

DEFENCE INSTITUTE OF ADVANCED TECHNOLOGY (DU)**M.Sc. Food Technology**

Revised Programme Structure as per National Education Policy (NEP) w.e.f. July 2025

Department of Applied Chemistry, DIAT In association with DIBT, Mysore

PROGRAMME STRUCTURE w.e.f. 2025-2027 Batch			
Sr. No	Code	SEMESTER I	Credit
1	ACFT 501	Food Chemistry	4
2	ACFT 502	Principles of Food Processing and Preservation	4
3	ACFT 503	Food and Nutrition	3
4	ACFT 504	Food Microbiology	3
5	RM501	Research Methodology	4
6	ACFT 512	Laboratory (PSL)	2
Total Credit of Semester I			20

Sr. No	Code	SEMESTER II	Credit
1	ACFT 521	Food Analysis & Sensory Evaluation	4
2	ACFT 522	Food Standards and Safety Management	3
3	PE-I	ELECTIVE -I	3
4	PE-II	ELECTIV -II	3
5	PE-III	ELECTIVE -III	3
6	OJT	On Job Training /(Intern / Project (120 hours)	4
Total Credit of Semester II			20

LIST OF ELECTIVES FOR SEMESTER II

1	ACFT 523	Technology of Fermented Foods	3
2	ACFT 524	Military Nutrition	3
3	ACFT 525	Technology of Milk & Dairy Products	3
4	ACFT 526	Functional and Personalized Nutrition	3
5		Electives from App Chem Dept or another dept with equal credit	3
6		Elective from NEPTL	3

Sr. No	Code	SEMESTER III	Credit
1	ACFT 531	Fundamentals of Food Engineering	4
2	ACFT 532	Technology of Fruits, Vegetables and Plantation Crops	3
3	PE-IV	ELECTIVE -IV	3
4	PE-V	ELECTIV -V	3
5	PE-VI	ELECTIVE –VI	3
6	RP541	Project I	6
Total Credit for Semester-III			22

LIST OF ELECTIVES SEMESTER III

	ACFT 533	Technology of Cereals, Pulses and Oil Seeds	3
	ACFT 534	Technology of Meat, Poultry & Fish Processing	3
	ACFT 535	Food Packaging Technology	3
	ACFT 536	Advanced Food Technology	3
		Electives from App Chem Dept or another dept with equal credit	3
		Elective from NEPTL	

Sr. No	Code	SEMESTER IV	Credit
1	RP 542	Project -II	18
Total Credit for Semester-IV			18

SEMISTER-I

COURSE CODE	COURSE NAME	CREDITS
ACFT 501	FOOD CHEMISTRY	4
<p>Unit-1. General Introduction & scope: Fundamentals of Chemistry, Physico-chemical and functional properties of various food constituents and importance.</p> <p>Unit-2. Water: Physical and chemical properties of Water and Ice, water activity, Dispersed systems and surface phenomena.</p> <p>Unit-3. Carbohydrates-Classification, structure, sources, Physico-chemical, functional properties of sugars and polysaccharides in foods& their applications.</p> <p>Unit-4. Proteins and amino acids: Classification, structure, sources, physico-chemical, functional properties of proteins & amino acids. Enzymes (classification, mode of action, kinetics, assay techniques, isolation and purification and applications). Denaturation of proteins. Principles for separation methods. Protein concentrates and isolates. Processing induced physical and chemical changes in Proteins.</p> <p>Unit-5. Lipids: Classification, structure, sources, physico-chemical, functional properties of lipids. Rancidity, Fatty acids- saturated mono unsaturated and poly-unsaturated. Chemistry of fats and oil and their role. Modifications of lipids.</p> <p>Unit-6. Vitamins and Minerals: Classifications, biological importance and functions, dietary sources, deficiency diseases, recommended dietary allowance.</p>		
COURSE CODE	COURSE NAME	CREDITS
ACFT 502	PRINCIPLES OF FOOD PROCESSING AND PRESERVATION	4
<p>Unit-1. Introduction: Definition and scope of Food Science and Technology, historical development of food processing and preservation, general principles of food preservation, unit operations, effect of various food processing operations on nutrients, packaging materials used for foods.</p> <p>Unit-2. Preservation by heating: Principles of the method, Types of microorganisms, bacterial load, sterilization and commercial sterility, thermal resistance of the microorganisms and enzymes. Canning and bottling, ultra-high temperature processes, determination of thermal process time.</p> <p>Unit-3. Refrigeration and freezing preservation: Refrigeration, refrigerated storage of various foods, freezing of foods, influence of freezing and freezing rate of the quality of food products, methods of freezing, storage and thawing of frozen foods.</p> <p>Unit-4. Drying and dehydrations: Water activity and its effect on the keeping quality, sorption isotherms. Factors affecting drying, methods of drying, type of driers, intermediate moisture foods.</p> <p>Unit- 5. Newer methods of food preservation: Introduction, newer thermal and non-thermal methods, irradiations, principles, applications in food processing.</p> <p>Unit-6. Chemical preservation: Preservation of foods using sugar, salt, chemicals, smoking</p>		

COURSE CODE	COURSE NAME	CREDITS
ACFT 503	FOOD AND NUTRITION	3
<p>Unit-1. Introduction to Nutrition: Nutritive value of food, recommended dietary allowance, interrelationship between nutrients, nutritional aspects of carbohydrates, lipids, proteins, vitamins, minerals, fibre, water and electrolyte balance, digestion and absorption of food, energy value of foods, and energy requirements for various conditions, nutrition of infants, children's, adolescents, mother and geriatric nutrition, high altitude nutrition. Military nutrition.</p> <p>Unit-2. Nutritional Requirements & Disease Control: Therapeutic nutrition & formulation of special dietary foods; Relation of food and diseases; Deficiencies of essential nutrients; Assessment of nutritional status & RDA; Effect of processing on nutrients; Functional foods with attributes to control cardiovascular diseases, cancer, obesity, ageing etc.,</p> <p>Unit-3. Nutrition of dietary fibres. Biological value of proteins. Energy value of foods. Techniques of diet and health surveys. Formulation of diets and food products for specific needs.</p> <p>Unit-4. Introduction to nutraceuticals: definitions, synonymous terms, basis of claims for a compound as a nutraceutical, regulatory issues for nutraceuticals.</p>		
Course Code	Course Name	Credits
ACFT 504	Food Microbiology	3
<p>Unit-1. Introduction to Microbiology: Historical developments; food microbiology basics and scope; structure, growth & reproduction of bacteria, yeast, fungi, algae and viruses - A brief account.</p> <p>Unit-2. Microbial growth factors and food spoilage - Intrinsic and extrinsic parameters affecting microbial growth; cultivation of microorganisms; different types of spoilage and their control for various foods.</p> <p>Unit-3. Microbial detection and destruction- sample collection, transport and storage; sample preparation for analysis; microscopic and culture dependent methods for microbial detection; thermal death time, Z, F and D values; principles of food preservation; control of water activity.</p> <p>Unit-4. Food hygiene, sanitation and public health: Contamination during handling and processing and its control; indicator organisms; Rapid methods in microbial detection; food poisoning- types and significance; bacterial agents of food borne illness; non-bacterial agents of food borne illness - poisonous algae, fungi and food borne viruses - A brief account.</p>		
Course Code	Course Name	Credits
ACFT 512	Laboratory Experiment (Any 12)	2
<ol style="list-style-type: none"> Principles and working of common analytical instruments. Analysis of water with respect to pH Determination TDS of water Determination of total hardness of water 		

5. To determine the moisture content in the given sample
6. To determine the total ash content in the given sample
7. To determine the acid insoluble ash in the given sample
8. Estimation of reducing and non-reducing sugars, starch
9. Estimation of vitamin-C
10. Analysis of lipids-saponification value
11. Determination of TSS, pH, acidity
12. determination of acid value and free fatty acids of given oil/ fat sample
13. Principles and working of common instruments including microscopy.
14. Preparation of nutrient media, sterilization and inoculation techniques
15. Staining techniques: Monochrome staining, gram staining, acid fast staining, spore staining, capsule staining and motility of bacteria.
16. Pure culture techniques: isolation of pure cultures from spoiled food
17. Growth characteristics: Methods for determination of microbial numbers– direct and plate count; Generation time.
18. Industrial Visit

SEMISTER-II

Course Code	Course Name	Credits
ACFT 521	Food Analysis and Sensory Evaluation	4
<p>Unit-1. Food Component Analysis: Proximate composition includes protein, fat, moisture ash etc. Analysis of minerals & vitamins & nutritional component, pesticide analysis. Use of Analytical Techniques in Food Science; Basics, Principles and Applications of UV – Vis Spectrophotometer, Gas Chromatography (GC), High Pressure Liquid Chromatography (HPLC), LCMS, GCMS, Atomic Absorption Spectroscopy (AAS), ICPMS, MALDI-TOF, Fourier Transform Infrared Spectroscopy (FTIR), Differential Scanning Calorimetry (DSC) and Thermo Gravimetric Analysis (TGA). Microwave and IR techniques.</p> <p>Unit-2. Introduction to quality attributes of food: Appearance, flavour, textural factors and additional quality factors. Chemical dimensions of basic tastes- sweet, salt, sour, bitter and umami</p> <p>Unit-3. Gustation & Taste perception: Structure and physiology of taste organs- tongue, papillae, taste buds, salivary glands. Mechanism of taste perception Factors affecting taste quality& evaluation methods foe sensory analysis, Estimation of colour of food by visual /instrumental means.</p> <p>Unit-4. Principles and working of common instruments.</p> <p>Practical</p> <ol style="list-style-type: none"> 1. Analysis of minerals by using Atomic Absorption Spectroscopy (AAS)/ICP 2. Fatty acid analysis by using GC 		

3. Determination of vitamins by chromatography
4. Taste evaluation
5. Evaluation of Taste thresholds
6. Taste evaluation by overall acceptability (OAA)

Course Code	Course Name	Credits
ACFT 522	Food Standards and Safety Management	3
<p>Unit-1. Importance and functions of food safety and quality control: Concept and meaning of food quality and food Safety, food adulteration, food hazards.</p> <p>Unit-2. Food laws and regulations – International and National scenario & law, standards and governing bodies dealing with inspection, certification, traceability and authentication such as Codex Alimentarius Commission, USFDA, FSSAI, Voluntary national standards (BIS and AGMARK). Domestic regulations and Food Safety and Standards Act, 2006</p> <p>Unit-3. Principles of Food safety and quality management- Total Quality Management, Risk analysis (risk management, risk assessment and risk communication), History, structure, principles, HACCP applications, HACCP based SOPs, Other food safety practices (GMP/GHP; GLP, GAP sanitary and hygienic practices)</p> <p>Unit-4. Food Safety and Quality Management Systems-Quality Management system (ISO-9001), food safety management system (ISO 22000:2005 and ISO 22000:2018). Quality manuals, documentation and audits, case studies of food safety and Quality management. Quality assurance and quality control, sampling procedures and plans, specification of raw materials and finished products, labelling issues, export import policy; laboratory quality procedures and assessment of laboratory performance</p>		

ELECTIVE SUBJECTS FOR SECOND SEMESTER

Course Code	Course Name	Credits
ACFT 523	Technology of Fermented Food	3
<p>Unit-1. Scope and Importance: History and Introduction to fermentation Technology, Types of Fermentation, Fermentor Designs.</p> <p>Unit-2. Fermentation process: Media formulations, sterilization, Starter cultures and their maintenance. Factors influencing fermentation process. Down-stream process. Immobilization of enzymes. Primary and secondary metabolites</p> <p>Fermented food products: Lactic acid fermentation. Ethanol fermentation. Vitamin B-12 fermentation. Fermented Dairy products. Wine and Beer fermentation. Vinegar fermentation. Bread making by yeast. Indian traditional foods, pickles, fermented vegetables, Mushroom cultivation, Oriental fermented products, Probiotics.</p> <p>Unit-3. GM foods: Genetically modified microorganisms and foods. Bio-safety, ethics and risk assessment</p>		

Unit-4. Volarization of Agri food waste: Bioethanol production, biohydrogen production.

Practical

1. Media preparation and sterilization
2. Fermentation involving lactic acid bacteria.
3. Identification of simple secondary metabolites such as lactic acid bacteriocins.

Course Code	Course Name	Credits
ACFT 524	Military Nutrition	3

Unit 1. Introduction to Military Nutrition Definition and scope of military nutrition, Differences between civilian and military nutrition needs, Nutritional challenges in various military settings (combat, training, deployment)

Unit 2. Human Physiology and Energy Systems in Military Performance -Basic human metabolism and energy systems, Role of macronutrients in energy production, Role of micronutrients for physical and cognitive performance, Hydration and electrolyte balance in high-stress environments

Unit 3. Nutritional Needs for Different Military Populations

Nutrition for different branches of the military (Army, Navy, Air Force, Marines), Energy and macronutrient requirements for different military roles (infantry, pilots, special forces), Gender-specific nutritional considerations, Dietary needs for high-altitude, cold weather, desert, and jungle operations.

Unit 4: Meal Planning, Military Rations and performance nutrition for military training and combat-

Types of military rations (MREs, First Strike Rations, Unitized Group Rations), Nutritional composition and adequacy of military field rations, Pre-mission and post-mission nutrition strategies, Nutritional supplements for military performance and resilience and recovery

Unit 5: Mental Performance, Emergency Survival and Rehabilitation Nutrition -

Nutritional impact on cognitive function, alertness, and decision-making, Strategies to prevent fatigue, sleep deprivation effects, and combat stress through diet, Emergency nutrition strategies for survival situations, Role of protein and micronutrients in muscle repair and wound healing, Anti-inflammatory diets and functional foods for injury recovery

Course Code	Course Name	Credits
ACFT 525	Technology of Milk and Dairy Products	3

Unit-1. Introduction: Present status of milk & milk products in India and Abroad; market milk- Composition of milk of various species, quality evaluation and testing of milk, procurement, transportation and processing of market milk, standardization, toning of milk, homogenization, pasteurization, sterilization, storage, transportation and distribution of milk. Cleaning & sanitization of dairy equipment's. Special milks such as flavoured, sterilized, recombined & reconstituted toned & double toned. Judging and

grading of milk and its products.

Unit-2. Condensed milk- Definition, methods of manufacture, evaluation of condensed & evaporated milk; dried milk- Definition, methods of manufacture of skim & whole milk powder, instantization, physiochemical properties, evaluation, defects in dried milk powder.

Unit-3. Butter- Definition, composition, classification, methods of manufacture, theories of churning, evaluation, defects in butter.

Unit-4. Ice cream- Definition, composition and standards, nutritive value, classification, methods of manufacture, evaluation, defects in ice cream,

Unit-5. Cheese: Definition, composition, classification, methods of manufacture, cheddar, Gouda, cottage and processed cheese, evaluation, defects in cheese.

Unit-6. Milk product processing khoa, channa, paneer, fermented milk products. Yoghurt, dahi- Drying Theories, Dried milk: Definition and composition, production by drum drying and air spray system; defects; dried milk products–butter-milk powder, whey powder, cream powder, infant milk food. Drying Equipment's: Spray Drier, Drum Drier. Novel emerging milk processing techniques. Quality Control in Milk Processing: Tests for evaluation of quality of milk and adulteration.

Practical

1. Study on basics of reception of milk at the plant; platform test of milk, physico-chemical, microbiological and sensory analysis of milk and milk products
2. Estimation of fat by Gerbers' method and SNF in milk;
3. Homogenization of milk.
4. Preparation of special milks;
5. Preparation and evaluation of table butter,
6. Determination of adulterants in milk-by-milk testing kit.

Course Code	Course Name	Credits
ACFT 526	Functional and Personalized Nutrition	3

Unit 1: Introduction to Functional & Personalized Nutrition-Definition and scope of functional and personalized nutrition, Differences between traditional, functional, and personalized diets, Role of functional foods in disease prevention and health optimization.

Unit 2: Functional Foods and Bioactive Compounds-Classification of functional foods: probiotics, prebiotics, polyphenols, omega-3s, fiber, Mechanisms of action of bioactive compounds

Unit 3: Development of Functional Foods for Specific Health Conditions-Cardiovascular Health: Omega-3s, plant sterols, fiber, Gut Health: Probiotics, prebiotics, fermented foods, Diabetes Management: Low-GI foods, resistant starch, dietary fibers, Cognitive Function: Nootropics, flavonoids, MCTs, Sports Nutrition: Protein optimization, amino acids, ergogenic aids

Unit 4: Smart wearables for real-time nutritional tracking- Nutrigenomics-based meal planning apps, Role of microbiome analysis in precision nutrition

SEMISTER-III

Course Code	Course Name	Credits
ACFT 531	Fundamentals of Food Engineering	4
<p>Unit-1. Fundamental Concepts and Definitions: Introduction to food engineering, Dimensions and units, thermodynamic systems (closed, open and isolated), intensive and extensive properties, equilibrium state, density, specific volume, specific weight, specific heat, enthalpy, entropy, pressure, temperature scales. Material Balances: Principles, process flow diagrams, total mass balance, component mass balance, material balance problems involved in dilution, concentration and dehydration; heat balance calculations. Energy Balances: Principles, energy terms, specific heat of solids and liquids, properties of saturated and superheated steam, heat balances.</p> <p>Unit-2. Heat Transfer Conduction: Fourier's law, thermal conductivity, resistances in series, heat flow through cylinder. Convection: Natural convection and force convection, film coefficient, overall heat transfer coefficients, dimensionless numbers – pandtl number and nusselt and heat transfer from condensing vapours to boiling liquids, heat exchange equipment applied to food insustries – jacketed pans, heaters, coolers – tubular heat exchangers, scrapped surface heat exchangers and plate heat exchangers. Radiation: Stefan-Boltzmann constants. Black bodies. Irradiation of foods. Radiation units and doses for foods, safe limits, irradiation mechanism and survival curve, irradiation of packaging materials. Thermal process calculations: Commercially sterile concept, concept of D, F and Z values, reference F value; effect of temperature on thermal inactivation of micro-organisms, thermal process calculation for canned foods; calculation of processing time in continuous flow systems. Evaporation: Properties of liquid, heat and mass balance, single and multiple effect evaporation, steam economy, heat recovery, efficiency, process calculations, equipment, accessories and systems. Application of evaporators in food industries.</p> <p>Unit-3. Mechanical operations: Mixing kneading, and blending: solid mixing, liquid mixing, classification of equipment and application. Homogenisation. Size separation: filtration theory, constant rate and constant pressure filtration. Classification of filtration equipment – plate and frame filter press, rotary vacuum filters, leaf filters, centrifugal filters and air filters. Sedimentation – sedimentation of solids in liquid and solids in gas – stokes law, centrifugal separation – equipment and theory. Size reduction and classification: Slicing, dicing, crushing and grinding – laws governing crushing and grinding – classification of equipment and applications. Sieve analysis, standard sieves – types of equipment, vibrating screen, tromels, oscillating, vibrating and planetary equipment. Extrusion Cooking: Theory and applications, extrusion cookers and cold extrusion, single and twin screw extruders, design considerations.</p> <p>Unit-4. Distillation : Vapour-liquid relationships, Raoult's law, Henery's law,boiling point diagram, classification of distillation – batch distillation, steam distillation, vacuum distillation and rectification and their application to food industries. Drying : Theory and Mechanism of drying, moisture and drying</p>		

rate curves, free moisture content, critical moisture content, equilibrium moisture content, constant and falling rate periods, spray, drum, bin, cabinet, tunnel, vacuum shelf dryer, through flow dryer, fluidized bed dryers, batch and continuous operational, osmotic dehydration, freeze drying and their respective applications in food industries. **Chilling, refrigeration and freezing:** Shelf life extension requirements for various products, theories, characteristics curve, cooling rate calculations. Chilling and freezing equipment, cryogenics. Freezing – technological principles of freezing operations, freezing systems – direct contact and indirect contact system; influence of freezing rate on food system; freezing time calculations. **Crystallization:** Solubility, nucleation, super saturation, heat of crystallization, type of crystallization, equipment and applications

Practical's

1. Mechanical drawing
2. Refrigeration plant
3. Boiler house
4. Pilot plant
5. Electrical laboratory
6. Instrumentation
7. Pumps and Flow meters
8. Mass and energy balance
9. Determination of water activity
10. Heat treatment pasteurization and sterilization
11. Thermal Process calculations
12. Canning operations
13. Dehydration of fruits and vegetables – drying rate curves
14. Numerical Problem based on Mass balance
15. Size determination
16. Mixing, kneading, blending
17. Extrusion products
18. Filtration and centrifugation
19. Freezing curve
20. Filtration and centrifugation
21. Freezing curve

Course Code	Course Name	Credits
ACFT 532	Technology of Fruits, Vegetables & Plantation Crops	3
<p>Unit-1. Introduction to fruits and vegetables: Importance of fruits and vegetables; structure, classification and general composition of fruits and vegetables, Indian and global scenario on production and processing of fruits and vegetables</p> <p>Unit-2. Postharvest handling, storage of fresh fruits and vegetables: Post-harvest changes in fruits and vegetables, climacteric rise, horticultural maturity, physiological maturity, physiological changes during ripening and storage of fruits and vegetables, factors affecting postharvest losses. Fresh fruits and vegetables handling, sorting, grading, Phyto sanitation, cooling, packaging, quality assurance, chilling injury. Principles of storage, types of storage, low temperature storage, modified atmosphere and</p>		

controlled atmosphere storages, hypobaric storage.

Unit 3. Processing of fruits and vegetables: Canning of fruits and vegetables, syrups and brines for canning, types of cans, manufacturing of cans, lacquering, mechanical defects, spoilage in canned foods. Fruit juices, beverages and concentrates, carbonated beverages, fruit juice powders. Jams, jellies, marmalades, preserves and candied products, role of pectin, theory of jelly formation, strength of pectin. Chutneys, sauces, pickles and tomato products.

Unit 5: Plantation crops: Importance of plantation crops, chemical composition, processing of tea, coffee, cocoa, chicory. Spices, production, processing.

Practical's

1. Equipment for fruits and vegetable processing and plant layout
2. Preparation of fruit juices, squashes, syrups and ready-to-serve beverages
3. Preparation of jams, jellies, marmalades,
4. Canning of fruits and vegetables
5. Estimation of pectin, Estimation of browning enzymes, PPO and POD
6. Determination of salt content

ELECTIVE SUBJECTS FOR THIRD SEMESTER

Course Code	Course Name	Credits
ACFT 533	Technology of Cereals, Pulses and Oil Seeds	3
<p>Unit-1. Wheat and wheat processing: Structure, types and physicochemical characteristics; wheat milling products and by products; factors affecting quality parameters; physical, chemical and rheological tests on wheat flour; manufacture of bakery products confectionary products and other cereal-based foods.</p> <p>Unit-2. Rice and rice processing- Structure, classification, physicochemical characteristics; cooking quality; rice milling technology; by- products of rice milling and their utilization; Parboiling of rice-technology and effect on quality characteristics; aging of rice - quality changes; processed products based on rice.</p> <p>Unit-3. Maize and maize processing: Structure, Classification, chemical properties. Primary and secondary processing products. Application in food and allied industries.</p> <p>Unit-4. Millets and millet processing: Structure, etc. Types & availability, Post-harvest processing handling & storage. Millet based primary and secondary processed products.</p> <p>Unit-5. Bakery and confectionary industry; raw materials and quality parameters; dough development; methods of dough mixing; dough chemistry; rheological testing of dough. Technology for the manufacture of bakery products and the effect of variations in formulation and process parameters on the quality of the finished product; Staling and losses in baking; machineries used in bakery industry. Chapati making process and qualities,</p> <p>Unit-6. Legumes, pulses and their processing: Type of legumes/pulses, physicochemical and nutritional</p>		

characteristics, processing and value-added products, storage.

Oil seeds and their processing: Production of edible oils and other by-products. Refining of edible oils;

Hydrogenation and value added products.

Practical:

1. Physical characteristics of grains
2. Texture analysis of grains
3. Oil extraction from oilseed
4. Oil content of oilseeds
5. Free fatty acids, Iodine value
6. Saponification value
7. Peroxide Value
8. Estimation of gluten content,

Course Code	Course Name	Credits
ACFT 534	Technology of Meat, Poultry And Fish Processing	3

Unit-1. Meat: Sources of meat and meat products in India, its importance in national economy. Selection of animals for slaughtering, importance of traceability, ante-mortem inspection, grading and safety protocols. Effect of feed, breed and management on meat production and quality. Chemical composition and muscle structure, post-mortem muscle chemistry; meat colour and flavours; meat microbiology and safety.

Modern abattoirs/ meat plants, typical layout and features, design of Ante-mortem handling facilities; hoisting rail and travelling pulley system; stunning methods; Slaughtering of animals and poultry. Steps in slaughtering and dressing; offal handling and inspection; inedible by-products; operational factors affecting meat quality: Rigor mortis, pH changes, colour changes, effects of processing on meat tenderization; abattoir equipment and utilities. Meat quality evaluation, inspection, grading of meat. Mechanical deboning, Meat plant sanitation and safety Chilling and freezing of carcass and meat/poultry; factors responsible for effective chilling and freezing, importance of cold chain facilities, quality changes during chilling and freezing, cold shortening, ripening, DFD and PSE, Factors affecting post-mortem changes - properties and shelf-life of meat.

Processing of meat – pickling, curing and smoking; thermal and non-thermal processing methods of preservation – retort processing, different dehydration techniques, high pressure processing, hurdle processing and irradiation.

Unit-2. Poultry: classification, composition, preservation methods and processing. Poultry industry in India, quality characteristics of poultry products, microbiology of poultry meat, spoilage factors; Layout and design of poultry processing plants, Plant sanitation; Poultry meat processing operations, equipment used – Defeathering, bleeding, scalding etc.; Packaging of poultry products, refrigerated storage of poultry meat and by-products

Structure, composition, nutritive value and functional properties of eggs and its preservation by different

methods. Processing of egg products. Factors affecting egg quality and measures of egg quality. Packaging of eggs, egg products,

Unit-3. Fish: Types of fish, composition, structure, post-mortem changes in fish. Handling of fresh water fish. Canning, smoking, freezing and dehydration of fish. Preparation of fish products, fish sausage and home makings. Commercially important marine products from India; product export and its sustenance; basic biochemistry and microbiology; transportation in refrigerated vehicles; deodorization of transport systems; design of refrigerated and insulated trucks; grading and preservation of shell fish; pickling and preparation of fish protein concentrate, fish oil and other by-products.

Practical

1. Slaughtering and dressing of meat animals;
2. Study of post-mortem changes;
3. Meat cutting and handling; evaluation of meat quality;
4. Preservation by dehydration, freezing, canning, curing, smoking and pickling of fish and meat;
5. Evaluation of quality of eggs;
6. Estimation of meat: bone ratios;
7. Application of meat testing kits for quality evaluation.
8. Visit to meat processing plants / modern abattoir

Course Code	Course Name	Credits
ACFT 535	Food Packaging Technology	3

Unit-1. Introduction to food packaging: Definition, objectives, functions and roles of food packaging, Packaging design and development, Packaging environment, Factors influencing the selection of packaging. **Packaging materials and their properties:** Paper: pulping, fibrillation and beating, types of papers, paper boards, corrugated fibre board, Glass: composition, properties, types of closures, methods of bottle making; Metals: types of cans, tin and aluminium based cans, lacquers; Plastics: used in packaging, their chemical structure and properties. **Different forms of packaging:** Rigid, semi rigid and flexible, Liquid and powder filling machines; bottling machines, Form fill seal and multilayer aseptic packaging machines, vacuum packs unit, shrink pack unit, tetra-pack unit

Unit-3. Testing of packaging materials: Mechanical properties such as tensile strength, bursting strength, tearing resistance, puncture resistance, impact strength, tear strength, bond strength, heat seal strength, Cobbs value, their methods of testing and evaluation. **Barrier properties of packaging materials:** Theory of permeability, factors affecting permeability, permeability coefficient, gas transmission rate (GTR) and its measurement, water vapour transmission rate (WVTR) and **Migration from packaging materials:** Overall and specific migration, physical process, partition coefficient and sorption process, determination of migration, food simulants, packaging flavour interaction, factors affecting flavour absorption, role of food matrix.

Unit-4. Recent trends in food packaging: Vacuum packaging, controlled atmospheric packaging (CAP), modified atmospheric packaging (MAP), gas packing, bioplastics in food packaging, aseptic

packaging, retort pouch packaging, microwave packaging, active packaging, intelligent packaging, smart packaging, edible packaging, shrink and stretch packaging. **Packaging systems and methods:** Packaging requirements and their selection for raw and processed foods, dehydrated foods, frozen foods, cereals and pulses, fats and oils, dairy products, beverages, fresh fruits and vegetables, meat, poultry and sea foods.

Unit-5. Role of packaging in food marketing: Coding and marking; nutrition labelling, Traceability: RFID tag, bar coding, QR code. **Packaging Laws and regulations:** safety aspects of packaging materials, Environmental & recycling and waste disposal.

Practical

1. Identification and testing of packaging materials
2. Determination of grammage, water proofness
3. Determination of physico-mechanical properties (thickness, tensile properties, tear strength and seal strength) of polymer packaging materials
4. Determination of total migration
5. Determination of water vapour transmission rate (WVTR) and gas transmission rate (GTR) of packaging material
6. Determination of gas composition by Head space analyser

Course Code	Course Name	Credits
ACFT 536	Advanced Food Technology	3

Unit-1. Introduction: Scope and importance of advanced techniques in food technology, Importance and types of thermal and non-thermal processing techniques.

Unit-2. Dielectric heating, Microwave heating, Infrared heating, Combination processing, RF heating, Ohmic heating, Extrusion cooking (Introduction, processing equipment and design, Mode of action, Biological effect and application in food processing)

Unit-3. High hydrostatic pressure in food processing, High intensity pulsed electric field processing, High pressure CO₂ processing, O₃ (Ozone) processing, Electron beam processing, Pulsed light processing, Ultra sonication. processing, (Introduction, processing equipment and design, Mode of action, biological effect and application in food processing)

Unit-4. Application of nanotechnology in food systems, Introduction and applications in foods, human nutrition, preservation, processing, packaging.

SEMISTER-IV

Course Code	Course Name	L – T – P	Credits
RP 542	PROJECT -II		18