M.Sc Food Technology

Jiwaji University, Gwalior MP

(Non-CBCS for College)

Syllabus -2020-2022

M.Sc FOOD TECHNOLOGY
FOR AFFILIATED COLLEGE
M.Sc. I SEMESTER SCHEME

Course Code	Course Name	Max Marks			Min Marks	
		IA	EA	Total	IA	EA
FT 101	Food Chemistry	15	85	100	05	29
FT 102	Food Biochemistry & Nutrition	15	85	100	05	29
FT 103	Food Microbiology	15	85	100	05	29
FT 104	Principles of Food Processing & Preservation	15	85	100	05	29
FT 105	Laboratory-I	-	-	100	05	29
FT 106	Laboratory-II	-	-	100	05	29
	Grand Total	-	-	100	-	40

M.Sc FOOD TECHNOLOGY
FOR AFFILIATED COLLEGE
M.Sc. II SEMESTER SCHEME

Course Code	Course Name	Max Marks			Min Marks	
		IA	EA	Total	IA	EA
FT 201	Fruits & Vegetable Technology	15	85	100	05	29
FT 202	Food Engineering	15	85	100	05	29
FT 203	Food Packaging	15	85	100	05	29
FT 204	Food Quality control, Laws & Management	15	85	100	05	29
FT 205	Laboratory-I	-	100	-	05	29
FT 206	Laboratory-II	-	100	-	05	29
	Grand Total	-	100	-	-	40

M.Sc FOOD TECHNOLOGY
FOR AFFILIATED COLLEGE
M.Sc. III SEMESTER SCHEME

Course Code	Course Name	Max Marks			Min Marks	
		IA	EA	Total	IA	EA
FT 301	Processing of Cereals, Legumes, oil seeds, & Sugar crops	15	85	100	05	29
FT 302	Dairy Technology	15	85	100	05	29
FT 303	Meat, Fish & Poultry products	15	85	100	05	29
FT 304	Food additives, Spices & Flavor technology	15	85	100	05	29
FT 305	Laboratory-I	-	-	100	05	29
FT 306	Laboratory-II	-	-	100	05	29
	Grand Total			100	-	40

M.Sc FOOD TECHNOLOGY
FOR AFFILIATED COLLEGE
M.Sc. IV SEMESTER SCHEME

Course Code	Course Name	Max Marks			Min Marks	
		IA	EA	Total	IA	EA
FT 401	Advances in Food technology	15	85	100	05	29
FT 402	Entrepreneurship & Business management in food technology	15	85	100	05	29
FT 403	Personality/Skill development*	15	85	100	05	29
FT 404	Project Work	15	85	100	05	29
	Grand Total	-	-	100	-	40

CENTRE FOR FOOD TECHNOLOGY

SYLLABUS (2020 -2021)

FT 101: FOOD CHEMISTRY

Objective-To acquaint the students about chemistry of various foods.

Outcome: The student will have an idea of food constituents, importance and their daily dietary allowances; scope and prospects for food industries. Student will understand the changes in food during cooking, processing, storing and even digestion. Knowledge of the chemical components (nutritional value) of food is essential for developing a food product with essential amino acids and fatty acids. This also informs the health importance of food chemistry

UNIT -I

Carbohydrate: General introduction, classification, properties and functions of carbohydrates, role of carbohydrate in food industries, Starch, cellulose, hemicelluloses, gums, pectic substances, Modified starch.

Browning reactions in food: Enzymatic and non-enzymatic browning in foods of vegetable and animal origin during storage and processing of foods.

UNIT –II

Proteins: General introduction, classification, structure, properties, purification and denaturation of proteins, protein derived from milk, egg protein, meat protein, fish muscle protein, oil seed protein and cereal protein. Modified proteins and application in food industry. Single Cell Protein. Allergens associated with food.

UNIT –III

Lipids: General introduction, classification, properties, functions and requirements of food lipids, Vegetable and animal fat, margarine, lard, butter.
Refining of crude oil, hydrogenation and winterization, Frying and shortenings.
Flavor changes in fats and oils, lipid oxidation & factors affecting lipid oxidation.

Unit IV

Vitamins: General introduction, Fat- and Water-soluble Vitamins, effect of various processing treatments
Minerals: General introduction, effect of various processing treatments.
Fortification: Methods, Significance and applications.

Unit V

Enzymes: General introduction, Nature, nomenclature, classification, properties and functions of enzymes.Factors affecting rate of enzymatic action.
Enzyme activity in different food systems, Introduction of Flavor production by enzymes.
Plant pigments and their role in Food Industry: Carotenes, Xanthophylls, Chlorophyll, Bitter Substances and Tannins.

Text books and Reference materials

1. Beltz, H.D. 2005. Food Chemistry. Springer Verlag.
2. Fennema, O.R, 2006, Food Chemistry, Academic Press.
3. Meyer, L.H. 1987. Food Chemistry. CBS publishers and Distributors, New Delhi.
4. Potter, N.N. and Hotchikiss, J.H. (2006), Food Sciences, Fifth edition, CBS publishers and Distributors, New Delhi.

FT 102: FOOD BIOCHEMISTRY AND NUTRITION

Objective To acquaint the students about Food biochemistry and Nutrition of various foods.

Outcome: To emphasize the need for greater and more efficient utilization of the existing food sources and development of entirely sources of different food groups. Digestion and metabolic pathways of different components knowledge about water, fat soluble vitamin and minerals and recommendatory dietary allowance:

UNIT –I

Introduction to different food groups and its importance in nutrition. Carbohydrate: Introduction, digestion, food sources. Metabolic pathways for breakdown of carbohydrates: glycolytic pathway, pentose phosphate pathway, citric acid cycle, electron transport chain, ATP balance, gluconeogenesis, deficiency, metabolic defects such as diabetes associated with carbohydrates.

UNIT -II

Protein: Introduction, Essential amino acids. Food sources, metabolic defects, Metabolism of proteins – outlines (digestion and absorption), Nitrogen balance & nitrogen pool, Evaluation of quality of proteins, deficiency symptoms, prevention and cure.

Fat: Digestion: Introduction, digestion, metabolism outlines, essential fatty acids, food sources, metabolism of fat and fatty acid, nutritive functions, effects of excess and deficiency: obesity, cardiovascular diseases. Nutritional significance of lipo-proteins.

UNIT –III

Fat soluble vitamins: Salient features, requirements, food sources, effects of excess and deficiency.**Water soluble vitamins**: Salient features, requirements, food sources, effects of excess and deficiency. **Minerals:** silent features, requirements, food sources, effects of excess (if any) and deficiency factors affecting utilization.

Unit IV

Energy metabolism: Basal metabolic requirements and activity, SDA- specific dynamic action of food, respiratory quotient of food, caloric requirement of humans.

Recommendatory dietary allowance: concept of balance diet, menu planning in different ages and diseases.

UNIT-V

Colorimetry: Introduction, beers & lamberts law, extinction coefficient, general principles of colorimeter, application in food industry.

Flourimetry: Introduction, principle, instrumentation & application., Flame photometry: Instrumentation & application.

Spectroscopy: General principle, instrumentation, types-atomic absorption spectrophotometer, UV-Visible, principle, instrumentation & applications

Text Books / References:

1. Modern Experimental Biochemistry, Boyer, Pearson Education
2. Lubert stryer, Biochemistry, Freeman & Co, N.Y.
3. Voet & Voet, Fundamentals of Biochemistry, Jonh Willey & Sons

FT 103 FOOD MICROBIOLOGY

Objective To understand the role and significance of different microbes and their activity in food safety, food quality and food shelf-life especially during food production to food storage.
Outcome: Students will be able to understand the principles behind microbiological techniques used in evaluating the quality of food. They will be able to identify the microorganism responsible for food spoilage and the methods to control the food spoilage. It focuses on the study of microbial ecology related to fermentation, preservation, investigation of food borne illness and national and international Food Legislation.

UNIT I

Definition, Historical Development, Classification, propagation and importance of Yeast, Mold and Bacteria. Importance and significance of microorganisms in Food science.
Factors affecting the growth of micro organisms in food – Intrinsic and Extrinsic parameters that affect microbial growth.

UNIT II

Food Hygiene and Sanitation: Contamination during handling and processing and its control.
Indicator organisms; rapid methods in detection of microorganisms.
Sterilization, Thermal inactivation of microbes- Concept, determination & importance of TDT, F, Z & D values, factors affecting heat resistance, pasteurization.
Protection and preservation of Foods: Modified atmosphere, Radiation.

UNIT III

Water: Chemistry, role in food storage, water activity and growth of microorganisms, physical, chemical and microbiological characteristics of water.
Outlines of indicators of water and food safety and quality-Microbiological criteria of foods and their significance.

UNIT IV

Food spoilage: Characteristic features, dynamics and significance of spoilage of different groups of foods - Cereal and cereal products, vegetables and fruits, meat, poultry and sea foods, milk and milk products, packed and canned foods.
Food borne diseases: Bacterial food borne diseases (Staphylococcal in-toxification, Botulism, Salmonellosis, Shigellosis, Enteropathogenic Escherichia Coli Diarrhea, Clostridium Perfringens gastroenteritis, Bacillus cereus Gastroenteritics), Mycotoxins: Aflatoxicosis, Deoxyni valenol Mycotoxicosis, Ergotism.

UNIT V

Food Fermentation: Microbial culture in food fermentations and their maintenance & evaluation. factors affecting activity of culture, single and mixed cultures of cultures; Therapeutic value of fermented foods.
Probiotics and Prebiotics: definition, characteristics, history and classification, Safety considerations on probiotics, application of probiotics and prebiotics in food industry

Text books and Reference materials:

1. Essentials of Microbiology; K. S. Bilgrami; CBS Publishers, Delhi
2. Food Microbiology; WC Frazier; Tata McGraw Hill, Delhi
3. Modern Food Microbiology; James M Jay; CBS Publishers, Delhi
4. Microbiology; Pelczar, Chan and Krieg; Tata McGraw Hill, Delhi

FT104 PRINCIPLES OF FOOD PROCESSING & PRESERVATION

Objective: To identify and select preservation methods appropriate for specific foods and to learn the effects of preservation methods on the quality of food.

Outcome: Students shall develop the knowledge of need of food processing and learn various preservation techniques. To impart knowledge on the causes of food spoilage and principles of different techniques used in processing and preservation of foods. Knowledge about baking and milling of process.

UNIT -I

Introduction: Definition and scope of Food science and technology, historical development of food processing and preservation, general principles of food preservation Processing and preservation by heat: Blanching, pasteurization, sterilization and UHT processing, canning, extrusion cooking

Baking: Principle of baking and several changes in baked products.

UNIT –II

Radiation: Source of radiations, mode of action effect on microorganisms and different nutrients dose requirements for radiation preservation of food.

Microwave heating: Principles and application in Food processing

UNIT –III

Refrigeration and Freezing Preservation: Refrigeration and storage of fresh food major requirement of refrigeration plant atmospheric storage, refrigerated storage of various food freezing point of selected food influence of freezing and quality of the food product. Method of freezing, freeze drying, storage, and thawing of frozen food

Unit IV

Chemical Preservation: Preservation of food by use of sugar, salt, chemicals, antibiotics & by smoking

Concertation: Application in food industry processes and equipment for manufacture of various concentrated foods and their keeping quality

Fermentation: Application in preservation of food pickling. curing etc

Unit V

Drying: Processing and preservation by drying, various methods employed in production of dehydrated food products, selection of methods based on characteristics of foods to be produced, advantages and disadvantages of different methods, sun-drying, tray or tunnel drying, spray drying, drum drying, fluidized bed drying. Physical and chemical changes during drying control of chemical changes, desirable and undesirable changes. Packaging and storage of dehydrated food products.

Text books and Reference materials

1. Desrosier NW & James N. (2007). Technology of food preservation. AVI. Publishers
2. Fellows, P.J. (2005). Food processing technology: Principle and Practice. 2nd Ed. CRC Publishers
3. Jelen, P. (2005). Introduction to Food Processing. Prentice Hall
4. N.M.Potter, Food Science and Technology.

FT 201: FRUITS AND VEGETABLE TECHNOLOGY

Objective: To develop knowledge regarding biochemistry and physiology of fruits and vegetables and their role in pre- and post-harvest changes in product quality.
Outcome: This course aims in providing knowledge about the fruit and vegetable structure, post-harvest physiology and its spoilage. The student shall understand biological, chemical and physical properties of fruits and vegetables and the technologies involved in the processing, preservation and value-addition of fruit and vegetable products.

UNIT -I

Introduction, definition, role, importance and status of post harvest technology.
Fruits and vegetables: Morphology of fruits and vegetables, maturity indices and methods of maturity determinations. Post-harvest physiological and biochemical changes in fruits and vegetables, ripening of climacteric and non climacteric fruits; regulations, methods.

UNIT –II

Post harvest disorders- Factors affecting post harvest changes, handling and packaging of fruits and vegetables, chilling injury & disease, storage practices: CA and MA, hypobaric storage, pre-cooling and cold storage, Zero energy cool chamber, commodity pre treatments - chemicals, wax coating, VHT and irradiation.

UNIT –III

Canning: Introduction, Canning of fruits and vegetables, its process, spoilage in canned foods. Changes during canning of fruits of vegetables and problems related to storage of canned products.

Pickles and chutney: Preparation of various pickles, sauces and chutneys, problems related to shelf life of pickles and chutneys, quality control.

UNIT –IV

Vinegar: Method of preparation and quality control
Tea, Coffee and Cocoa: Production and manufacturing.
Pectin: Raw material processes and uses of pectin, products based on pectin, manufacturing and quality control.

UNIT –V

Fruits and Vegetables: Preparation of juice, syrup, squashes, jam, jellies, marmalades, cordials and nectars, fortification and soft drinks.
Tomato products: Preparation of various tomato products and quality control.

References :

1. Bose, T.K. Ed. 1985. Fruits of India: Tropical and Sub-tropical. Naya Prokash, Calcutta. Dauthy, M.E. 1997. Fruit and Vegetable Processing. International Book Distributing Co. Lucknow, India.
2. Hamson, L.P. 1975. Commercial Processing of Vegetables. Noyes Data Corporation, New Jersey.
3. Lai, G., Siddappa, G. and Tondon G.L. 1986. Preservation of Fruits and Vegetables, indian Council of Agril. Research, New Delhi.
4. Salunkhe, D.K. and Kadam, S.S. Ed. 1995. Handbook of Fruit Science and Technology: Production, Composition and Processing. Marcel Dekker, New York. Salunkhe, D.K. and Kadam, S.S. Ed. 1995. Handbook of Vegetable Science and Technology. Production,

FT 202: FOOD QUALITY CONTROL, LAWS AND MANAGEMENT

Objective: To develop knowledge regarding food quality control and related laws to manage in our food protects.

Outcome: This course aims to impart the knowledge of food safety issues, surveillance and monitoring techniques, Food Labeling as well as sanitation and food allergy. To know the principles of Food Safety and Quality. To apply preventive measures and control methods to minimize the hazards in foods. To know the requirements of FSSAI for different food items. To learn the principles of HACCP and to develop procedures and approaches to identify food safety hazards in food processing.

UNIT -I

Food safety and hygiene: General introduction

Food safety concept- Importance of food safety in food processing. Food hygiene and its practices (GMP/GHP, GAP, GLP). Hygiene verification in food industry, Clean In Place (CIP) - Different sanitizers and detergents- Sanitation and hygiene in quality assurance in different food industries (Fruits and vegetables, Meat, Milk, Cereal Based)cleaning and sanitation (ETP, WTP, Pest control) prevention and control.

UNIT –II

Concept of quality: Quality attributes- physical, chemical, nutritional, microbial and sensory, evaluation. Quality measurement techniques, process design and control and product design and control, TQM, IPR and Patent.

UNIT –III

Food laws and regulations: Food safety act 2006, 2011and 2022basic differences, FSSAI. Various organizations dealing with inspection and traceability and authentication, Certifications (BIS, AGMARK, ISO, FPO, MFPO, PFA, MPO, etc.)

International food laws and regulations: US Federal laws, USDA, FDA, FAO, WHO, CODEX, HACCP with new guideline.

UNIT –IV

Concept of product development –product success and failure ,factors for success ,process of product development ,managing for products success innovation strategy –possibilities for innovation ,building up strategy ,product design, commercialization , launch, and evaluation product development program for RND in food industry .Cost of Quality, Supplier development, Microbial enumeration, production floor environment monitoring, quality of water (Process/Raw/reuse).

UNIT- V

Introduction to sensory evaluation, Selection of sensory panellists; Factors influencing sensory measurements; Sensory quality parameters -Size and shape, texture, aroma, taste, color and gloss; Detection, threshold and dilution tests Different tests for sensory evaluation– discrimination, descriptive, affective; Flavour profile and tests; Ranking tests; Methods of sensory evaluation of different food products. Selection and training of sensory panel; Detection and threshold tests; Ranking tests for taste, aroma colour and texture; Sensory evaluation of various food products using different scales, score cards and tests;

Text Books / References:

1. Early R.1995.*Guide to Quality Management Systems for Food Industries*. Blackie Academic.
2. Krammer A & Twigg BA.1973. *Quality Control in Food Industry*. Vol. I, II. AVI Publ.
3.Chhabra TN & Suria RK. 2001. *Management Process and Perspectives*. Kitab Mahal.
4Jhingan ML. 2005. *International Economics*. 5th Ed. Virnda Publ.
5.Kotler P. 2000. *Marketing Management*. Prentice Hall.
6. Reddy SS, Ram PR, Sastry TVN & Bhavani ID. 2004. *Agricultural Economics*. Oxford & IBH.

FT 203: FOOD ENGINEERING

Objective: The course provides the knowledge about engineering principles to food materials and food processing operations, food machinery, packaging, ingredient manufacturing, instrumentation and control.
Outcome
The students shall be able to understand the basics of mass and energy conservation, fundamentals of fluid flow dynamics as applied to food processing operations. They will learn planning, designing, improving, as well as maintaining the processing system in food industry,

UNIT -I
Mechanical operations in food processing: Introduction, scope and applications
Size Reduction process: Principles, theories &laws, energy consideration, equipments & size reduction of solid and liquid food products
Mixing & forming: Theory & applications, mixing indices, equipments for solid and liquid foods products.

UNIT –II
Process Heat Transfer - Thermal properties of foods such as specific heat and thermal conductivity Modes of heat transfer and overall heat transfer, Fourier's law. steady state and unsteady state heat transfer, heat exchange equipment. Rheology of foods: Newtonian fluids and Non Newtonian fluids.

UNIT –III
Unit operation in Food engineering
Food dehydration: Mechanism of drying, moisture & drying rate curves, constant and falling rate periods, dehydration equipment & freeze drying.
Evaporation: Properties of liquid, heat & mass balance, single & multiple effect evaporation, steam economy, heat recovery, efficiency, equipment & systems.

UNIT - IV
Chilling, refrigeration & freezing: Introduction, types of freezers, precooling & cold storage,
Shelf life extension requirements, theories, characteristic curve, cooling rate calculations, chilling & freezing equipment, cryogenics, freeze drying, properties of frozen foods.

UNIT-V
Separation processes:
Centrifugation: General principles, instrument & types of centrifuges, preparatory & analytical centrifugation & applications
Chromatographic Techniques: General introduction to principles, partion & adsorption chromatography-paper, thin layer, gas & liquid, ion exchange & affinity chromatography gel filtration, HPLC and application in food industry
Membrane filtration technology: Principles of other food processing such as-RO, UF, Dialysis, osmosis, micro-filteration, and nano filteration -outlines

Text Books / References:
1. Heat Transfer: D.Q. Kern, MGH.
2 R.K. Rajput. 2007. Engineering Thermodynamics, 3rd Ed. Laxmi Publications (P) Ltd.,
3. Bangalore. P.K. Nag.2005. Engineering Thermodynamics, 3rd Ed. Tata-McGraw-Hill
4. Basics of Food Engineering, Romeo Toledo
5. Earle RL. 1985. Unit Operations in Food Processing. Pergamon Press.

FT 204: FOOD PACKAGING

Objective: The course aims to develop the student's knowledge in various types of packaging food and packaging materials.

Outcome: The students shall gain knowledge on the different types of materials and media used for packaging foods, hazards associated with packaging materials, laws, regulation and the monitoring agencies involved in food safety. They will understand the material Cost reduction strategies and Materials substitution like Bioplastic, recycled, renewable materials, high-performance barrier materials, and holographic foil are some of the few trends influencing the food packaging landscape

UNIT I

Introduction to Food Packaging: Packaging terminology- definition, types of packaging. Functions of food packaging; characteristics of food stuff that influences packaging selection.

UNIT II

Packaging material and their properties: Glass, paper and paper board, corrugated fiber board (CFB), Metal containers -Tin Plate and Aluminium, composite containers, collapsible tubes, plastic films, laminations, metalized films, Co-extruded films.

UNIT III

Packaging systems and methods: vacuum packaging, controlled atmospheric packaging, modified atmospheric packaging, aseptic packaging, retort processing, microwave packaging, active packaging, intelligent packaging, edible packaging, shrink and stretch packaging.

UNIT IV

Packaging of fresh and processed foods: Packaging of fruits and vegetables, fats and Oils, spices, meat, Poultry and sea foods, dairy Products, bakery, beverages, dehydrated and frozen foods.

Liquid and powder filling machines – like aseptic system, form and fill (volumetric and gravimetric), bottling machines. Form Fill Seal (FFS) and multilayer aseptic packaging machines.

UNIT V

Packaging Laws, Regulations, Evaluation and Quality control- shelf life testing, corrosion, tensile strength, bursting strength, tearing resistance, puncture resistance, impact strength, tear strength, 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 its measurement, prediction of shelf life of foods, selection and design of packaging material for different foods.

Text Books and Reference materials

1. NIIR. (2003). Food Packaging Technology Handbook, National Institute of Industrial Research Board, Asia Pacific Business Press Inc.
2. Ahvenainen, R. (Ed.) 2003 Novel Food Packaging Techniques, CRC Press,
3. Han, J.H. (Ed.) 2005 Innovations in Food Packaging, Elsevier Academic Press,
4. Coles, R., McDowell, D. and Kirwan, M.J. (Eds.) 2003 Food Packaging Technology,

FT – 205: LAB COURSE I

Objective: To understand the effect of various preservation techniques on the quality and safety of food products. To evaluate a processing procedure used to preserve a food product.

Outcome: The students will be able to understand and utilize different food preservation techniques. Sampling techniques and preparation of test samples, Estimation of Water activity of food sample. Physical and Chemical evaluation of thermally processed food (Canned or Bottled), Pickling and curing of foods. Dehydration of foods and preparation of fruit juice concentrates and powder, Physicochemical analysis of dehydrated food sample.

1. Canning of fruits and vegetables.
2. Dehydration of fruits and vegetables.
3. Preparation of tomato juice.
4. Preparation of tomato puree.
5. Preparation of tomato paste.
6. Preparation of various types of pickles.
7. Preparation of tomato ketchup.
8. Preparation of tomato mock tail.
9. Preparation of tomato soup.
10. Preparation of tomato chutney.
11. Preparation of jackfruit pickles.
12. Preparation of jams
13. Preparation of lime squashes.
14. Preparation of jellys.
15. Preparation of jam marmalades.
16. Pectin determination
17. Determination of chemical preservatives in fruits and vegetables.
18. Blanching of fruits and vegetables for quality estimation.

FT- 206: LAB COURSE II

Objective: To understand the effect of various type of packaging materials, impact of packaging materials in different types of food.

Outcome: The students will be able to understand and utilize different type of packaging materials. Moisture content in different type of packaging materials. To perform Test for formal shock resistance in glass bottles etc.

1. Testing of different types of packaging materials.
2. Determine moisture content in given package samples.
3. Test for modified starch in different package materials.
4. Test for water absorbency in corrugated fibre board box.
5. Test for types of adhesive used in CFB.
6. Development of new food products and formulations.
7. To perform flap bend test in CFB.
8. Test for formal shock resistance in glass bottles.
9. Graphical representation of moisture contents in different food products.
10. Determination of shelf lives.

FT 207: SEMINAR / ASSIGNMENT

Every student shall deliver at least one seminar on topic of the curriculum/ advances in food technology which will individually be assessed by every available teacher on the basis criteria laid down by the Staff council. Students in audience will also be encouraged to assess the seminar on the given criteria and their evaluation will also be

FT 208: PERSONALITY DEVELOPMENT/ SKILL DEVELOPMENT IN FOOD PRODUCT FORMULATION

Every student will be imparted skills in development of new products and will be evaluated by the concerned teacher.

FT 209: COMPREHENSIVE VIVA

A comprehensive viva-voce of 4 virtual credits will be conducted at the end of semester of the programme by a board of four examiners.

FT 301 PROCESSING OF CEREALS, LEGUMES, OILSEED AND SUGAR CROPS

Objective: To create knowledge about the processing and quality evaluation of cereal grains.

Outcome: Student will acquire the understanding of the technologies used for processing of cereal grains. Understands structure of wheat, Rice and Corn, Oats, Barley. Baking techniques for cereal's based products. Processing of legumes, oilseeds and sugar crops. Oil extraction process and its biproducts.

UNIT –I

Wheat: Types, structure & composition and physicochemical characteristics; wheat milling - products and byproducts; factors affecting quality parameters; physical, chemical and rheological tests on wheat flour; additives used in bakery products; flour improvers and bleaching agents; manufacture of wheat based products.

UNIT –II

Rice: Classification, structure & composition, physicochemical characteristics; cooking quality; rice milling technology; by- products of rice milling and their utilization; Rice bran stabilization, oil extraction and refining, parboiling methods of rice criteria of quality of rice: aging of rice – quality changes; processed products based on rice.

UNIT –III

Corn: Types and nutritive value; dry and wet milling, processing of corn in breakfast cereals, snacks, tortilla etc., production of glucose syrups, dextrose, high fructose corn syrups, modified Corn starches.

Barley: composition, milling, malting of barley, changes during malting, uses of malt.

Oat: composition, processing of oat, byproducts of oatmeal milling.

UNIT –IV

Legumes and oilseeds: composition, anti-nutritional factors, processing and storage; processing for production of edible oil, meal, flour, protein concentrates and isolates; development of low-cost protein foods. Oil extraction process –mechanism, oil refining, utilization of biproducts of oil milling.

UNIT –V

Processing of sugar crops and tubers- (sugar cane, sugar beet crops and their difference). Sugar production and manufacturing, types and grades of sugars, products of sugars (alcohol, beer, wine and sugar syrups).

Text books and Reference materials

1. Chakrabarthy, M.M. (2003). Chemistry and Technology of Oils and Fats. Prentice Hall.
2. Dendy, D.A.V., & Dobraszczyk, B.J. (2001). Cereal and Cereal Products. Aspen.
3. Hamilton, R.J., & Bhati, A. (1980). Fats and Oils - Chemistry and Technology. App. Sci. Publ.
4. Hoseney, R.S. (1994). Principles of Cereal Science and Technology. 2nd Ed.AACC.
5. Kay, D.E. (1979). Food Legumes. Tropical Products Institute.
6. Kent, N.L. (1983). Technology of Cereals. 4th Ed. Pergamon Press.

FT 302 Dairy Technology

Objective: To impart knowledge about processing of milk and its products and legislation for the quality control of milk and milk products.

Outcome: Students shall acquire knowledge about composition, processing, product development, organization and operations involved in milk processing unit. Impact knowledge about frozen milk products, fermented milk products and evaporated and dried milk products

Unit – I

Composition and characteristic of milk, Collection, chilling, transportation, cream separation, standardization, pasteurization, sterilization, UHT, homogenization, packaging, storage and distribution of fluid milk and cleaning and sanitation of dairy equipment's.

Unit – II

Technology of fermented milk products: Principles and practices of manufacture, packaging, storage and marketing of Dahi, yoghurt, Shrikhand etc. **Butter**: Manufacture, packaging, storage and marketing of butter; butter defects and their control.

Unit – III

Technology of frozen milk products: Classification, manufacture, packaging, storage and marketing of ice cream, ices, sherbets etc. defects of frozen products and their control.

Technology of indigenous milk products: Principles and practices of manufacture, packaging, storage and marketing of ghee, khoa, Paneer, channa and milk based foods.

Unit – IV

Technology of evaporated and dried milk: Manufacture of evaporated milks and milk powders, Sweetened and non-Sweetened condensed milk, SMP, WMP, Packaging storage defects and their control

Unit -V

Cheese: Manufacture of hard, semi hard, soft and processed cheeses, Storage, grading and marketing of cheese, Cheese defects and their control.

Technology of Dairy by- products: Utilization of skim milk, buttermilk and whey for the manufacture of casein, lactose etc.

References:

1. Robinson RK; 1996; Modern Dairy Technology, Vol 1 & 2; Elsevier Applied Science Pub.
2. Milk & Milk Processing; Herrington BL; 1948, McGraw-Hill Book Company.
3. Modern Dairy Products, Lampert LH; 1970, Chemical Publishing Company.
4. Developments in Dairy Chemistry – Vol 1 & 2; Fox PF; Applied Science Pub Ltd.
5. Outlines of Dairy Chemistry, De S; Oxford.

FT 304 Food Additives, Spice and Flavor Technology

Objective: To impart knowledge about additives in food processing, types of food additives, chemical nature, their analysis and risk and benefits.
Outcome: Student shall gain a thorough knowledge of natural and synthetic food additives and their properties in food. They will understand different flavor components arise from the normal biosynthetic processes of animal and plant metabolism. The knowledge of flavorings and other food additives is essential to achieve either flavor intensification or suppression in different food products.

UNIT I
Additives in food processing and preservation. their functions, types and safety
Need for food additives in food industry, Various additives such as preservatives, antioxidants, emulsifiers, sequesterants, humectants, stabilizers with respect to their functioning and role and mechanism.

UNIT II
Food Flavour basics: Olfactory perception of flavor and taste, relationship of taste-sweet, bitter, salt, sour, chemicals causing pungency, astringency, cooling effects-properties. classification of flavours-natural, nature identical and synthetic

Unit III
Flavour production during processing-enzymatic development, effect of roasting (eg coffee), frying on flavor developments, staling of flavors
Flavour encapsulation-need, methods and application in food industry

UNIT IV
Major spices and Minor spices–Oleoresins and essential oils; method of manufacture; chemistry of the volatiles; enzymatic synthesis of flavour identicals; quality control; fumigation and irradiation of spices.

UNIT V
Food Additives and toxicants added or formed during Food Processing: Safety of food additives;toxicological evaluation of food additives and adulterants , food processing generated toxicants: nitroso compounds, heterocyclic amines. Types of adulteration in food and methods of detection
Techniques for flavor extraction-supercritical fluid extraction-continious and semi-continious methods-effects of types of solvents used, and its role in food industry.

Suggested Readings
1. Fennema, O.R. Ed. 1976. Principles of Food Science: Part-I Food Chemistry. Marcel Dekker, New York.
2.Potter, N.N. 1978. Food Science. 3rd Ed. AVI, Westport.
3. Branen A.L. and Davidson, P.M. 1983. Antimicrobials in Foods. Marcel Dekker, New York.
4. Furia, T.E. 1980, Handbook of food additives, Vol I and Vol II.

FT 305 Lab Course I

Objective: Imparting knowledge about the general methods of quality evaluation, testing and processing cereals and preparation of different type of cereal based products.

Outcome: The students shall be able to assess the quality of wheat, rice and different type cereals. Preparation of different type of cereal based products.

1. Detection of adulteration in different types of foods.
2. Determination of moisture content in food product by hot air oven drying method.
3. Determination of yeast quality by its dough rising capacity.
4. Determination of thousand kernel weight of different grains sample.
5. Determination of cooking time in different rice sample.
6. Determination of elongation ratio in different rice sample.
7. Determination of Gluten content in different flour sample.
8. Determination of ash content in flour samples.
9. Determination of Acid insoluble Ash
10. Estimation of fat acidity
11. Determination of Alcoholic acidity
12. Preparation of Bread.
13. Preparation of Biscuits.
14. Preparation of Pizza base.
15. Preparation of Dinner roll.
16. Preparation of Cookies.
17. Preparation of Muffins
18. Preparation of Nankhatai.
19. Preparation of Cakes.
20. Preparation of fermented products.
21. Quality evaluation of different biscuit sample—physical and chemical analysis.
22. To determine the foaming capacity of given flour sample.
23. Determination of protein content of floor by Micro Kheldahl Method
24. Estimation of curcumin in turmeric.
25. Determination of cappsaicin in content in chilli.

FT 306 Lab Course II

Objective: Imparting knowledge about the general methods of quality evaluation, testing and processing fresh milk and preparation of different type milk products.

Outcome: The students shall be able to assess the quality of milk and milk products and to develop various milk products. Preparation of different milk products and fat estimation and analysis of fat for milk and milk products,

1. Platform Test Of Milk
2. Adulteration tests.
3. Fat estimation in milk by Garbers Methods.
4. Preparation of flavored milk.
5. Preparation of curd.
6. Preparation of lassi.
7. Preparation of shrikhand.
8. Preparation of ghee.
9. Preparation of khoa.
10. Preparation of chenna and paneer.
11. Determination of total solids in milk, skim milk, butter milk and whey by drying method.
12. Viscosity determination of milk by pipette method.
13. Test for fats: Bromothymol blue test.
14. Alcohol test for determining coagulability of milk.
15. Determination of salt content in butter.
16. Casein estimation in milk sample.

FT 307: PERSONALITY DEVELOPMENT/ SKILL DEVELOPMENT IN FOOD PRODUCT FORMULATION

Every student will be imparted skills in development of new products and will be evaluated by the concerned teacher.

FT 308: COMPREHENSIVE VIVA

A comprehensive viva-voce of 4 virtual credits will be conducted at the end of semester of the programme by a board of four examiners.

FT 401 Advances in Food Technology

Objective: To understand the importance of various technology used in processing of food.

Outcome: Student will acquire knowledge about improvement in food processing and different application for production and improvement in food nutritional content which can be used in field of food technology.

UNIT I

Historical development and eras of modern food processing, Application of extrusion cooking in food industry; effect of process variables on the physic-chemical and nutritional characteristics of extruded foods. Thermoplastic extrusion cooking-preparation of meat analogues and advantages of meat analogues over natural meat.

UNIT II

Advances in Non-thermal processing of foods: Bio-preservation, Ultra-sonification, high-hydrostatic pressure processing, pulsed electric processing.

UNIT III

Advances in fortification (complementation & supplementation); Techniques of food fortification; advances in use of radiation and microwaves in processing of foods.
GM foods: Safety of Genetically Modified food: potential toxicity and allergenicity of GM foods.

UNIT IV

Encapsulation; Design and structure of microcapsules, Techniques of microencapsulation, advantages and applications of encapsulation.

UNIT V

Fractionation of fat
Super-critical carbon dioxide extraction
Introduction to food biotechnology: application and food processing

Text books and reference materials

1. Lopez, G.F.G. and Canovas, G.V.B. "Food Science and Food Biotechnology" CRC Press, Florida, USA. 2003.
2. Bains, W. Biotechnology from A to Z. Oxford Univ. Press. 2009.
3. Cupp J & Tracy TS. *Dietary Supplements:* Humana Press. 2003.

FT 402 Entrepreneurship and Business Management in Food Technology

Objective: Imparting knowledge about Entrepreneurship, concepts of Management quality functions.
Outcome: Students understands about the different functions Entrepreneurship in food processing, Production, Financial, Marketing Management. Quality and materials managements.

UNIT-I
Entrepreneurship in food processing: Concept of entrepreneur and entrepreneurship, quality, functions of an entrepreneur. Current status of entrepreneurship in Indian food industries.
Management in food Industries: History, role, need, benefits of Management Development, Management as Science and Art, Management as a Profession, Functions of Management, Levels of Management

UNIT-II
Forms of Business Organisations:
Types of Organisations – Concepts, merits and demerits of Line, Line and Staff, Classification of small, medium and large-scale manufacturing industries; Opportunities of food processing industries in India and abroad
Business Organisations, Advantages and Disadvantages of Private Ownership and Public Ownership; Distinction between Sole Proprietary Firm and Partnership Firm;
Distinction between Partnership Firm and Joint Stock Company; Distinction between Private and Public Company

UNIT-III
Production Management: Objectives of Production Management, Qualities and Responsibilities of a Production Manager; Product design and Development, Factors Influencing Choice of Manufacturing Systems, Plant Location, plant layout.

UNIT –IV
Financial Management: Need for Finance, Types of Capital, Methods of Raising Funds
Marketing Management: Marketing Concepts – Need, Want, Demand, Difference between Selling and Marketing, Marketing Research –Need for and Steps of Marketing Research, Promotion Mix.
UNIT-V
Personnel Management: Human Resource Planning – Steps in Manpower Planning, Recruitment and Selection –Difference between Recruitment and Selection Steps in the Selection Procedure; Training and Development – Need for Training, Steps in Training, Training Methods; Performance Appraisal.
Quality and Materials Management: Concept of Quality needs and its role, Quality Control and its techniques, Total Quality Management-meaning, role, pillars, PDCA cycle, Importance, Objectives and Functions of Materials Management, Inventory control.

Text Books / References:
1. Production (operations) Management by L.C. Jhamb
2. Entrepreneurship and Management inputs for entrepreneurs in food processing sector by Dinesh Awasthi and Rama Jaggi.
3. Production and Operation Management by R. Panneerselvam (Prentice- Hall of India Pvt.

FT 403: PERSONALITY DEVELOPMENT/ SKILL DEVELOPMENT IN FOOD PRODUCT FORMULATION

Every student will be imparted skills in development of new products and will be evaluated by the concerned teacher.

FT 404: COMPREHENSIVE VIVA

A comprehensive viva-voce of 4 virtual credits will be conducted at the end of semester of the programme by a board of four examiners.