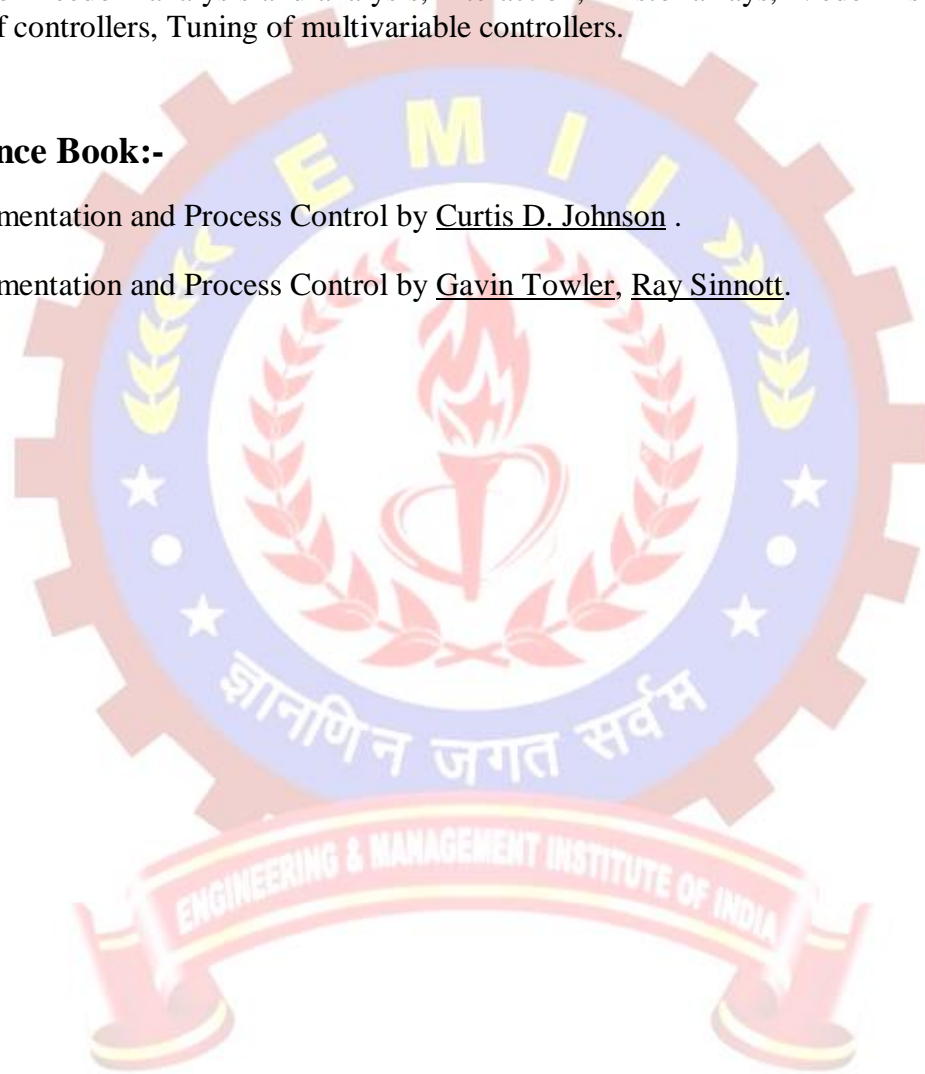
Sample Data Controllers: - Basic review of Z transforms, Response of discrete systems to various inputs. Open and closed loop response to step, impulse and sinusoidal inputs, closed loop response of discrete systems. Design of digital controllers. Introduction to PLC and DCS.

UNIT -V

Multivariable Control Analysis :- Introduction to state-space methods, , Control degrees of freedom analysis and analysis, Interaction, Bristol arrays, Niederlinski index - design of controllers, Tuning of multivariable controllers.

Reference Book:-

1. Instrumentation and Process Control by Curtis D. Johnson .
2. Instrumentation and Process Control by Gavin Towler, Ray Sinnott.



ENVIRONMENTAL ENGINEERING (FTE-2.4)**UNIT-I****INTRODUCTION:-**

Man and Environment :- Overview (socio-economic structure & occupational exposures) – Scope of Environmental Engineering – pollution problems due to urbanization & industrialization.

UNIT –II**AIR POLLUTION :-**

Causes of air pollution :- types & sources of air pollutants- Climatic & Meteorological effect on air pollution concentration- formation of smog and fumigation.

UNIT – III

Analysis of Air Pollutants :- Collection of Gaseous Air Pollutants- Collection of Particulate Pollutants – Analysis of Air Pollutants like : Sulphur dioxide – Nitrogen oxide – Carbon monoxide – Oxidants & Ozone – Hydrocarbons – Particulate Matter.

UNIT – IV

Air Pollution Control Measures & Equipment :- Control of Particulate Emission – Control of Gaseous Emission – Flue Gas Treatment Methods : Stacks Gravitational and Inertial Separation, Settling Chambers, Dynamic Separators, Cyclones, Filtration, Liquid Scrubbing, Spray Chambers, Packed Towers, Orifice and Ventury Scrubbers, Electrostatic Precipitators, Gas/solid Adsorption, Thermal Decomposition.

UNIT -V

Methods & Approach of Air Pollution Control: - Controlling smoke nuisance – Develop air quality criteria and practical emission standards – Creating zones suitable for industry based on micrometeorology of air area – Introducing artificial methods of removal of particulate and matters of waste before discharging to open atmosphere.

Reference Book: -

1. ENVIRONMENTAL ENGINEERING by Gilbert M Master.
2. ENVIRONMENTAL ENGINEERING by R.K. Lad.



MATERIAL SCIENCE & ENGINEERING (FTE-2.5)**UNIT-I**

Introduction and structure of materials:- study properties of materials? Structure of atoms - Quantum states-Atomic bonding in solids-binding energy-inter atomic spacing - variation in bonding characteristics - Single crystals – polycrystalline - Non crystalline solids - Imperfection in solids – Vacancies – Interstitials - Geometry of dislocation - Schmid’s law - Surface imperfection - Importance of defects - Microscopic techniques - grain size distribution.

UNIT –II

Solid solutions and alloys - Phase diagrams - Gibbs phase rule - Single component systems – Eutectic phase diagram – lever rule - Study of properties of phase diagrams - Phase transformation - Nucleation kinetics and growth.

UNIT – III

Band model of semiconductors - carrier concentrations in intrinsic, extrinsic semiconductors – organic semiconductors - Fermi level - variation of conductivity, mobility with temperature – law of mass action - Hall effect - Hall coefficients for intrinsic and extrinsic semiconductors – Hall effect devices. Application of diffusion in sintering, doping of semiconductors and surface hardening of metals.

UNIT – IV

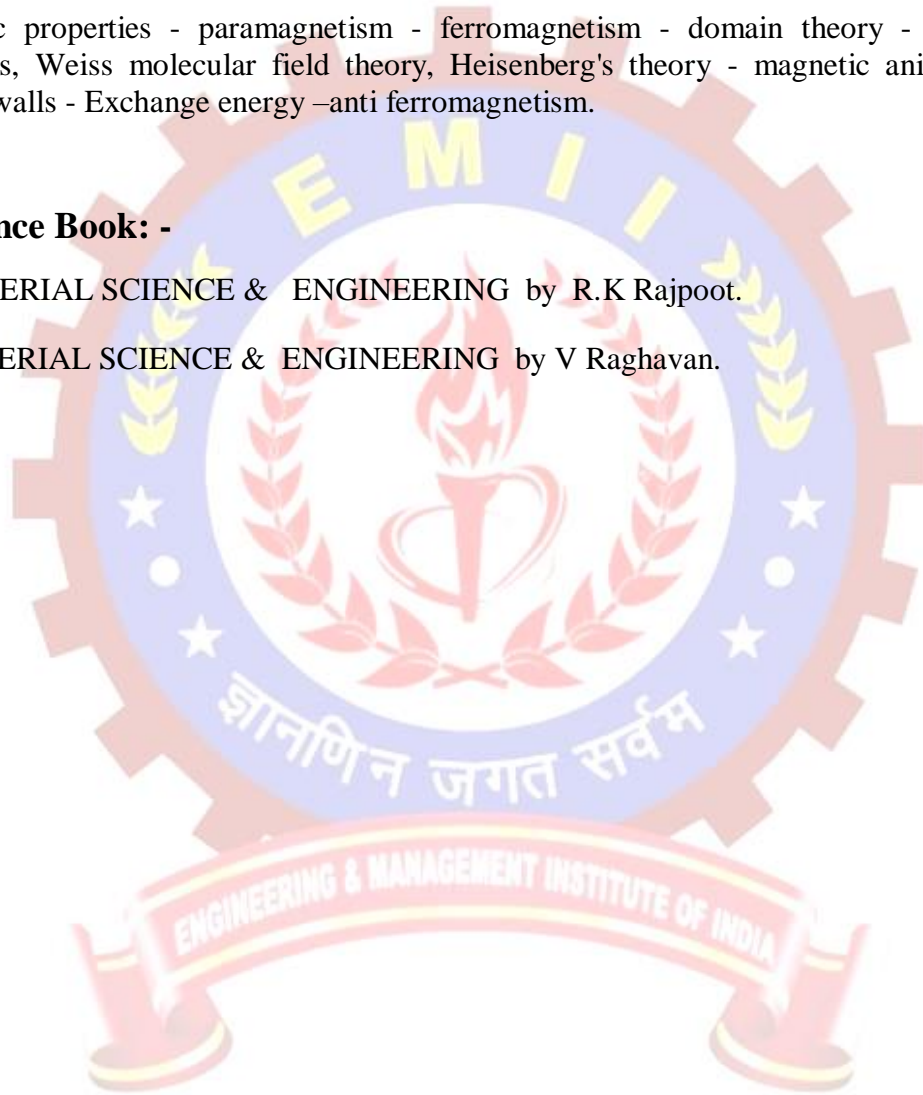
Mechanical properties - Stress, Strain, Elastic properties – Deformation – elasticity – hardness - Optical properties - Light interaction with solids - Atomic, electronic interaction, non – radiative transition - refraction, reflection, Absorption, Transmission, Insulators, luminescence.

UNIT –V

Magnetic properties - paramagnetism - ferromagnetism - domain theory - magnetic hysteresis, Weiss molecular field theory, Heisenberg's theory - magnetic anisotropy - domain walls - Exchange energy –anti ferromagnetism.

Reference Book: -

1. MATERIAL SCIENCE & ENGINEERING by R.K Rajpoot.
2. MATERIAL SCIENCE & ENGINEERING by V Raghavan.



Fundamental of Food Technology (FTE-2.6)**UNIT-I**

Introduction:- Historical evolution of food processing technology, Malting, gelatinization of starch, types of browning- Maillard & caramelization, Rice- structure and composition, parboiling of rice- advantages and disadvantages.

UNIT –II

Cereals and Millets: - Structure and composition of cereals Wheat- structure and composition, types (hard, soft/ strong, weak) Diagrammatic, representation of longitudinal structure of wheat grain.

Pulses: - Structure and composition of pulses, toxic constituents in pulses, processing of pulses-soaking, germination, decortications, cooking and fermentation.

UNIT – III

Fats and Oils: - Classification of lipids, types of fatty acids - saturated fatty acids, unsaturated fatty acids, essential fatty acids, trans fatty acids. Refining of oils, types- steam refining, alkali refining, bleaching, steam deodorization, hydrogenation. Rancidity –Types- hydrolytic and oxidative rancidity and its prevention.

UNIT – IV

Fruits and Vegetables: - Classification of fruits and vegetables, general composition, enzymatic browning, names and sources of pigments, Dietary fibre. Post harvest changes in fruits and vegetables – Climacteric rise, horticultural maturity, physiological maturity, physiological changes, physical changes, chemical changes, pathological changes during the storage of fruits and vegetables.

UNIT –V

Flesh Foods - Meat, Fish, Poultry: - Meat - Definition of carcass, concept of red meat and white meat, composition of meat, marbling, post-mortem changes in meat- rigor mortis, tenderization of meat, ageing of meat. Fish - Classification of fish (fresh water and marine), aquaculture , composition of fish, characteristics of fresh fish, spoilage of fish- microbiological, physiological, biochemical. Poultry - Structure of hen's egg, composition and nutritive value, egg proteins, characteristics of fresh egg, deterioration of egg quality, difference between broiler and layers.

Reference Book: -

1. Fundamental of Food Technology by WA Gould.
2. Fundamental of Food Technology by Romeo T. Toledo.

Food Microbiology (FTE-2.7)**UNIT-I**

Introduction:- definition, historical development and significance of food microbiology; Microscope; Classification & morphology of microbes; Techniques of pure culture; Bacteriology of air & water; Antimicrobial agents – physical & chemical – mechanism & action.

UNIT –II

Disinfection & disinfectants:- Energy metabolism of aerobic & anaerobic microbes; Thermal inactivation of microbes; Concept, determination & importance of TDT, F, Z & D values; Factors affecting heat resistance; Pasteurization and sterilization.

UNIT – III

Microbiology of Milk Production:- Microbiology of milk & milk products like cheese, butter, ice-cream, milk powder; Microbiology of meat, fish, poultry & egg and their products.

UNIT – IV

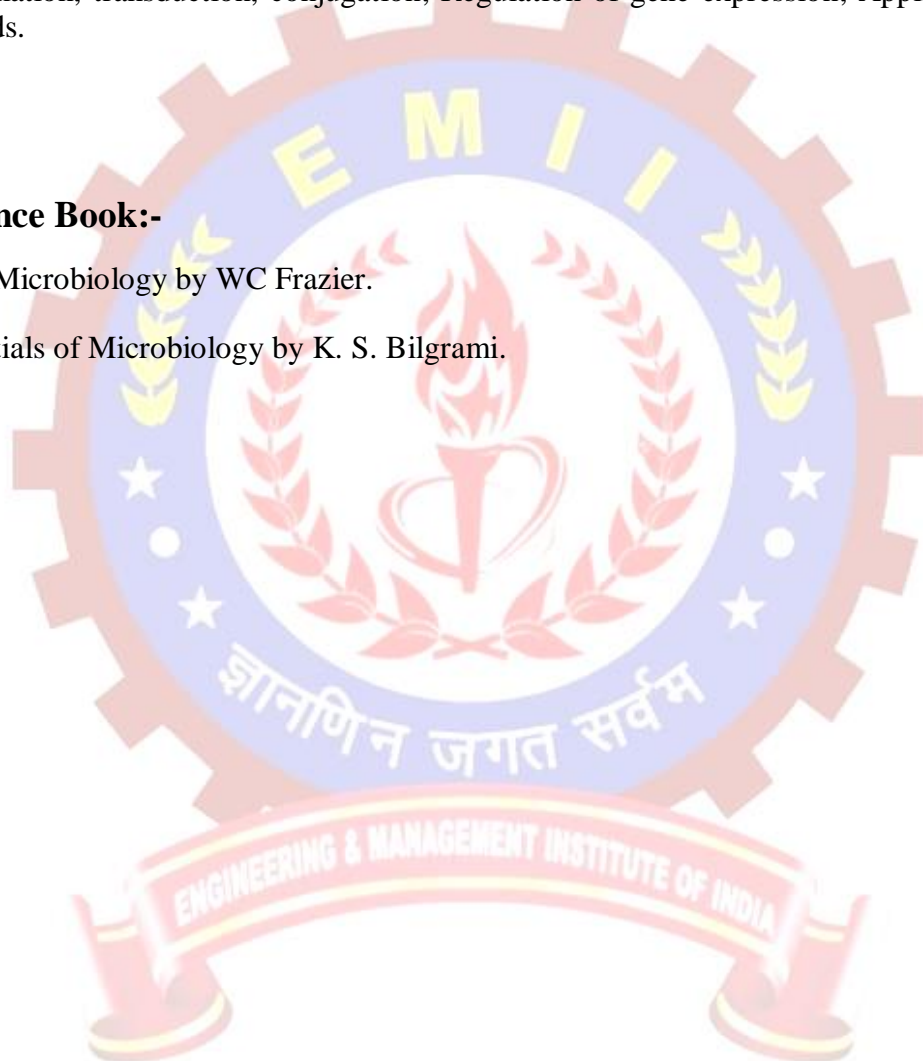
Microbiology of Fruits & Vegetable Production :- Microbiology of fruits & vegetable and products like jam, jelly, sauce, juice; Microbiology of cereal and cereal products like bread, biscuits, confectionary.

UNIT -V

Basics of microbial genetics: - Gene, DNA, RNA; Replication, transcription, transformation, transduction, conjugation; Regulation of gene expression; Application in GM foods.

Reference Book:-

1. Food Microbiology by WC Frazier.
2. Essentials of Microbiology by K. S. Bilgrami.



Bakery Technology (FTE-2.8)**UNIT-I**

Introduction to baking:- Bakery ingredients and their functions; Machines and equipment for batch and continuous processing of bakery products.

Bakery equipment and machinery:- Different types of Mixers, kneaders and cutters. Different ovens. Packaging machinery for bread and biscuits. Quality control in bakery industry. Quality types of control of raw materials. Quality control of finished products. Quality control of packaging materials.

UNIT –II

Testing of flour:- Manufacture of bread, cake and biscuits; Analysis of bakery products; Cake icing techniques, wafer manufacture, cookies, crackers, dusting or breading.

UNIT – III

Manufacture of bread rolls:- sweet yeast dough products, cake specialties, pies and pastries, doughnuts, chocolates and candies; Coating or enrobing of chocolate (including pan-coating); Maintenance, safety and hygiene of bakery plants.

UNIT – IV

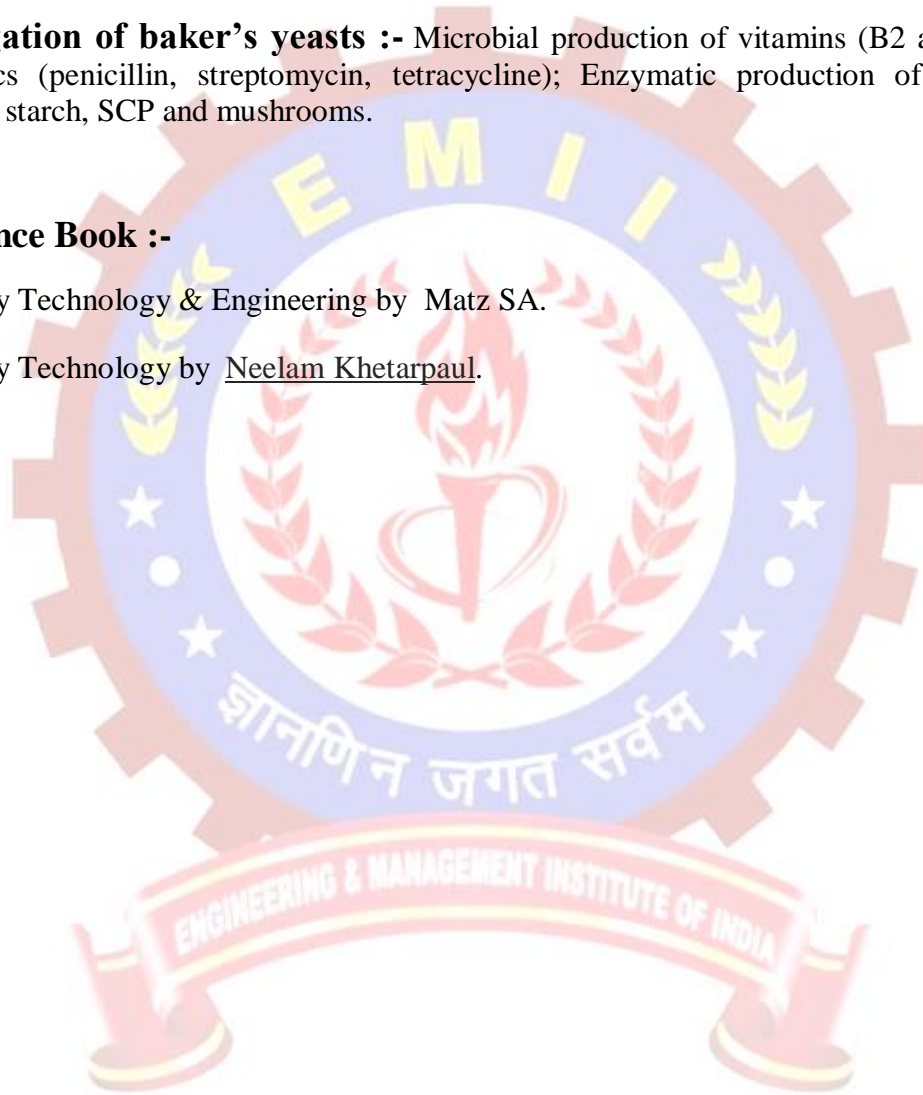
Importance and applications of extrusion in food processing:- Pre and post extrusion treatments; Manufacturing process of extruded products; Change of functional properties of food components during extrusion.

UNIT –V

Propagation of baker's yeasts :- Microbial production of vitamins (B2 and B12), antibiotics (penicillin, streptomycin, tetracycline); Enzymatic production of glucose, fructose, starch, SCP and mushrooms.

Reference Book :-

1. Bakery Technology & Engineering by Matz SA.
2. Bakery Technology by Neelam Khetarpaul.



FERTILIZER TECHNOLOGY (FTE-2.9)**UNIT-I**

INTRODUCTION: -Origin, Development and use of commercial fertilizers, types of chemical fertilizers with special reference to availability in Indian conditions. Role of fertilizers in plant growth and their application. Micro & Macro Nutrient of fertilizer, Selection of the relevant fertilizer for the different types crops, advantage and disadvantage of synthetic fertilizer.

UNIT –II

NITROGENEOUS FERTILIZERS: -Feed stock for production of Ammonia- Natural gas, Associated gas, Coke oven gas, Naphtha Petroleum heavy stock, Coal, Lignite, Coke, etc.

Nitrogenous Fertilizers: -Ammonia:- Manufacturing of synthesis gas by catalytic partial oxidation steam hydrocarbon reforming process , various types of Ammonia manufacturing process- Linde, M.W.Kellogg & Haldor Topsoe process. Different types of Ammonia Converters (Single Bed & Multi bed Converters). Major Engg. Problems related to Ammonia Production, Storage and Transportation of Ammonia.

Urea: -Properties of urea manufacturing of urea (by stami-carbon's CO₂ stripping process), Biuret Test, Hight of prilling tower , major Engg. Problems in urea manufacturing.

UNIT – III

Ammonium Sulphate: -Manufacturing of Ammonium Sulphate – Direct Neutrallization, Gypsum Process. Major Engg. Problems in ammonium sulphate production.

Calcium Ammonium Nitrate (CAN):- Manufacturing of CAN-Prilling Process, Granulation process. Major Engg. Problems in CAN.

UNIT – IV

POTASSIC FERTILIZERS: -Properties of Potassic fertilizer, Role of potassium as Fertilizer, Source of Potash, Manufacturing of potassium chloride , Muriate of Potash – Hot leaching , Floation process. Manufacturing of Potassium Sulphate from Potassium Chloride.

UNIT –V

CATALYST: -Catalyst used in fertilizer industry - Reforming catalyst (Primary and Secondary), High Temperature, Low Temperature, Shift Reaction Catalyst, Methanator Catalyst , Ammonia Synthesis Catalyst etc.

Reference Book:-

1. FERTILIZER TECHNOLOGY By K.K.Pant , S Bajpai.
2. FERTILIZER TECHNOLOGY By M. Gopal Rao and Marshal Sitting.

Food Safty(FTE-2.10)**UNIT-I**

Chemical bonds and forces, concept of pH and buffer, thermo chemistry, chemical equilibrium, chemical kinetics. Aliphatic and Aromatic hydrocarbons- concept of aromaticity, methods of preparation and chemical properties of alcohols, phenols, aldehydes, ketones, carboxylic acids, nitro compounds and amines. Different methods of purification, qualitative and quantitative analysis. Solutions- concentration terms, liquid- properties, surface tension, viscosity and its applications. Surface chemistry- adsorption, homogeneous and heterogeneous catalysis, colloids and suspension.

UNIT –II

Types of micro organism associated with food, their morphology and structure, factors affecting their growth, microbiological standards, sources of micro organism in food, some important food spoilage micro organisms, fermentation- definition and types, micro organisms used in food fermentation, dairy fermentation, fermented foods- types, methods of manufacture for vinegar, sauerkraut, soya sauce, beer, wine and traditional Indian foods.

UNIT – III

Bio molecules - carbohydrates, proteins, lipids and nucleic acids, their classification, structure, bio synthesis, metabolism and calorific value. Enzymes- classification, kinetics, factors controlling enzyme activities, enzymes used during food processing, modification of food by endogenous enzymes. Vitamins and their types. Minerals- important minerals and their functions in human body. Plant alkaloids and their uses. Animal and plant toxins. Toxic substances and their metabolism- pesticides, metals, food additives etc.

UNIT – IV

Classification- five kingdom system upto phylum, plants and animal products used as food by human. Culture of animals used as food. Eukaryotic and Prokaryotic cells. Types

of cells, animal tissues and organs. Human physiology- Nutrition and Digestion. Respiration- respiratory pigment, transport and gaseous exchange. Excretion- structure of kidney and urine formation. Circulatory system- Heart, Blood vascular system, blood and its components. Nervous system- conduction of impulses. muscular system- types of muscles and muscle contraction. Reproductive system. Endocrine system- hormones and their role. Immune system- types of immunity, antigen-antibody reaction. Diseases- deficiency diseases, communicable diseases and diseases caused by animals (protozoans, helminthes, arthropodans).

UNIT –V

Genetically modified plants and animals, plant and animal tissue culture and its application, importance of GM-crops and their products, environmental bio technology- pollutants, Biomagnification and microbial bioremediation .Statistical analysis- mean, median, mode, standard deviation, regression and co-relation, T-test, variance, chi-square test.

Reference Book:-

1. FOOD SAFTY By K.K.Pant , S Bajpai.
2. FOOD SAFTY By M. Gopal Rao and Marshal Sitting.

Technology of Sea Food (FTE-2.11)**UNIT-I**

Fishery by-products :- Surimi- Introduction, fish muscle proteins, the surimi process, traditional and modern surimi production lines, quality of surimi products, comparison of surimi and fish mince products.

UNIT –II

Fish Curing and Smoking :- Drying and salting of fish, water activity and shelf-life, salting process, salting methods (brining, pickling, kench curing, gaspe curing), types of salts, dried and salted fish products- pindang, fishwood, dried shrimp. Preservation by smoking, smoke production, smoke components, quality, safety and nutritive value of smoked fish, processing and equipment, pre-smoking processes, smoking process control. Traditional chimney kiln, modern mechanical fish smoking kiln, examples of smoked and dried products.

UNIT – III

Canning of fish :- Principles of canning, classification based on pH groupings, effect of heat processing on fish, storage of canned fish, pre-process operations, post process operations, cannery operations for specific canned products.(Tuna,Mackerel,Sardine).

UNIT – IV

Chilling and Freezing of fish :- Relationship between chilling and storage life, MAP, general aspects of freezing, freezing systems (air blast freezing, plate or contact freezing spray or immersion freezing, freezing on board, onshore processing, changes in quality in chilled and frozen storage, thawing.

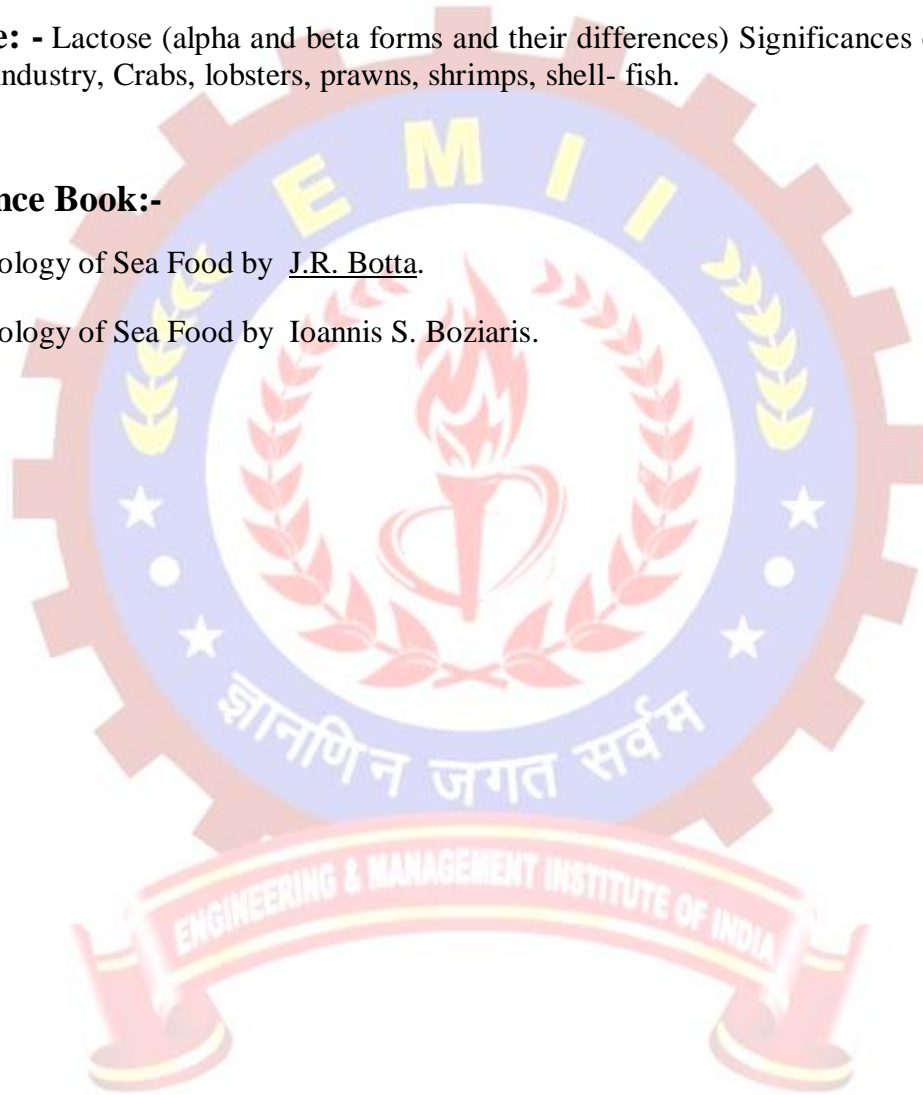
UNIT -V

Concept of other Sea foods:-

Lactose: - Lactose (alpha and beta forms and their differences) Significances of lactose in dairy industry, Crabs, lobsters, prawns, shrimps, shell- fish.

Reference Book:-

1. Technology of Sea Food by J.R. Botta.
2. Technology of Sea Food by Ioannis S. Boziaris.



Chemical Engineering (FTE-2.12)**UNIT-I**

Chemical Kinetics: -Rate of reaction – Homogeneous and Heterogeneous, rate expression, elementary and nonelementary reactions, rate constant – Effect of temperature and pressure on rate constant – Activation energy; rate mechanism for elementary reactions – analysis of rate mechanism from the order of reaction for a particular species; Analysis of batch reactor data: Evaluation of reaction rate parameters – Integral and differential analysis – their limitations – use Microsoft EXCEL for analysis of batch reactor data.

UNIT –II

Design of Ideal reactors for isothermal homogeneous reactions : - Derivation of performance equations for Batch, tubular plug flow and stirred tank reactors – space time and space velocities, size comparison of reactors; Reactors choice for single reactions – Reactors in series and in parallel, Effect of recycle on reactor performance; Reactor design for multiple reactions – Series and parallel reactions, selectivity, fractional and overall conversion, choice of contacting pattern for parallel and series reactions, reactor size determination for series and parallel reactions.

UNIT – III

Effect of pressure drop on reactor performance – Gas and liquid phase reactions; standard heat of reaction – effect of temperature on heat of reaction, Design of non-isothermal reactions – non-isothermal PFR and CSTR, adiabatic reactors, effect of spatial variations of temperature on non-isothermal PFR, optimization of reactor temperature – gas and liquid phase reactions.

UNIT – IV

Polymers: -Nomenclature of polymers and their classification, Modes of polymerization i.e. addition, condensation, step growth and chain growth polymerization, Methods of polymerization. Selected industrial polymerization, including plastics, synthetic fibers, synthetic and natural rubbers.

UNIT –V

Agricultural Residue Utilization: -Availability and Characteristics, energetic and energy contents, modes of energy recovery, gasification, pyrolysis, deoxygenation, chemicals from agricultural residues.

Reference Book:-

1. Chemical Engineering By Ramesh Babu.
2. Chemical Engineering By J.G.Proakis& Dimitis G. Manolakis, Pearson.

Technology of Milk Product (FTE-2.13)**UNIT-I**

Composition of milk: - Varieties of milk; Checks for purity of milk; Handling of freshly produced milk; Cleaning and sanitization.

UNIT-II

Thermal processing of fluid milk: - Pasteurization (LTLT and HTST), sterilization and UHT techniques; Packaging of fluid milk; Fermentation of milk and fermented milk products – Cheese, yogurt, etc including probiotic dairy products.

UNIT – III

Processing of evaporated and dried milk products: - Milk powder, SCM, etc.; Cream, butter, ghee, Ice-cream, Infant formulae, Stabilizers and emulsifiers as additives in milk products.

Paneer: - Preparation and preservation. Prospects for mechanization of paneer manufacturing/packaging process through innovative approaches and integration with newly emerging technologies. Physico-chemical changes during manufacture and storage. Nutritive value of paneer.

UNIT – IV

Traditional Indian sweets: - Dairy processing by-products – Fermented, condensed and dried products from whey, Production of lactose and protein from whey.

UNIT –V

Khoa: - Classification of types, methods of manufacture, packaging and preservation. Factors affecting yield of Khoa. Physico-chemical changes during manufacture and storage of Khoa. Mechanization in manufacture of Khoa. Confections made from Khoa - Burfi, Peda, Lal Peda, Milk cake, Kalakand, Gulabjamun, compositional profile, manufacture practices. Nutritive value of Khoa and Khoa-based confections. Rabri, Malai, Khurchan, Basundhi: Product identification, process description, factors affecting yield. Rheological changes during manufacture.

Reference Book: -

1. Technology of Milk Product by B. H. Webb.
2. Technology of Milk Product by Shivashraya Singh.

Basic Food Chemistry (FTE-2.14)**UNIT-I**

Introduction: - Introduction to different food groups and importance of food chemistry; Water in foods and its properties. Carbohydrate: Sources of food carbohydrates; Physico-chemical and functional properties; chemistry and structure of homosachharides and heterosachharides.

UNIT –II

Proteins: - Sources and physico-chemical and functional properties; Purification of proteins; Common food proteins.

UNIT – III

Fats: - Sources and physico chemical and functional properties, PUFA [Poly-unsaturated Fatty Acids] hydrogenation and rancidity; Saponification number, iodine value, Reichert-Meissl number, Polenske value; Lipids of biological importance like cholesterol and phospholipids.

UNIT – IV

Minerals and Vitamins: - Sources and structures of minerals & vitamins; Effect of processing and storage of vitamins; Pro vitamins A & D; Vitamins as antioxidants. Food Pigments & Flavouring Agents : Importance, types and sources of pigments – their changes during processing and storages.

UNIT –V

MAINTENANCE OF DIGITAL SWITCHING SYSTEM: Introduction , Software maintenance, Interface of a typical digital switching system central office, System outage and its impact on digital switching system reliability, Impact of software patches on digital switching system maintainability, A methodology for proper maintenance of digital switching system.

Reference Book: -

1. Food Chemistry by L. H. Moyer.
2. Food Chemistry by Linhinger.

Food Strong A Packing (FTE-2.15)**UNIT-I**

Functions of packaging :- Type of packaging materials; Selection of packaging material for different foods; Selective properties of packaging film; Methods of packaging and packaging equipment.

UNIT –II

Mechanical strength of different packaging materials :- Printing of packages; Barcodes & other marking; Interactions between packaging material and foods; Environmental and cost consideration in selecting packaging materials.

UNIT – III

Manufacture of packaging materials; Potential of biocomposite materials for food packaging; Packaging regulations; Packaging and food preservation; Disposal of packaging materials.

UNIT – IV

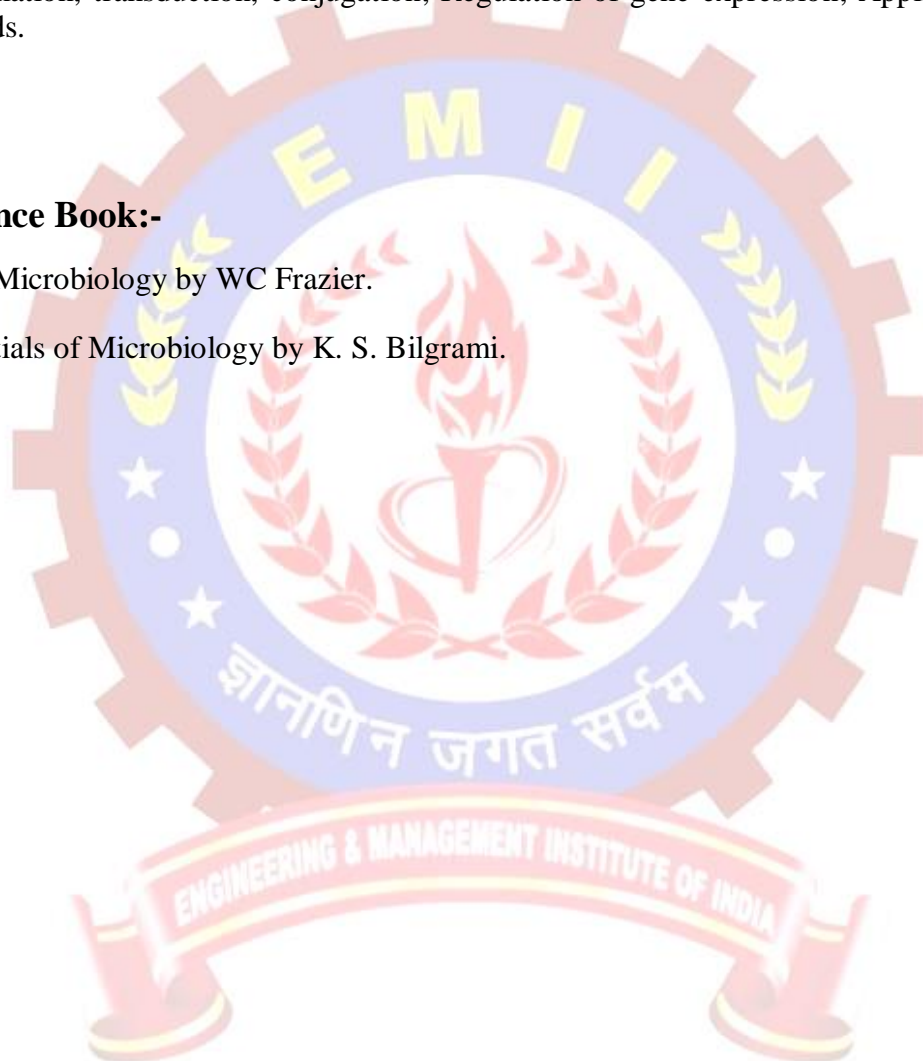
Testing of packaging: - Rigid and semi rigid containers; Flexible containers; Sealing equipment; Labelling; Aseptic and shrink packaging; Secondary and transport packaging.

UNIT -V

Basics of microbial genetics:- Gene, DNA, RNA; Replication, transcription, transformation, transduction, conjugation; Regulation of gene expression; Application in GM foods.

Reference Book:-

1. Food Microbiology by WC Frazier.
2. Essentials of Microbiology by K. S. Bilgrami.



Entrepreneurship Development & Management (FTE-2.16)**UNIT-I**

Introduction:- Meaning and Importance, Evolution of term 'Entrepreneurship, Factors influencing entrepreneurship, Psychological factors, Social factors, Economic factor, Environmental factors, Characteristics of an entrepreneur, Entrepreneur and Entrepreneur, Barriers to entrepreneurship.

Types of entrepreneur:- According to Type of Business, According to Use of Technology, According to Motivation, According to Growth, According to Stages, New generations of entrepreneurship viz. social entrepreneurship, Edupreneurship, Health entrepreneurship, Tourism entrepreneurship, Women entrepreneurship etc.

UNIT –II

Entrepreneurial Motivation:- Motivation, Maslow's theory, Herzberg's theory, McGregor's Theory, McClelland's Need – Achievement Theory, Culture & Society , Values / Ethics , Risk taking behavior.

Creativity:- Creativity and entrepreneurship, Steps in Creativity, Innovation and inventions, Using left brain skills to harvest right brain ideas, Legal Protection of innovation, Skills of an entrepreneur, Decision making and Problem Solving (steps indecision making).

UNIT – III

Organisation Assistance:- Assistance to an entrepreneur, New Ventures, Industrial Park (Meaning, features, & examples), Special Economic Zone (Meaning, features & examples), Financial assistance by different agencies, MSME Act Small Scale Industries, Carry on Business (COB) licence, Environmental Clearance, National Small Industries Corporation (NSIC), Government Stores Purchase scheme (e-tender process), Excise exemptions and concession, Exemption from income tax, Quality Standards with special reference to ISO, Financial assistance to MSME, Modernization assistance to small scale unit, The Small Industries Development Bank of India(SIDBI), The State Small Industries

Development Corporation(SSIDC), Export oriented units, Incentives and facilities to exports entrepreneurs, Export-Import Bank of India, Export oriented zone.

UNIT – IV

Rules And Legislation:- Applicability of Legislation, Industries Development (Regulations) Act, 1951., Factories Act, 1948, The Industrial Employment (Standing Orders) Act, 1946, Suspension, Stoppage of work, Termination of employment, West Bengal Shops and Establishment Act, 1963, Environment (Protection) Act, 1986, The sale of Goods Act, 1950, Industrial Dispute Act 1947.

Project Report:- Introduction, Idea Selection, Selection of the Product / Service, Aspects of a Project, Phases of a Project, Project Report, Contents of a Project Report, Proforma of a Suggested Project Report for a manufacturing Organization, Suggested Readings.

UNIT –V

Agencies for industrial assistance:- West Bengal Electronics Development Corporation, ICICI West Bengal Infrastructure Development Corporation, West Bengal Industrial Infrastructure Development Corporation, Other Corporations with focus as specific segments, State Industrial Development Corporation (SIDC), State Financial Corporation (SFCs), Directorate General of Supplies and Disposals(DGS & D), Registration with DGS & D, Registration Categories, Registration Procedure, Benefits of DGS & D, Information facilities centre in DGS & D, Khadi and Village Industries Commission (KVIC), Industrial Estate, Financing of Industrial Estates, Shilpabandhu-M Incentives for entrepreneurs 9reference to The West Bengal State Support for Industries Scheme 2008 & 2013.

Reference Book :-

1. Entrepreneurial Development, by S S Khanka.
2. The Entrepreneur, by Mark Casson.

Industrial Management (FTE-2.17)**UNIT-I**

Basic of Management:- Management - Definition – Administration- Definition – Henry-Fayol’s principles of management- Business Organisation-Types- Proprietorship-Partnership- Joint stock- Cooperative Society-Advantages and disadvantages -Functions of Management – Planning-Definition-Functions- Organisation-Definition- types of organisation –Line-Functional-Line &staff- advantages and disadvantages- Leadership -Types –Quality of good leader- Motivation - Maslow’s Theory of Motivation -Hierarchy of needs- Communication - Process of Communication – Barriers for effective communication.

UNIT –II

Production Management:- Concept of project work - Project planning -Market survey- Project capacity-selection of site for project- Plant layout-Types of Plant layout-Product design-Stages in product design-drawing-Specifications-Material requirement-operation-Planning-Production-definition-Job, Batch & Mass production with their advantages and disadvantages-Productivity-definition-factors to improve productivity- Production planning and Control (PPC)-definition-Functions of PPC- planning, routing, scheduling, dispatching and Inspection-Introduction to CPM and PERT –Comparison.

UNIT – III

Material Management:- Material management - definition, functions- Purchase - Objectives, different methods of purchasing -Purchase procedure-Comparative statement-purchase order-Tender-Types of tender- Storekeeping- classification of stores - Functions of store keeper. Store management-Bin Card - Material Issue Requisition- Material Returned Note- Store ledgers -Codification of stores-Inventory Management- Definition - functions of Inventory Control- Advantages of Inventory Control. Material management - definition, functions- Purchase - Objectives, different methods of purchasing -Purchase procedure-Comparative statement-purchase order-Tender-Types of tender- Storekeeping- classification of stores - Functions of store keeper. Store management-Bin Card - Material Issue Requisition- Material Returned Note- Store ledgers -Codification of stores-

Inventory Management- Definition - functions of Inventory Control- Advantages of Inventory Control.

UNIT – IV

Total Quality Management:- Quality–Concept–Quality control- Definition - Factors affecting quality- Advantages of quality control –Inspection–Different types of inspection Total Quality Management–Meaning- Principles of total quality management–PDCA cyclesQuality Circles–definition–Function. TQM Tools- Flow charts, Control charts, Histograms, Pareto charts, Cause and effect diagram–5-S- Kaizen, and Six-sigma Quality Certification Systems- ISO 9000 series quality standards, QS14000– ISO 9000, ISO 9001,ISO9002,ISO9003 & ISO 9004- ISO9000 quality certification procedure.

UNIT –V

Plant Maintenance and Industrial Safety:- Plant maintenance–Definition -Types of maintenance–Preventive maintenance- Break down maintenance–Advantages and disadvantages- Total Productive Maintenance–Meaningbenefits of TPM -Tools of TPM–planned maintenance and predictive maintenance. Industrial safety –Meaning - Accident-causes for accident- Direct and indirect losses due to an accident–Personal protective devices for preventions of accidents–Safety department- role of safety officer – safety supervisor -safety committee – Fire prevention and Protection- Fire triangle–principles of fire extinguishing- various classes of fire- A, B,C, D types of fire extinguishers.

Reference Book: -

1. Industrial Engineering and Management by S. C. Sharma, T. R. Banga.
2. Industrial Engineering and Management by Ravi, V.

Final year Project

Project (FTE-2.18)

Select any one topic:-

1. THE EFFECTS OF BLENDING COW MILK WITH SOYMILK ON YOGHURT QUALITY
2. EVALUATION OF OIL OBTAINED FROM PAW PAW (CARICA PAPAYA) SEEDS
3. EFFECT OF PROCESSING ON THE STORAGE STABILITY AND FUNCTIONAL PROPERTIES OF COWPEA FLOUR IN THE PRODUCTION OF MOIN-MOIN AND AKARA
4. THE ROLE OF FOOD SCIENCE IN HUMAN NUTRITION
5. ECONOMIC ASSESSMENT OF SOME MEHTODS ADOTPED IN YOGHURT PRODUCTION
6. PROCESS FOR REFINING VEGETABLE OIL AND ITS FOOD VALUE
7. PRODUCTION AND DETERMINATION OF FUNCTIONAL PROPERTIES OF PLANATAIN FLOUR
8. EVALUATION OF THE NUTRIENT CONSTITUENTS OF FRESH FORAGES AND FORMULATED DIETS
9. EVALUATION AND OPTIMIZATION OF THE CASSAVA PRODUCTION PROCESSES
10. THE STATUS OF PROCESSING AND PRESERVATION OF CEREALS IN NIGERIA: A PROCESS FOR REFINING VEGETABLE OIL AND IT'S FOOD VALUE