

NATIONAL EDUCATION POLICY-2020
Common Minimum Syllabus for all
Uttarakhand State Universities and Colleges



Syllabus Proposed

2023-24

Sri Dev Suman Uttarakhand University
Badshahithol, Tehri (Garhwal)

पाठ्यक्रम निर्माण समिति, उत्तराखण्ड

Curriculum Design Committee, Uttarakhand

क्र० सं०	नाम एवं पद	
1	प्रो० एन० के० जोशी कुलपति, श्रीदेव सुमन उत्तराखण्ड विश्वविद्यालय, टिहरी	अध्यक्ष
2	कुलपति, कुमाऊँ विश्वविद्यालय, नैनीताल	सदस्य
3	प्रो० जगत सिंह बिष्ट कुलपति, सोबन सिंह जीना विश्वविद्यालय, अल्मोड़ा	सदस्य
4	प्रो० सुरेखा डंगवाल कुलपति, दून विश्वविद्यालय, देहरादून	सदस्य
5	प्रो० ओ० पी० एस० नेगी कुलपति, उत्तराखण्ड मुक्त विश्वविद्यालय, हल्द्वानी	सदस्य
6	प्रो. एम० एस० एम० रावत सलाहकार—रूसा, रूसा निदेशालय, देहरादून	सदस्य
7	प्रो० के० डी० पुरोहित सलाहकार—रूसा, रूसा निदेशालय, देहरादून	सदस्य

M.Sc Food Technology

Syllabus as per NEP 2020

Year I (M.Sc. Food Technology)/ Year 4(B.Sc Food Technology with Research)

SEMESTER – VII

Course	Course Code	Course Title	L	P	Credits
Major	BFT-701	Food Industry Waste Management	4		4
Major	BFT-702	Food Extrusion Technology	4		4
Major	BFT-703	Post Harvest Technology	4		4
Major	BFT-704	Dairy Plant Engineering	4		4
Minor	BFT-705	Marketing of Food Products	4		4
Practical	BFT-706	Practical-VII		4	4
		Industrial Training – III (4 week)		4	4
Total			20	8	28

SEMESTER – VIII

Course	Course Code	Course Title	L	P	Credits
Major	BFT-801	Food Processing Technology	4		4
Major	BFT-802	Fat and Oil Processing Technology	4		4
Major	BFT-803	Food Fermentation Technology	4		4
Major	BFT-804	New Product Development and Seminar	2	2	4
Practical	BFT-805	Practical-VIII		4	4
		Industrial Training – IV (4 week)		4	4
Total			14	10	24

Year II (M.Sc. Food Technology)

SEMESTER IX

Course	Course Code	Course Title	L	P	Total Credits
Major	MFT-901	Food Microbiology	4		4
Major	MFT-902	Enzymes in food processing	4		4
Major	MFT-903	Food Additives, Contaminants and Toxicology	4		4
Major	MFT-904	Nutraceuticals and Functional Foods	4		4
Practical	MFT-905	Practical IX		4	4
Practical	MFT-906	Industrial training/ Survey/ Research Project		4	4
Total			16	8	24

SEMESTER X

Course	Course Code	Course Title	L	P	Total Credits
Major	MFT-1001	Snack Food Technology	4		4
Major	MFT-1002	Entrepreneurship in Food Processing	4		4
Major	MFT-1003	Technology Of Malting and Brewing	4		4
Major	MFT-1004	Techniques in Food Analysis	4		4
Practical	MFT-1005	Practical X		4	4
Practical	MFT-1006	Industrial training/ Survey/ Research Project		4	4
Total			16	8	24

SEVENTH SEMESTER

Food Industry Waste Management (BFT-701)

Major

Course Code: BFT-701

Course Outline

THEORY

Unit I

Introduction: Classification and characterization of food industrial wastes from fruit and vegetable processing industry, beverage industry, fish, meat and poultry industry, sugar industry and dairy industry; Waste disposal methods – physical, chemical and biological; Economical aspects of waste treatment and disposal.

Unit II

Treatment methods for liquid wastes from food process industries; Design of activated sludge process, Rotating biological contactors, Trickling filters, UASB, Biogas plant.

Unit III

Treatment methods of solid wastes: Biological composting, drying and incineration; Design of solid waste management system: Landfill digester, Vermicomposting pit.

Unit IV

Biofilters and bioclarifiers, Ion exchange treatment of waste water, Drinking-water treatment, Recovery of useful materials from effluents by different methods.

BOOKS

1. Verma, L. R. and Joshi, V. K. 2000. Post Harvest Technology of Fruits and Vegetables: Handling, Processing, Fermentation and Waste Management. Indus Publishing Company, New Delhi
2. **Mooyong, M.** Bio-mass Conversion Technology : Principles and Practices
3. **Shuler, Michael L. and Kargi, Fikret** Bio-process Engineering Basic Concepts

Food Extrusion Technology (BFT-702)

Major

Course Code: BFT-702

Course Outline

THEORY

Unit I

Extrusion: definition, introduction to extruders, principles and types; uses of extruders in the food industry

Unit II

Single screw extruder: principle of working, net flow, factors affecting extrusion process

Twin screw extruder: counter rotating and co-rotating twin screw extruder; process characteristics of the twin screw extruder

Unit III

Pre-conditioning of raw materials used in extrusion process; chemical and nutritional changes in food during extrusion; classification of breakfast cereals

Unit IV

Raw materials, process and quality testing of vermicelli, spaghetti, pasta and macronic products; texturized vegetable protein: definition, processing techniques; Ready to eat breakfast cereals by extrusion cooking

Books

1. Matza S., Extruded foods
2. N.D. Frame, Technology of Extrusion Cooking
3. Riaz M.N., Extruders in Food Application

Post Harvest Technology (BFT-703)

Major

Course Code: BFT-703

Course Outline

THEORY

Unit I

Introduction to post harvest management: Definition of PHM, PHT, scope, responsibilities, post-harvest losses, possible measures to reduce the PHL; Morphology of fruits and vegetables: Introduction; parts of fruit; botanical classification of fruit; consumer classification of fruit; classification of fruits on the basis of origin; vegetables; fruits vs. vegetables

Unit II

Physiology: Introduction; physiological development stages; respiration; respiration drift; climacteric fruit; non-climacteric fruit; aerobic and anaerobic respiration; RQ; factors affecting rate of respiration; transpiration

Maturity of fruits and vegetables: Introduction; methods of identification of maturity, fruit ripening: introduction; changes during ripening

Unit III

Deterioration of fruits & vegetables: Introduction; primary and secondary causes of losses

Pre-harvest factors affecting quality: Introduction; preharvest factors related to plant; preharvest factors related to environment; preharvest factors related to chemicals

Harvesting of fruits & vegetables: Introduction; definition; different methods of harvesting; factors during harvest affecting quality of produce; post-harvest handling: Introduction; postharvest handling

Unit IV

Post-harvest commodity treatments: Introduction; precooling; waxing; sprout inhibition; disinfestation; fungicide application; hot water treatment; vapour heat treatment; irradiation; ripening and degreening; delaying ripening; curing of roots and tubers; dryings of root crops

Pre-cooling: Introduction; effect of precooling on product quality; factors affecting precooling; cooling methods

Unit V

Packinghouse operations: Introduction; dumping (loading and unloading); washing; drying; sorting & grading; commodity treatments; packaging; transportation

Storage structures: Introduction; goal of storage systems; storage considerations; storage systems; low cost and high cost technology, MA, CA and hypobaric storage

Books

1. P. Jacob John, A Handbook on Post harvest Management of Fruits and Vegetables
2. Verma L. R. and Joshi V. K. , Post harvest Technology of Fruits and Vegetables – Vol. 1

Dairy Plant Engineering (BFT-704)

Major

Course Code: BFT-704

Course Outline

THEORY

Unit I

[Materials and sanitary features of the dairy equipment](#); Sanitary pipes and fittings, standard glass piping, plastic tubing, fittings and gaskets; Installation, care and maintenance of pipes & fittings; Milk storage tanks, silos, road tankers, tail tankers; Bottle & cans washing and CIP cleaning equipment

Unit II

[Mechanical Separation: Fundamentals involved in separation](#); Principles involved in filtration, Types, rates of filtration; Gravity settling, Sedimentation, Principles of centrifugal separation; Different types of centrifuges. Application in Dairy Industry, clarifiers, tri processors, cream separator

Unit III

Homogenization: Classification, single stage and two stage homogenizer pumps, power requirement for homogenization; [Care and maintenance of homogenizers, aseptic homogenizers](#)

Unit IV

Pasteurization: Batch, flash and continuous (HTST) pasteurizers; [Pasteurizer control, Flow diversion valve](#); Different types of sterilizers, in- bottle sterilizers, autoclaves; Continuous sterilization plant, UHT sterilization; [Aseptic packaging and equipment](#)

Unit V

Filling Operation: Principles and working of different types of bottle fillers and capping machine; Pouch filling machine, Form-Fill-Seal Types

Marketing of Food Products(BFT-705)

Minor Elective

Course Code: BFT-705

Course Outline

THEORY

Unit I

Nature of products; cost concepts, cost curves and short run and long run equilibrium. Returns to scale and Economics of scale

Unit II

Project preparation and feasibility analysis. Financial management. Demand, markets, marketing, market structure, marketing management and pricing strategies of firms

Unit III

Marketing environment and Consumer buying behavior. Market segmentation, market measurement, market plan, marketing promotion, management of distribution and market research

Unit IV

Market Information System, export and government regulations, GATT and WTO.

EIGHTH SEMESTER

Food Processing Technology (BFT-801)

Major

Course Code: BFT-801

Course Outline

THEORY

Unit I

Freezing: requirements of refrigerated storage - controlled low temperature, air circulation and humidity, changes in food during refrigerated storage, progressive freezing, changes during freezing –concentration effect and ice crystal damage, freezer burn. Refrigeration load, factors determining freezing rate-food composition and non compositional influences

Unit II

Freezing methods -direct and indirect, still air sharp freezer, blast freezer, fluidized freezer, plate freezer, spiral freezer and cryogenic freezing; Normal drying curve , effect of food properties on dehydration , change in food during drying ,drying methods and equipments air convection dryer, tray dryer, tunnel dryer ,continuous belt dryer , fluidized bed dryer, spray dryer, drum dryer, vacuum dryer ,freeze drying ,foam mat drying.

Unit III

Ionizing radiation and sources, unit of radiations, direct and indirect radiation effects, safety and wholesomeness of irradiated food. Microwave heating and application; Packaging: Properties of packaging material, factors determining the packaging requirements of various foods and brief description of packaging of frozen products, dried products, fats and oils and thermally processed foods

Unit IV

Introduction, classification of Thermal Processes, Principles of thermal processing, Thermal resistance of microorganisms, Thermal Death Time, Lethality concept, characterization of heat penetration data, Thermal process Calculations

Unit V

Elementary concept of material handling in food industry, equipment and functioning of belt conveyor, screw conveyor, bucket elevator and pneumatic conveyor; Principles and methods of: distillation, extraction, washing, filtration, sedimentation, sieving and centrifugation

Books

1. P. Fellows, Food Processing Technology: Principles and Practice
2. Da-Wen Sun, Emerging Technologies for Food Processing
3. Jelen P., Introduction to Food Processing

Fat and Oil Processing Technology (BFT-802)

Major

Course Code: BFT-802

Course Outline

THEORY

Unit I

Introduction to oils and fats and their nomenclature; physical and chemical properties of fats and oils; nutritional importance of oils and fats

Unit II

Source and physico-chemical properties of following oils:-

- a. Animal – Butter oil, lard and tallow
- b. Plant – Mustard, groundnut, sunflower, soybean, coconut, rice bran, cottonseed, linseed, etc

Unit III

Extraction of oils/fats; problems during storage – rancidity, reversion

Food Fermentation Technology (BFT-803)

Major

Course Code: BFT-803

Course Outline

THEORY

Unit I

Concept of fermented foods, scope & development in fermented foods & beverage industry; benefits of fermented foods

Unit II

Food fermentation, stock culture and inoculum preparation; fermented milk products- Curd, Yoghurt, Acidophilic milk, Bulgarian milk, Koumiss and Kefir

Unit III

Fermented legume products- soy sauce, miso, tempeh, idli; fermented fruit and vegetable products- Sauerkraut, Kimchi, Cucumber pickles

Unit IV

Fermented meat products- fermented meat sausages; fermented alcoholic beverages- Beer, wine, vinegar

Malting, brewing, steeping, germination, kilning and curing; chemical and biochemical changes during malting and mashing; separation of wort, wort boiling and hops addition; fermentation, separation, maturation, carbonation and packaging

NINTH SEMESTER

Food Microbiology (MFT-901)

Major

Course Code: MFT-901

Course Outline

THEORY

Unit I

Types of micro-organism normally associated with food spoilage- mold, yeast, and bacteria. Factors influencing growth and survival of microorganisms in foods.

Unit II

Biochemical changes caused by micro-organisms. Physical and chemical methods to control microorganisms.

Unit III

Food Spoilage: spoilage of fresh and processed products: fruits and vegetables; meat, poultry and fish, egg and poultry, grains and oilseeds, milk and milk products. Spoilage of canned foods. Antagonism and synergism in microorganisms.

Unit IV

Food Fermentations and microbes in food fermentation. Traditional fermented foods of India and other Asian countries. Probiotics and prebiotics. Fermented foods based on milk, meat and vegetables; Fermented beverages.

Unit V

Food hygiene and sanitation: Contamination during handling and processing and its control; indicator organisms; Rapid methods in detection of microorganisms. Food poisoning (Staphylococcus, Bacillus, Listeria, Salmonella) and microbial toxins, Food-borne infections and intoxicants. Microbial toxins and mycotoxins

Suggested Readings

1. Banawart GJ. 1989. *Basic Food Microbiology*. 2nd Ed. AVI Publ.
2. Frazier J & Westhoff DC. 1988. *Food Microbiology*. 4th Ed. McGraw Hill.
3. Garbutt J. 1997. *Essentials of Food Microbiology*. Arnold Heinemann.
4. Jay JM, Loessner MJ & Golden DA. 2005. *Modern Food Microbiology*. 7th Ed. Springer.
5. Ray B. 2004. *Fundamentals of Food Microbiology*. 3rd Ed. CRC.
6. Robinson RK. (Ed.). 1983. *Dairy Microbiology*. Applied Science.
7. Steinkraus KS. 1996. *Handbook of Indigenous Fermented Foods*. Marcel Dekker.
8. Branen A.L. and Davidson, P.M. 1983. *Antimicrobials in Foods*. Marcel Dekker, New York.
9. Jay J.M. 1986. *Modern Food Microbiology*. 3rd Edn. VNR, New York.
10. Robinson, R.K. Ed. 1983. *Dairy Microbiology*. Applied Science, London.

Enzymes in Food Processing (MFT-902)

Major

Course Code: MFT-902

Course Outline

THEORY

Unit I

Enzymes– classification, properties, characterization, kinetics and immobilization; fermentative production of enzymes (amylases, proteases, cellulases, pectinases, xylanases, lipases) used in food industry.

Unit II

Enzymes for production of protein hydrolysates and bioactive peptides, maltodextrins and corn syrup solids (liquefaction, saccharification, dextrinization, isomerization for production of high fructose-corn-syrup), fructose and fructo-oligosaccharides.

Unit III

Role of enzymes in cheese making and whey processing; fruit juices (cell wall degrading enzymes for liquefaction, clarification, peeling, debittering, decolourization of very dark coloured juices such as anthocyanases); baking (fungal α -amylase for bread making; maltogenic α -amylases for anti-staling; xylanases and pentosanases as dough conditioners; lipases or dough conditioning; oxidases as replacers of chemical oxidants; synergistic effect of enzymes); meat and meat processing (meat tenderization); egg processing.

Unit IV

Enzyme processing for flavours (enzyme-aided extraction of plant materials for production of flavours, production of flavour enhancers such as nucleotides; flavours from hydrolyzed vegetable/animal protein); enzymatic approach to tailor- made fats.

Suggested Readings

1. Flickinger MC & Drew SW. 1999. *Encyclopedia of Bioprocess Technology*. A Wiley-Inter Science Publ.
2. Kruger JE. *et al.* 1987. *Enzymes and their Role in Cereal Technology*. American Association of Cereal Chemists Inc.
3. Nagodawithana T & Reed G. 1993. *Enzymes in Food Processing*. Academic Press.
4. Tucker GA & Woods LFJ. 1991. *Enzymes in Food Processing*.
5. Whitehurst R & Law B. 2002. *Enzymes in Food Technology*. Blackwell Publ.

Food Additives, Contaminants and Toxicology (MFT-903)

Major

Course Code: MFT-903

Course Outline

THEORY

Unit I

Definition scope and general principles of food toxicology; manifestation of toxic effects; classification of food toxicants; factors affecting toxicity of compounds; methods used in safety evaluation-risk assessments.

Unit II

Toxicants and allergens in foods derived from plants, animals, marine, algae & mushroom; Microbial toxins; Food Poisoning; Food borne infections and disease.

Unit III

Food additives- definitions, classification and functions, Preservatives, antioxidants, colours and flavours (synthetic and natural), emulsifiers, sequesterants, humectants, hydrocolloids, sweeteners, acidulants, buffering salts, anti-caking agents, etc. - chemistry, food uses and functions in formulations; indirect food additives; toxicological evaluation of food additives.

Unit IV

Toxicology and food additives; Toxicological aspects of nutrient supplements; Chemicals from processing such as fumigants, chlorinated solvents, auto-oxidation products, carcinogens in smoked foods and pyrolysis, agrochemicals; heavy metals.

Unit V

Derived Food toxicants- Processing & Packaging; Toxicants generated during food processing such as nitrosamines, acrylamide, benzene, dioxins and furans; persistent organic pollutants.

Suggested Readings

1. Branen A.L. and Davidson, P.M. 1983. Antimicrobials in Foods. Marcel Dekker, New York
2. Branen AL, Davidson PM &Salminen S. 2001. *Food Additives*. 2nd Ed. Marcel Dekker. New York.
3. Fennema, O.R. Ed. 1976. Principles of Food Science: Part-I Food Chemistry. Marcel Dekker
4. Furia, T.E. 1980, Handbook of food additives, Vol I and Vol II.
5. George AB. 1996. *Encyclopedia of Food and Color Additives*. Vol. III. CRC Press.
6. George AB. 2004. *Fenaroli's Handbook of Flavor Ingredients*. 5th Ed. CRC Press.
7. Madhavi DL, Deshpande SS &Salunkhe DK. 1996. *Food Antioxidants: Technological, Toxicological and Health Perspective*. Marcel Dekker.
8. Morton ID & Macleod AJ .1990. *Food Flavours*. Part A, BC. Elsevier.
9. Nakai S &Modler HW. 2000. *Food Proteins. Processing Applications*. Wiley VCH.
10. Potter, N.N. 1978. Food Science. 3rd Ed. AVI, Westport.
11. Stephen AM. (Ed.). 2006. *Food Polysaccharides and Their Applications*. Marcel Dekker. New York.

Nutraceuticals and Functional Foods (MFT-904)

Major

Course Code: MFT-904

Course Outline

THEORY

Unit I

Introduction to nutraceuticals: definitions, synonymous terms, basis of claims for a compound as a nutraceutical, regulatory issues for nutraceuticals including CODEX.

Unit II

Concept of angiogenesis and the role of nutraceuticals/functional foods; Nutraceuticals for cardiovascular diseases, cancer, diabetes, cholesterol management, obesity, joint pain, immune enhancement, age-related macular degeneration, endurance performance and mood disorders – compounds and their mechanisms of action, dosage levels, contraindications if any etc.

Unit III

Manufacturing aspects of selected nutraceuticals such as lycopene, isoflavonoids, prebiotics and probiotics, glucosamine, phytosterols etc.; formulation of functional foods containing nutraceuticals – stability and analytical issues, labelling issues.

Unit IV

Clinical testing of nutraceuticals and health foods; interactions of prescription drugs and nutraceuticals; adverse effects and toxicity of nutraceuticals; nutrigenomics – an introduction and its relation to nutraceuticals.

Suggested Readings

1. Brigelius-Flohé, J & Joost HG. 2006. *Nutritional Genomics: Impact on Health and Disease*. Wiley VCH.
2. Cupp J & Tracy TS. 2003. *Dietary Supplements: Toxicology and Clinical Pharmacology*. Humana Press.
3. Gibson GR & Williams CM. 2000. *Functional Foods - Concept to Product*.
4. Goldberg I. 1994. *Functional Foods: Designer Foods, Pharma Foods*.
5. Lusso JN. 2007. *Anti-angiogenic Functional and Medicinal Foods*. CRC Press.
6. Manson P. 2001. *Dietary Supplements*. 2nd Ed. Pharmaceutical Press.
7. Campbell JE & Summers JL. 2004. *Dietary Supplement Labeling Compliance*.
8. Neeser JR & German BJ. 2004. *Bioprocesses and Biotechnology for Nutraceuticals*. Chapman & Hall.
9. Robert EC. 2006. *Handbook of Nutraceuticals and Functional Foods*. 2nd Ed. Wildman.
10. Shi J. (Ed.). 2006. *Functional Food Ingredients and Nutraceuticals: Processing Technologies*. CRC Press.
11. Webb GP. 2006. *Dietary Supplements and Functional Foods*. Blackwell Publ.

TENTH SEMESTER

Snack Technology (MFT-1001)

Major

Course Code: MFT-1001

Course Outline

THEORY

Unit I

GRAIN-BASED SNACKS- Technology for Whole Grains Snacks – roasted, toasted, puffed, popped, flaked; Technology for Coated Grain Snacks – salted, spiced, sweetened; Technology for Batter-Based and Dough-Based Products; Technology for Formulated Products – chips, wafers, papads, instant premixes

Unit II

HORTICULTURE PRODUCE-BASED SNACKS- Technology for Fruit-Based Snacks; Technology for Vegetable-Based Snacks; Technology for Coated Nuts

Unit III

EXTRUDED SNACKS- Formulation and Processing Technology; Colouring and Flavouring; Packaging; Machinery and Equipment, Use, and Care

Suggested Readings:

1. Edmund WL. Snack Foods Processing. AVI Publ.
2. Frame ND. 1994. The Technology of Extrusion Cooking. Blackie Academic.
3. Gordon BR. 1997. Snack Food. AVI Publ
4. Samuel AM. 1976. Snack Food Technology. AVI Publ.

Entrepreneurship and Business Management (MFT-1002)

Major

Course Code: MFT-1002

Course Outline

THEORY

Unit I

BEING AN ENTREPRENEUR- Definition and Qualities of an Entrepreneur; Types of Industry— cottage and small scale industry; Market Structure— macro and micro business; Creating a Business Model; Brand Creation

Unit II

FOOD PROCESSING PLANT- Product and Process Designs; General and Specific Design and Layout Considerations; Selection of Equipment

Unit III

HUMAN RESOURCE MANAGEMENT- Recruitment; Training; Performance Appraisals; Worker's Safety and Welfare; Employee's Union

Unit IV

MARKETING MANAGEMENT- Functions of Marketing; Market Intelligence - survey techniques, demand & supply; Market Forecasting – consumer behaviour and trends; Segmentation, Targeting and Positioning; Marketing Network; E-Marketing and E-Procuring

Unit V

ADVERTISING AND COMMERCIALIZATION- Objectives of Advertising; Advertising Message; Budgeting; Media Selection; Personal Selling and Publicity; Sales Promotion

Suggested Readings:

1. Chhabra TN and Suria RK. 2001. Management Process and Perspectives. KitabMahal.
2. Jhingan ML. 2005. International Economics. 5th Ed. Virnda Publ.
3. Kotler P. 2000. Marketing Management. Prentice Hall.
4. Reddy SS, Ram PR, Sastry TVN and Bhavani ID. 2004. Agricultural Economics. Oxford & IBH.

Technology of Malting and Brewing (MFT-1003)

Major

Course Code: MFT-1003

Course Outline

THEORY

Unit I

Barley production and trade, composition and structure of barley. Preparation and storage of barley for malting, suitability of different cereals for malting, characteristics of barley for malting and brewing, problem of dormancy and water sensibility, Steeping techniques, Germination of barley, morphological, enzymatic and chemical changes during malting, Role of Gibberellic acid in malting, Techniques of malting composition of malt, malting of wheat and other cereals.

Unit II

Kilning, changes during kilning, Kilning techniques , Quality evaluation of malt, special malts, milling techniques, Significance of water quality in brewing process, Mashing: changes during mashing, methods of mashing, treatment of cereals used as adjuncts, properties and complications of using adjuncts of different sources. Filtration of wort and sparging.

Unit III

Spent grain: composition and uses, Techniques of wort boiling, changes during boiling, hops, selection of hops, acidification of mash, wort cooling, methods of fermentation, management of primary fermentation, Lagering: objectives and techniques

Unit IV

Beer: composition, filtration, racking, pasteurization and defects, Application of malt in food: Baking, infant food etc , Quality control–malt specifications and test procedures , Brewing operations, constituents of hops. Brewing adjuncts , Beer quality–flavor, taste, alcohol content, chemical constituent etc. Head retention–factors affecting head retention. Haze formation.

Suggested Readings:

1. Malting and Brewing Science Vol. I: Lewis and Young (1981)
2. Malting and Brewing Science Vol. II: Lewis and Young (1982)

Techniques in Food Analysis (MFT-1004)

Major

Course Code: MFT-1004

Course Outline

THEORY

UNIT I

Introduction, Food Regulations and Standards- Sampling methods - Sample preparation for analysis; Statistical evaluation of analytical data- Official Methods of Food Analysis. Moisture in foods - determination by different methods- ash content of foods, wet, dry ashing, microwave ashing methods; Significance of Sulphated Ash, water soluble ash and acid insoluble ash in foods; titratable Acidity in foods, determination of dietary fiber and crude fiber.

UNIT II

Determination of Total fat in foods by different methods; Analysis of oils and fats for physical and chemical parameters, Quality standards, and adulterants; different methods of determination of protein and amino acids in foods; determination of total carbohydrates, starch, disaccharides and simple sugars in foods.

UNIT III

SPECTROSCOPIC TECHNIQUES basic Principles- Spectrophotometric analysis of food additives and food Components -IR Spectroscopy in online determination of components in foods; AAS and ICP-AES in mineral elements and toxic metals analysis; use of fluorimeter in vitamin assay- specific use of Tintometer in vanaspathi analysis.

UNIT IV

Chromatographic Techniques- Basic principles and types of:- Paper chromatography, thin layer chromatography, column chromatography, Ion exchange chromatography, HPTLC, HPLC, UHPLC, GC,GC-MS, Types of detectors ,Uses and applications of chromatographic techniques.

UNIT V

Basic Principles, application of electrophoresis in food analysis, refractive indices of oils and fats, total soluble solids in fruit juice and honey, specific rotation of sugars, estimation of simple sugars and disaccharides by polarimeter; Immunoassay techniques and its applications in foods.

Suggested Readings

1. Fung, D.Y.C. and Matthews, R. (1991): Instrumental Methods for Quality Assurance in Foods, Marcel Dekker, Inc. New York.
2. Skoog, D.A., Holler, F.H. and Nieman (1998): Principles of Instrumental Analysis Saunders College Publishing, Philadelphia. Department of Food Science and Technology 14

3. Gruenwedel, D.W.; Whitaker, J.R. (editors) (1984): Food Analysis Principles and techniques, Volumes 1 to 8, Marcel Dekker, Inc., New York.
4. Herschdoerfer, S.M. (ed) (1968 – 1987): Quality Control in the Food Industry, Vols. 1 to 4, Academic Press, London.
5. Pomeranz, Y. and McLoan, C.E. (1996): Food Analysis: Theory and Practice; 3rd Edition, CBS Publishers and Distributors, New Delhi.
6. Wilson and John Walker ,Principles and Techniques of Biochemistry and Molecular Biology (2010), Keith Wilson and John Walker, Cambridge University Press