

Jiwaji University, Gwalior MP



Centre for Food Technology

Syllabus (NEP 2020)

M. Sc. Food Technology

Session -2025-2027

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Scheme for M.Sc. Food Technology NEP 2020

For 2 Year PG Programme

Scheme B-1 (For the course of science having major practicum components)

First Year

M.Sc. Food Technology I Semester

S. No.	Course Code	Course Name	Total Marks	Credits (s)	End Semester Exam Marks		Internal Marks	
					Max.	Min.	Max.	Min.
1.	CC-11	Principles of Food Science and Nutrition	100	6	60	24	40	16
2.	CC-12	Principles of Food Preservation and Microbiology	100	6	60	24	40	16
3.	PC-11	Practical -I	100	4	60	24	40	16
4.	PC-12	Practical -II	100	4	60	24	40	16
5.		Internship/Apprenticeship or Seminar	100	2	-	-	100	40
		Grant Total	500	22				

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Scheme for M.Sc. Food Technology NEP 2020

For 2 Year PG Programme

Scheme B-1 (For the course of science having major practicum components)

First Year

M.Sc. Food Technology II Semester

S. No.	Course Code	Course Name	Total Marks	Credits (s)	End Semester Exam Marks		Internal Marks	
					Max.	Min.	Max.	Min.
1.	CC-21	Food Engineering and Post-Harvest Technology	100	6	60	24	40	16
2.	CC-22	Food Quality Control and Packaging Technology	100	6	60	24	40	16
3.	PC-21	Practical - I	100	4	60	24	40	16
4.	PC-22	Practical - II	100	4	60	24	40	16
5.		VAC-II: (Entrepreneurship and Business Management in Food Technology)	100	2	-	-	100	40
		Grant Total	500	22				

Manoj Kumar
Coordinator
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Scheme for M.Sc. Food Technology NEP 2020

For 2 Year PG Programme

Scheme B-1 (For the course of science having major practicum components)

Second Year

Option-1 (Only CourseWork)

M.Sc. Food Technology III Semester

S. No.	Course Code	Course Name	Total Marks	Credits (s)	End Semester Exam Marks		Internal Marks	
					Max.	Min.	Max.	Min.
1.	CC-31	Food Crops, Spices and Flavor Technology	100	6	60	24	40	16
2.	CC-32	Animal Products: Processing and Preservation Technology	100	6	60	24	40	16
3.	PC-31	Practical - I	100	4	60	24	40	16
4.	PC-32	Practical - II	100	4	60	24	40	16
5.		Internship/Apprenticeship or Seminar	100	2	-	-	100	40
		Grant Total	500	22				

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Scheme for M.Sc. Food Technology NEP 2020

For 2 Year PG Programme

Scheme B-1 (For the course of science having major practicum components)

Second Year

Option-1 (Only CourseWork)

M.Sc. Food Technology IV Semester

S. No.	Course Code	Course Name	Total Marks	Credits (s)	End Semester Exam Marks		Internal Marks	
					Max.	Min.	Max.	Min.
1.	CC-41	Advances in Food Technology	100	6	60	24	40	16
2.	CC-42	Nutraceuticals, Functional Foods and Food Toxicology	100	6	60	24	40	16
3.	PC-41	Practical - I	100	4	60	24	40	16
4.	PC-42	Practical - II	100	4	60	24	40	16
5.		VAC - I: (Food Regulations, Product Development and Intellectual Property Rights in Food Industries)	100	2	-	-	100	40
		Grant Total	500	22				

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Scheme for M.Sc. Food Technology NEP 2020
For 2 Year PG Programme
Scheme B-1 (For the course of science having major practicum components)
Second Year

Option 2 (Course Work and Research Work)

M.Sc. Food Technology III Semester

S. No.	Course Code	Course Name	Total Marks	Credits (s)	End Semester Exam Marks		Internal Marks	
					Max.	Min.	Max.	Min.
1.	CC-31	Food Crops, Spices and Flavor Technology	100	6	60	24	40	16
2.	CC-32	Animal Products: Processing and Preservation Technology	100	6	60	24	40	16
3.	PC-31	Practical - I	100	4	60	24	40	16
4.	PC-32	Practical - II	100	4	60	24	40	16
5.		Seminar	100	2	-	-	100	40
		Grant Total	500	22				

M.Sc. Food Technology IV Semester

S. No.	Course Name	Total Marks	Credit(s)
1.	Research Thesis/ Research Project/ Patent	500	22

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Scheme for M.Sc. Food Technology NEP 2020
For 2 Year PG Programme
Scheme B-1 (For the course of science having major practicum components)
Second Year

Option – 3 (Only Research Work)

M.Sc. Food Technology III Semester

S. No.	Course Name	Total Marks	Credit(s)
1.	Research Thesis/ Research Project/ Patent	500	22

M.Sc. Food Technology IV Semester

S. No.	Course Name	Total Marks	Credit(s)
1.	Research Thesis/ Research Project/ Patent	500	22

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Objective: To provide students with an integrated understanding of food chemistry, biochemistry, and nutrition. This course aims to develop knowledge of the chemical and biochemical components of food and their role in human health, metabolism, and food industry applications.

UNIT I - Fundamentals of Food Chemistry & Nutrition

1. Definition, importance and scope of food chemistry and nutrition biochemistry
2. Introduction to food groups and role and prospects of food constituents in human health and industry

UNIT II - Carbohydrates

1. Classification, structure, properties and functions of carbohydrates, Food sources, digestion and absorption, Role in Food Industry.
2. Starch, Modified starch, Cellulose, Gums, Pectin
3. Metabolic pathways: glycolysis, TCA cycle, gluconeogenesis, glycogenesis, glycogenolysis, PPP, ETC, ATP balance
4. Metabolic defects: Diabetes, other diseases associated with carbohydrate.
5. Browning reactions in food: Enzymatic & Non-enzymatic browning during storage and processing of food.

UNIT III - Proteins

1. Classification, structure, functions, physical and chemical properties, food sources, Digestion, absorption, metabolic pathways (transamination, deamination, decarboxylation, urea cycle), Nitrogen balance and nitrogen pool.
2. Purification and Denaturation of Protein
3. Protein interactions from various sources (milk, cereal, egg, fish, meat, muscle, oilseed)
4. Essential amino acids, Modified proteins and single cell proteins
5. Deficiency symptoms and related metabolic disorders, prevention and cure

UNIT IV: Lipids

1. Classification, structure, functions and food sources (vegetable and animal fats- Margarine, Lard, Butter etc.), Frying and Shortenings.
2. Digestion, absorption, metabolism of fatty acids, Metabolic pathways: β -oxidation, biosynthesis of free fatty acids, cholesterol metabolism, phospholipids, Essential Fatty Acids.
3. Crude oil refining, hydrogenation, winterization
4. Flavour changes in fats/oils: rancidity, lipolysis, oxidation, Factors affecting lipid oxidation.
5. Health implications: Obesity, CVDs, Nutritional and industrial significance of lipoproteins

UNIT V - Vitamins & Minerals

1. Classification: Vitamins (Fat- and water-soluble vitamins), Minerals (Major and Minor)
2. Biochemical roles, requirements, physiological functions, food sources
3. Processing effects, Bioavailability, deficiency effects and excess intake implications
4. Factors affecting utilization of micronutrients

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UNIT VI -Energy & Metabolism

1. Energy metabolism: Basal metabolic rate, SDA, respiratory quotient
2. Caloric requirement calculations
3. Nutritive functions and deficiency effects of nutrients
4. Recommended Dietary Allowance (RDA): concept, balanced diet planning for various groups and diseases

UNIT VII -Food Enzymes & Bioactive Compounds

1. Enzymes: classification, nomenclature, structure, properties and functions
2. Enzyme activity in food systems, factors affecting rate of enzymatic action.
3. Industrial enzyme applications: flavor production, processing aids
4. Bioactive compounds: Tannins, Phytosterols, Glucosinolates, Alkaloids, Polyphenols
5. Introduction to plant pigments and their food roles: Carotenoids, Xanthophylls, Chlorophyll, etc.

UNIT VIII: Analytical Techniques in Food Chemistry

1. Spectroscopy: UV-Visible, Flame photometry, Atomic Absorption Spectroscopy – principles and instrumentation
2. Colorimetry: Beer-Lambert law, extinction coefficient
3. Applications in food quality and nutrition assessment

Textbooks / References:

1. Potter N. & Hotchkiss, J.H.(1996) ,Food Science 5th Edition , CBS Publishers
2. N. Shakuntala Manyas(2024), Foods Facts and Principles , 5th Edition, New Age International Publishers.
3. Boyer, R. (2000). Modern Experimental Biochemistry, 3rd Ed. Pearson
4. Lubert Strayer (2023). Biochemistry, 9th Ed. Freeman & Co.
5. Voet & Voet (2024). Fundamentals of Biochemistry, 6th Ed. John Wiley & Sons
6. Chakrapani, S. (2021). Biochemistry, 6th Ed. Elsevier
7. Jain, J.L. et al. (2020). Fundamentals of Biochemistry, 6th Ed. S. Chand
8. Joshi, S. (2021). Nutrition and Dietetics, 5th Ed. McGraw Hill
9. Belitz, H.D. (2009). Food Chemistry, 4th Ed. Springer
10. Damodaran, S. (2017). Food Chemistry, 5th Ed. Academic Press
11. Wildman, R.E.C. (2019). Handbook of Nutraceuticals and Functional Foods, 3rd Ed. CRC Press
12. Fennema, O.R. (2017) Food Chemistry , 4th Edition, Springer.
13. Meyer, L.H. (2006). Food Chemistry, CBS Publishers

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Objectives

To provide knowledge of microorganisms in food, sources of contamination, and principles of preservation methods including heat, cold, chemicals, drying, irradiation, and fermentation, with emphasis on their effects on safety, quality, and shelf life.

Unit I: Introduction to Food Preservation and Microbiology

1. **Definition and Scope:** Overview of food microbiology and food science, their significance in food safety, quality, and technology.
2. **Historical Development:** Evolution of food microbiology and preservation techniques.
3. **Microorganisms in Food:** Classification, propagation, and importance of yeast, mold, and bacteria in food science.
4. **General Principles of Food Preservation:** Introduction to preservation methods and their impact on food quality and safety.

Unit II: Microbial Growth and Contamination

1. **Sources of Contamination:** Air, water, soil, sewage, and post-processing contamination.
2. **Microbial Growth:** Definition, growth curves (lag, log, stationary, death phases), and factors affecting growth (intrinsic and extrinsic parameters).

Unit III: Food Spoilage and Food-Borne Diseases

1. **Food Spoilage:** Characteristics and significance of spoilage in cereals, vegetables, fruits, meat, poultry, seafood, milk, and canned foods.
2. **Food-Borne Diseases:** Bacterial diseases (Staphylococcal intoxication, Botulism, Salmonellosis, Shigellosis, E. coli diarrhea, Clostridium perfringens, Bacillus cereus) and mycotoxins (Aflatoxicosis, Dioxin valenok, Ergotism).
3. **Rapid detection methods for microorganisms.**
4. **Indicator Organisms:** Role in assessing food and water safety and quality.

Unit IV: Food Preservation by Heat

1. **Heat-Based Preservation:** Blanching, pasteurization, sterilization, UHT processing, canning, and their effects on microbes.
2. **Thermal Inactivation:** Concepts of TDT, F, Z, and D values; pathogen survival in food.
3. **Ohmic Heating:** Principles and applications in food processing.

Unit V: Low-Temperature Preservation and Freezing

1. **Refrigeration:** Requirements for refrigeration plants, storage of fresh foods, and impact on quality.
2. **Freezing:** Freezing points, methods (slow, quick, freeze-drying), effects on food quality, storage, and thawing processes.
3. **Microbial Survival:** Effects of low temperatures on microbial growth and pathogen survival.

Unit VI: Chemical and Alternative Preservation Methods

1. **Chemical Preservation:** Use of sugar, salt, chemicals, antibiotics.
2. **Smoking:** process and method.
3. **Concentration:** Processes and equipment for producing concentrated foods and their keeping quality.

Unit VII: Food Fermentation

1. **Food Fermentation:** Microbial cultures, their maintenance, evaluation, and use in single and mixed cultures; therapeutic value of fermented foods.
2. **Fermentation in Preservation:** Applications in pickling, curing, and other preservation techniques.

Unit VIII: Drying

1. **Drying:** Methods (sun-drying, tray/tunnel drying, spray drying, drum drying, fluidized bed drying), physical and chemical changes, and control measures.
2. **Packaging and Storage:** Techniques for dehydrated foods, ensuring quality and safety.
3. **Radiation:** Sources, mode of action, effects on microorganisms and nutrients, dose requirements, and irradiation of packaging materials.
4. **Microwave:** principles and applications.

Textbooks and Reference Materials

1. Bilgrami, S. (2019). *Essentials of Microbiology*. 1st Edition, CBS Publishers, Delhi.
2. Frazier, W.C. (2013). *Food Microbiology*. 5th Edition, Tata McGraw Hill, Delhi.
3. Jay, J.M. (2005). *Modern Food Microbiology*. 4th Edition, CBS Publishers, Delhi.
4. Peleazar, Chan, and Krieg (2024). *Microbiology*. 6th Edition, Tata McGraw Hill, Delhi.
5. Ray, B. and Bhunia, A. (2025). *Fundamental Food Microbiology*. 5th Edition, CRC Press.
6. Prescott, L.M., Harley, J.P., and Klein, D.A. (2023). *Microbiology*. 7th Edition, McGraw Hill, New York.
7. Desrosier, N.W. & James, N. (2007). *Technology of Food Preservation*. AVI Publishers.
8. Fellows, P.J. (2005). *Food Processing Technology: Principles and Practice*. 2nd Edition, CRC Publishers.
9. Jelen, P. (2005). *Introduction to Food Processing*. Prentice Hall.
10. Potter, N.N. (1995). *Food Science and Technology*. 5th Edition, Springer Publishers.

Manoj Shrivastava
Principal
Alka

PC-11 - Practical-I

Objective: To understand the chemistry of food and to develop skills related to quality evaluation of foods using various qualitative techniques.

Outcome: The students shall acquire the practical skills for the sampling of foods and shall be able to carry out quality evaluation foods. They will learn biochemical techniques for estimation of nutritional content in different type of food products. Qualitative analysis of carbohydrates, and Proteins.

1. Qualitative analysis of Carbohydrates
2. Qualitative analysis of Proteins
3. Analysis of lipids: acid value, iodine value, saponification value etc.
4. Estimation of carbohydrates in food materials
5. Estimation of proteins in food materials
6. Estimation of crude fiber in food materials
7. Estimation of ascorbic acid in food materials
8. Estimation of calcium in food materials
9. Estimation of cholesterol in food materials
10. Estimation of calorific value of foods
11. Balance diet: food exchange list and steps in diet planning.
12. Diet planning for pre-school, school children, lactating women

Textbooks/References:

1. Weaver CM and Doniel JR (2003). The Food chemistry Laboratory: A manual for Experiment Foods, Dietetics and Food scientist. 2nd Edition. CRC Press.
2. Sehgal S. 2016. A laboratory Manual of Food Analysis I K International Publishing Hors Pvt. Ltd.
3. Yeshtajahu Pomeranz, Clifton E. Meloan, (2018) Food Analysis- Theory and Practice. 4th Edition. by Medtech

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PC-12-Processing and Microbial Quality

Credits -4

Objective: To understand the microbial techniques and to develop skills related to microbial quality evaluation and processing of foods using various techniques.

Outcome: The students shall acquire the practical skills for the processing and sampling of foods and shall be able to carry out microbial analysis. Introduction to microbiological techniques: Requirements of a microbiology lab, Safety rules to be, analyse food products for possible microbial contamination

A) Processing of Food

1. Determination of moisture in different food samples.
2. Determination of TSS in different food samples.
3. Quality assessment by Blanching and browning control
4. Quality assessment by different drying methods.
5. Determination of acidity and pH in different food samples.
6. Determination of ash in food samples.
7. Instruments used for food processing.
8. Gelatinization
9. Stages of sugar cookery
10. Estimation of gluten content

B) Food Microbiology Lab

1. Preparation of common laboratory media and study of Simple and Compound Microscope.
2. Staining: Gram's staining.
3. Sub culturing of a bacterial strain in liquid and solid medium. Isolation of pure culture.
4. Study of growth of E. coli by a spectrophotometer.
5. Study of microbiological quality of milk by MBRT test.
6. Preparation of synthetic medium for yeast and mold and inoculation with standard strains of yeasts and molds. Microbiological analysis of typical processed food and un-processed food.
7. Dilution and Plating by spread-plate, pour-plate techniques and Microbial counting.
8. Evaluation of Microbiological quality of Water and MPN test of coliforms.
9. Determination of Thermal resistance of Enzymes and Microorganisms.
10. Determination of activity of starter cultures used in Dairy Industry.

Textbooks/References:

1. Garg N, Garg KL and Mukerji KG. (2010). Laboratory Manual of food Microbiology. I.K international Publishing House
2. Manual of Methods of Analysis – Microbiological Examination of Food and Water (2024) eighth Edition, FSSAI.
3. Manual of Methods of Analysis of Cereal and Cereal Products (2023) second Edition, FSSAI.

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Garg
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Internship Apprenticeship or Seminar

Credits-2

- 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 given due consideration. The average marking will be taken into consideration.
- The internship provides students with practical exposure to real-world industrial environments, bridging the gap between classroom learning and professional practice. It enables hands-on experience, skill development, and industry-oriented learning for career readiness.

Project /
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Internship

CC21 Food Engineering and Post-Harvest Technology

Credit: 6

Objective: To develop comprehensive knowledge about engineering principles in food processing, instrumentation, and control, alongside the biochemistry, physiology, and post-harvest technology of fruits and vegetables. This includes their role in quality, pre- and post-harvest changes, and the technologies involved in processing, preservation, and value addition.

UNIT-I

1. Introduction to food processing and post-harvest technology: Scope, applications, role, importance, and status.
2. Morphology of fruits and vegetables, maturity indices, and methods of maturity determination.
3. Post-harvest physiological and biochemical changes in fruits and vegetables, ripening of climacteric and non-climacteric fruits, regulations, and methods.

UNIT-II

1. 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, cold storage, Zero energy cool chamber), commodity pre-treatments (chemicals, waxing, VHT, and irradiation).
2. Minimal processing of fruits and vegetables: Quality factors for processing.

UNIT-III

1. Pectin: Raw material processes, uses, products based on pectin, manufacturing, and quality control.
2. Fermentation: Definition, fermented products, methods of preparation, and quality control (Vinegar, Wine, Beer, Sauerkraut, Kimchi, Pickle).
3. Tea, Coffee, and Cocoa: Production and manufacturing

UNIT-IV

1. Mechanical operations in food processing: Principles, theories, laws, energy considerations, equipment, and size reduction of solid and liquid food products.
2. Reduction processes: Theory and applications, mixing indices, equipment for solid and liquid foods.
3. Mixing & forming: Theory and applications.

UNIT-V

1. Process Heat Transfer: Thermal properties of foods (specific heat and thermal conductivity), modes of heat transfer, Fourier's law, steady and unsteady state heat transfer, heat exchange transfer, and overall heat transfer.
2. Rheology of foods: Newtonian fluids and non-Newtonian fluids, measurement of viscosity.
3. Fluid-Flow: Properties of liquids, flow measurement.

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Chakraborty

UNIT-VI

1. Operations in Food Engineering: Mechanisms of drying, moisture vs. drying rate curves, constant and falling rate periods.
2. Food dehydration: Mechanism, freeze drying.
3. Chilling, refrigeration & freezing: Introduction, characteristics curve, cooling rate calculations, chilling & freezing, shelf-life extension requirements, properties of frozen foods.

UNIT-VII

1. Evaporation: Properties of liquid, heat & mass balance, single & multiple effect evaporation, steam economy, heat recovery, efficiency, equipment & systems.
2. Food Storage: Introduction, storage requirements, types of freezers, precooling & cold storage, food machinery, packaging, instrumentation, and control.

UNIT-VIII

1. Separation processes: Centrifugation (general principles, instrument & types, centrifuges, preparatory & analytical centrifugation), chromatographic techniques (general introduction, partition & adsorption chromatography, paper, thin layer, gas & liquid, ion exchange & affinity chromatography, gel filtration, HPLC, and application in food industry).
2. Membrane filtration technology: Principles of other food processing such as RO, UF, dialysis, osmosis, microfiltration, and nanofiltration- outlines.

Textbooks and Reference Materials

1. Bose, T.K. Ed. (2022). Fruits of India: Tropical and Sub-tropical. Naya Prokash, 4th Edition, Calcutta. Authy, M.E.
2. Hulme, A.C. (1970). The Biochemistry of Fruits and their Products. Vol I & II. Academic Press, London.
3. Ranganna, S. (2015). Manual of Analysis of Fruit and Vegetable Products. Tata McGraw Hill, New Delhi.
4. Hanson, L.P. (2015). Commercial Processing of Vegetables. 2nd Edition. Noyes Data Corporation, New Jersey.
5. Lai, G., Siddappa, G., and Tandon G.L. (2022). Preservation of Fruits and Vegetables. 10th Edition. Indian Council of Agril Research, New Delhi.
6. Salunkhe, D.K and Kadam, S.S. Ed. (1998). Handbook of Fruit Science and Technology, Production, Composition and Vegetable and Processing. Marcel Dekker, New York. Salunkhe,
7. D.K. and Kadam, S.S. Ed. (2019). Handbook of Vegetable Science and Technology, Production, Composition and Processing. Marcel Dekker, New York.
8. R.P. Shrivastva, Sanjeev Kumar. (2023). Fruit and Vegetable Preservation Principles and Practices. Publication CB.
9. D.Q. Kern. (2019). Heat Transfer. 2nd Edition, MGH.
10. R.K. Rajput (2020). Engineering Thermodynamics. 6th Edition, Tata-McGraw-Hill.
11. Bangalore, P.K. Nag. (2017). Engineering Thermodynamics. 4th Edition Springer.
12. Romeo Toledo. (2014). Basics of Food Engineering. 2nd Edition. Pergamon Press.
13. Earle R.L. 1985. Unit Operations in Food Processing. 5th Edition, Elsevier India.
14. Fellows, P.J. (2022). Food Processing Technology. 5th Edition. Elsevier.
15. R Paul Singh, Denni R Heldman (2024). -Introduction to Food Engineering. 6th Edition Publication Elsevier.

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CC-22 Food quality control and Packaging technology

Credits: 6

Objective: This course equips students with knowledge of food safety, quality management, and sustainable packaging, along with relevant laws and standards. Graduates will be able to ensure food safety, design innovative products, and choose appropriate packaging to maintain quality and shelf life.

UNIT I - Food Safety & Hygiene

1. Introduction to food safety and hygiene.
2. Importance of food safety in food processing.
3. Food hygiene practices: GMP, GHP, GAP, GLP.
4. Hygiene verification, sanitation assurance, and Clean-in-Place (CIP) systems Food Industry.
5. Sanitizers and detergents used in the food industry.

UNIT II - Quality Concepts & Management

1. Concepts of quality management, quality assurance, and quality control in food processing.
2. Food Quality attributes: physical, chemical, nutritional, microbial and sensory.
3. Quality measurement techniques and process design and control.
4. Quality improvement in food processing industries.

UNIT-III-Principles and tools of quality management:

1. Total Quality Management (TQM) and its application in the food industry
2. ISO, HACCP, and FSSAI regulations.
3. PDCA cycle, 5S, KAIZEN, quality audits, and documentation.
4. Role of training and human resource development in maintaining quality standards.

UNIT IV - Fundamentals of Food Packaging

1. Definition, terminology, and types of packaging.
2. Functions of food packaging.
3. Selection and design of packaging materials for different foods.
4. Food characteristics influencing packaging choices.

UNIT V - Packaging Materials & Properties

1. Paper, paperboard, corrugated fibre board (CFB).
2. Glass packaging.
3. Metals: tin, aluminium.
4. Plastics: films, laminations, metallized films, co-extruded films.
5. Composite containers, collapsible tubes, edible and biodegradable packaging.

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UNIT VI -Packaging Systems & Applications

1. Packaging methods: vacuum, retort, microwave, active, intelligent.
2. Shrink and stretch packaging.
3. Controlled and modified atmosphere packaging.
4. Aseptic packaging and sterilization.
5. Packaging of fresh and processed foods: fruits, vegetables, dairy, bakery, beverages, dehydrated products, meats, fats, oils, spices.
6. Liquid and powder filling machines: volumetric, gravimetric, bottling, Form Fill Seal (FFS), multilayer aseptic systems.

UNIT VII -Packaging Quality Control

1. Quality control tests: shelf-life evaluation, tensile strength, tearing resistance, puncture resistance, permeability tests (GTR, WVTR).
2. Factors affecting packaging material performance.
3. Prediction of shelf life for packaged foods.

UNIT-VIII - Sensory evaluation of Food

1. Sensory evaluation: factors affecting sensory evaluation.
2. Sensory quality parameters: size, shape, texture, aroma, taste, colour and gloss.
3. Different tests, methods, scales and scorecards for sensory evaluation of various food products.
4. Sensory Panel: Selection and Training of Sensory Panelists.

Recommended Textbooks & References

1. Early, R. (2012). Guide to Quality Management Systems for Food Industries. Blackie Academic.
2. Kramer, A.E., & Twigg, B.A. (2017). Quality Control in Food Industry, Vol. I & II. AVI Publ.
3. Chhabra, T.N., & Surya, R.K. (2019). Management Process and Perspectives, Latest Edition. Kitab Mahal.
4. NIIR. (2023). Food Packaging Technology Handbook (3rd Ed.). National Institute of Industrial Research Board.
5. Han, J.H. (2013). Innovations in Food Packaging (2nd Ed.). Elsevier Academic Press.
6. Coles, R., McDowell, D., & Kirwan, M.J. (Eds.). (2011). Food Packaging Technology (2nd Ed.). CRC Press.

Haripal
Prasanna
Sharma

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 purée.
5. Preparation of tomato paste.
6. Preparation of tomato ketchup.
7. Preparation of tomato mock tail.
8. Preparation of tomato soup.
9. Preparation of tomato chutney.
10. Preparation of jams.
11. Preparation of jellies.
12. Preparation of marmalades.
13. Preparation of squashes.
14. Preparation of Various type of Pickles.
15. Pectin determination.
16. Determination of chemical preservatives in fruits and vegetables.
17. Blanching of fruits and vegetables for quality estimation.

Textbooks/References:

1. Lal G, Siddappa G S & Tandon GL. (2022). Preservation of fruits and Vegetables 10th Edition. ICAR.
2. R.P. Srivastava & Sanjeev Kapoor (2017) Fruit & Vegetables preservation: 3rd Edition. principle And Practices Revised And enlarged.
3. S Rangana. (2005) Handbook of Analysis and Quality Control for Fruit and Vegetable Product, Second Edition, Tata McGraw Hill.

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S. Srinivasan
Shelton

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

Textbooks/References:

1. NIIR (2020) Food packaging Technology Handbook 3rd Edition, National Institute of Industrial Research Board, Asia Pacific Business Press Inc.
2. Coles, R. Mc Dowell, D. and Kirwan M. J. (EDS) (2009) Food Packaging Technology. Publisher CBS.
3. Horst – Christian Langowski, Ali Abas Wani, Preeti Singh (2017). Food Packaging Materials and Quality Assurance, CRC Press.

Manish
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OPTION-1

CC31: Food Crops, Spices & Flavor Technology

Credit-6

Objective: To provide comprehensive knowledge on the processing, quality evaluation, and technologies for cereals, legumes, oilseeds, and sugar crops, while acquainting students with food additives, spices, and flavor components relevant to the processed food industry for shelf-life extension, sensory appeal, and safety.

UNIT-I: Wheat Processing and Bakery Applications

1. **Wheat:** Types, structure, composition, and physicochemical characteristics.
2. **Wheat milling:** Products and by-products; factors affecting quality parameters; physical, chemical, and rheological tests on wheat flour, manufacturing of wheat-based products,
3. **Baking:** Principles of baking and several changes in baked products, formulation of premixes for bakery products, pasta goods, and processed cereal foods for infants.

UNIT-II: Rice Processing

1. **Rice:** Classification, structure, composition, physicochemical characteristics, and quality.
2. **Rice milling technology:** By-products of rice milling and their utilization; rice bran stabilization, oil extraction and refining; parboiling methods, criteria of quality, aging of rice (quality changes), and processed products based on rice.

UNIT-III: Corn, Barley and Oat Processing

1. **Corn:** Types and nutritive value; dry and wet milling; corn products including corn flakes, corn starch, snacks, tortillas, production of glucose syrups, dextrose, high fructose corn syrups, and modified corn starches.
2. **Barley:** Composition, milling, malting, changes during malting, uses of malt and its products.
3. **Oats:** Composition, types, processing of oats, and by-products of oat milling.

UNIT-IV: Legumes and Oilseed Processing

1. **Legumes and Oilseeds:** Composition, anti-nutritional factors, processing, hydrogenation, and storage; processing for production of edible oil, meal, flour, protein concentrates and isolates; development of low-cost protein foods.
2. **Oil extraction process:** mechanism, oil refining, utilization of by-products of oil milling.

UNIT-V: Processing of Sugar Crops

1. **Processing of sugar crops and tubers:** Sugar production and manufacturing
2. **Products of sugars and by-products of sugar manufacturing,** types and grades of sugars (sugar cane, sugar beets, and their differences).

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UNIT-VI: Flavor Science

1. **Food flavor basics:** Olfactory perception of flavor and taste, relationship of taste-sweet, bitter, salt, sour; chemicals causing pungency, astringency, cooling effect, and properties.
2. **Flavors generated during processing:** Reaction flavors, flavor composites, stability of flavors during food processing.

UNIT- VII: Flavor Technology

1. **Flavor encapsulation-**need, methods and applications in food industry
2. **Flavor technology:** Types of flavors, classification of flavors (natural, nature identical, and synthetic).
3. **Analysis of flavors,** extraction techniques of flavors

UNIT- VIII: Spices Processing

1. **Major and minor spices:** Oleoresins and essential oils, method of manufacture, quality control, fumigation, and irradiation of spices.
2. **Techniques for flavor extraction:** Supercritical fluid extraction (continuous and semi-continuous methods), effects of types of solvents used, and its role in food industry.

Text Books and Reference:

1. Chakravarty, M.M. (2003). Chemistry and Technology of Oils and Fats. 1st Edition. Prentice Hall.
2. Dendy, D.A.V., & Braszczok, B.J. (2001). Cereal and Cereal Products. 1st Edition. Aspen.
3. Hamilton, R.J., & Bhati, A. (2000). Fats and Oils: Chemistry and Technology. 1st Edition. Aspen.
4. Hony, R.S. (2010). Principles of Cereal Science and Technology. 3rd Edition. App. Skippable.
5. Kay, D.E. (2017). Food Legumes. 5th Edition Tropical Products Institute.
6. Kent, N.L. (1983). Technology of Cereals. 4th Ed. Pergamon Press.
7. Food Flavors (2014). Morton, I.D. & Macleod, A.J. Part A. BC. Elsevier.
8. George, A.B. (2009). Fenaroli's Handbook of Flavor Ingredients. 6th Edition. CRC Press.
9. Fennema, O.R. (1976). Principles of Food Science Part-I Food Chemistry 5th Edition. Marcel Dekker, New York.
10. Andrew J. Taylor & Robert S.T (2010). Food flavor technology, 2nd Edition, Wiley-Blackwell.

Signature
Signature

Objective: This course offers in-depth knowledge of processing, preservation, and quality control of dairy, meat, fish, and poultry products, covering composition, technology, legislation, and hygiene practices. Students will learn to apply sanitation measures, evaluate quality, implement storage, packaging, and marketing strategies, and utilize by-products effectively.

UNIT I -Composition, Collection & Processing of Raw Materials

1. Milk composition and characteristics; collection, chilling, transportation, cream separation.
2. Composition and classification of edible fish; average composition of fish; freshness evaluation.
3. Meat composition; carcass components, postmortem changes, glycolysis.

UNIT II -Processing Technologies for Milk & Liquid Products

1. Standardization, pasteurization (LTLT, HTST, UHT), homogenization.
2. Packaging, storage, and distribution of fluid milk.
3. Sanitary design of dairy plant; waste disposal.

UNIT III -Fish Processing & Preservation

1. Handling, storage, and transport of fish.
2. Preservation methods: canning, freezing, drying, salting, smoking, curing.
3. Fish products: fish meal, oil, and by-products.
4. Spoilage of fish and quality assessment.

UNIT IV -Meat Processing & Preservation

1. Slaughtering methods, meat preservation, and packaging, Pre and post-slaughter factors affecting meat quality.
2. PSE and DFD conditions.
3. Chilling, freezing, curing, and smoking of meat.
4. Meat industry in India: importance, application, growth rate.

UNIT V -Poultry Processing & Products

1. Pre-slaughter care, ante mortem examination, slaughtering, Preservation, chilling, freezing, and packaging of poultry meat.
2. Processed poultry products: smoked, canned, barbecued, curried poultry.
3. Tenderness factors and by-product utilization.

UNIT VI - Dairy Technology

1. Fermented milk products: curd, yoghurt, shrikhand.
2. Butter: manufacture, storage, packaging, and defects.
3. Cheese: manufacture of hard, semi-hard, soft, and processed varieties; storage and grading.

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UNIT VII -Frozen, Indigenous, Evaporated & Dried Milk Products

1. Frozen milk products: ice cream, sherbets – classification, manufacture, defects.
2. Indigenous products: ghee, khoa, paneer, chhana.
3. Evaporated and dried milk: SMP, WMP, condensed milk – manufacture, storage, defects.

UNIT VIII - Eggs, By-products & Quality Evaluation

1. Egg structure, composition, nutritive value, functional properties.
2. Factors affecting egg quality and its measurement.
3. Industrial use of eggs; collection, grading, cleaning, storage.
4. Dairy by-products: skim milk, buttermilk, whey – utilization.
5. Quality parameters: appearance, texture, viscosity, flavour defects, contamination.

Textbooks & References

1. Robinson, R.K. (1996). Modern Dairy Technology, Vol. 1 & 2, 2nd Ed. Elsevier Applied Science.
2. Herington, B.L. (2009). Milk & Milk Processing. McGraw-Hill.
3. Lampert, L.H. (1998). Modern Dairy Products. Chemical Publishing Co.
4. Fox, P.F. (2016). Developments in Dairy Chemistry, Vol. 1 & 2, 2nd Ed. Springer.
5. De Sukumar. (2024). Outlines of Dairy Technology. Oxford Univ. Press.
6. Pearson, A.M., & Gillett, T.A. (1996). Processed Meats, 3rd Ed. CBS.
7. Toldra, F. (2022). Lawries Meat Science, 9th Ed. Woodhead Publishing.
8. Stadelman, W.J., et al. (1988). Egg and Poultry Meat Processing. Wiley-VCH.
9. Lawrie, R. (1991). Developments in Meat Science, Vol. 5. Applied Science Pub.
10. Stadelman, W.J., & Cotterill, O.J. (1995). Egg Science & Technology, 4th Ed. AVI Publ.
11. Borgstrom, G. (2012). Fish as Food, Vol. 1 & 2. CRC Press.

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, Biscuits, Pizza base, Dinner roll, Cookies, Muffins, Nankhatai, Cakes.
13. Preparation of fermented products.
14. Quality evaluation of different biscuit sample—physical and chemical analysis.
15. To determine the foaming capacity of given flour sample.
16. Determination of protein content of flour by Kjeldahl Method
17. Estimation of curcumin in turmeric.
18. Determination of capsaicin in content in chilli.

Textbooks/References:

1. MIIR (2022). Handbook on spices. 6th Edition. National Institute of Industrial Research Board, Asia Pacific Business Press Inc.
2. Peeler EJ. (2000) Bakery Science & Technology. 3rd Edition. Vols. I, II Sosst and Publication.
3. Lorenz KL. Hand Book of cereals Science and Technology. Marcel Dekker.
4. Manual of Methods of Analysis of Cereal and Cereal Products. (2023) 2nd Edition, FSSAI.

original

Manoj Kumar

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. Fat estimation in milk by Gerber Method.
3. Preparation of curd, lassi, shrikhand, ghee, khoa, chenna and paneer.
4. Determination of total solids in milk, skim milk, butter milk and whey by drying method.
5. Viscosity determination of Milk by Pipette method.
6. Test for fats: Bromothymol blue test.
7. Alcohol test for determining coagulability of milk.
8. Determination of salt content in butter.
9. Casein estimation in milk sample.
10. Preparation of fortified, reconstituted and flavoured milks.
11. Sensory analysis of food products: Paired comparison test, Duo-trio test, Hedonic test, Triangle test; Ranking test, Single sample test, Composite scoring test.

Textbooks/References: -

1. Herrington BL. (1948) Milk and Milk processing, 1st Edition. Mc Craw Hill Book Company.
2. De S. (2001). Outlines of Dairy Technology. 1st Edition. Oxford University Press.
3. Manual of Methods of Analysis of foods- Dairy and Dairy Products. (2022), 2nd Edition FSSAI.

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Internship/Apprenticeship or Seminar

Credits-2

- 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 given due consideration. The average marking will be taken into consideration.
- The internship provides students with practical exposure to real-world industrial environments, bridging the gap between classroom learning and professional practice. It enables hands-on experience, skill development, and industry-oriented learning for career readiness.

Approved

Manager

Objective: To understand the importance of various technologies used in food processing. Imparting knowledge about principles and application of computer in food technology.

UNIT I – Foundations of Modern Food Processing

1. Historical development and eras of modern food processing.
2. Overview of current challenges and future prospects.

UNIT II – Extrusion & Non-Thermal Processing

1. Extrusion – thermoplastic extrusion cooking, preparation of meat analogues, advantages over natural meat
2. Advances in non-thermal processing: bio-preservation, high-hydrostatic pressure processing, pulsed electric field processing

UNIT III – Ultrasound & Hurdle Technology

1. Ultrasound processing – preservation & enhancement of mass transfer
2. Hurdle Technology – principles and applications

UNIT IV – Food Biotechnology & Food Fortification

1. **Food Biotechnology:** introduction, history, and applications in the food industry
2. **Genetically Modified (GM) Foods:** Process of genetic modification, Transgenesis methods, Safety concerns: potential toxicity and allergenicity
3. **Food Fortification:** Advanced technologies for fortification, Types of fortified products, Challenges: nutrient interaction and bioavailability

UNIT V – Nanotechnology in Food

1. New ways of food production
2. Efficient fractionation of product
3. Optimizing nutritional values
4. Applications in sensing, packaging, encapsulation
5. Super-critical fluid extraction

UNIT VI – 3D Food Printing

1. Principles of food printing technologies
2. Printing methods and advancements
3. Potential culinary applications

UNIT VII – AI in Food Processing

1. **Role of AI:** Food production enhancement, Precision agriculture, Food safety and quality control, Food packaging, Personalized food products, Supply chain management, Consumer experience
2. Benefits & limitations of AI in food technology

Signature
Signature

UNIT VIII – Biostatistics for Food Technology

1. Introduction of Biostatistics and its applications
2. Population and sample – types of statistical data – collection and classification of data
3. Frequency tables – diagrammatic representation of data
4. Measures of central tendency – mean, median, mode
5. Measures of dispersion – range, quartile deviation, standard deviation, skewness, kurtosis
6. Sampling techniques – simple random sampling, stratified random sampling

Textbooks and Reference:

1. Lopez, G.F.G., & Canovas, G.V.B. (2003). Food Science and Food Biotechnology, 1st Ed., CRC Press, Florida, USA.
2. Cupp, J., & Tracy, T.S. (2003). Dietary Supplements, 1st Ed., Humana Press.
3. Lewin, B. (2004). Genes VIII, 8th Ed., Pearson Education International.
4. Bains, W. (2022). Biotechnology 6th Edition: from A to Z, Oxford Univ. Press.
5. Khalid Barkat, Kulsum Jan, Valibhay Kumar Maurya, Amita Shakya. (2024). Food Fortification, 1st Ed., CRC Press.
6. Insha Zahoor, Sajad Ahmad Wani, & Tariq Ahmad Ganaie. (2025). Artificial Intelligence in the Food Industry, CRC Press.
7. Eila Hassanein, Mona Soliman. (2023). Artificial Intelligence: A Real Opportunity in the Food Industry, 1st Ed., Springer.
8. Bandarkar, P.L. and Wilkinson T.S. (2000): Methodology and Techniques of Social Research, Himalaya Publishing House, Mumbai.
9. Mukherjee, R (1989): The Quality of Life: Valuation in School Research, Sage Publications.

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Manish

Objective: To understand the importance of various nutrients, bioactive compounds, and toxicants in foods, their role in human health, and effects of their imbalance. To study utilization, deficiency diseases, metabolic disorders, safety, and regulatory issues. To explore probiotic, prebiotic, and functional foods, and learn about toxicology and contaminants in foods.

UNIT I — Fundamentals of Nutraceuticals, Functional Foods & Food Toxicology

1. Definitions, concepts, scope, history, and market trends.
2. Significance in disease prevention and health promotion.
3. General principles of food toxicology: manifestation of toxic effects, classification of food toxicants, factors affecting toxicity.

UNIT II — Classification & Occurrence

1. Classification of nutraceuticals and functional foods.
2. Natural occurrence of phytochemicals (antioxidants, flavonoids, omega-3 fatty acids, carotenoids, dietary fiber).
3. Agricultural & industrial contaminants in foods: pesticide residues in fruits/vegetables, metal contaminants.

UNIT III— Phytochemicals, Bio-actives & Safety

1. Phytoestrogens, glucosinolates, organosulfur compounds: dosage for disease control/health benefits, safety, acute/chronic studies.
2. Regulatory aspects of nutraceuticals and bio-actives.
3. Natural toxins in foods: plant and animal origin, microbial toxins (algal, bacterial, fungal) and their significance.

UNIT IV — Probiotics

1. Probiotics: definition, types, relevance.
2. Role in gastrointestinal health and other benefits.
3. Development of probiotic products, recent advances, challenges, and regulatory issues.
4. Mycotoxicosis: significance, determination, and management.

UNIT V — Prebiotics

1. Definition, chemistry, sources, metabolism, and effects of processing.
2. Prebiotics in foods: types, effects on gut microbiota, health benefits, and recent developments.
3. Food poisoning: causes, microbial toxins, and prevention strategies.

UNIT VI — Functional Food Development

1. Development process, use of bio-actives in appropriate forms with protective substances and activators.
2. Effect of environmental conditions and food matrix.
3. Food allergies and sensitivities: sources, chemistry, true/false allergies, food intolerances.

UNIT VII — Food Contaminants, Adulterants & Processing-Generated Toxicants

1. Environmental contaminants and drug residues: pesticide/fungicide residues, heavy metals, veterinary drug residues, radioactive contamination.
2. Processing-generated toxicants: nitroso compounds, heterocyclic amines.
3. Safety of genetically modified foods: potential toxicity and allergenicity.
4. Food adulteration, definition, types, reasons and methods of detection.

UNIT VIII — Food Additives, Supplements & Nutritional Genomics

1. Food additives: Need, safety, toxicological evaluation.
2. Dietary supplements: toxicity related to dose, possible toxic effects, relevance.
3. Research frontiers in functional foods, nutrigenomics, personalized nutrition, and their application in the food industry.

Textbooks & References:

1. Wildman, R.E.C. (2019). Handbook of Nutraceuticals and Functional Foods (3rd ed.). CRC Press.
2. Gibson, G.R., & Williams, C.M. (2000). Functional Foods: Concept to Product (1st ed.). CRC Press.
3. Goldberg, I. (2012). Functional Foods: Designer Foods, Pharma Foods. Springer-Verlag.
4. Brigelius-Flohé, R., & Joost, H.G. (2006). Nutritional Genomics (1st ed.). Wiley VCH.
5. Helferich, W., & Winter, C.K. (2000). Food Toxicology (1st ed.). CRC Press.
6. Duffus, J.H., & Worth, H.G.J. (2015). Fundamental Toxicology. Royal Society of Chemistry.
7. Stine, K.E., & Brown, T.M. (2015). Principles of Toxicology (3rd ed.). CRC Press
8. Tonu, P. (2014). Principles of Food Toxicology (2nd ed.). CRC Press.
9. Branen, A.L., Davidson, P.M. & Salminen, S. (2001). Food Additives, 2nd Edition. Marcel Dekker.
10. George, A.B. (1997). Encyclopedia of Food and Color Additives, 1st Edition Vol. III. CRC Press.
11. Furia, T.E. (1980). Handbook of Food Additives, Vol I and Vol II. CRC Press.

Alwings

Objectives: Provide hands-on exposure to modern food technology, train students in applied biostatistics for food research without high-end software dependency and develop skills in product development, shelf-life testing, and data interpretation.

Outcomes: Conduct advanced food technology concepts, design small-scale experiments, apply statistical tools to food data and interpret results for product optimization and quality control.

Advanced Techniques

1. Small-scale Vacuum Packaging & Shelf-life Study
2. Low-cost Freeze drying Simulation
3. Fortified Product Development
4. Texture Analysis (Manual Method)
5. Solar/Tray Drying vs. Oven Drying
6. Spectrophotometry Using Colorimeter
7. pH & Acidity Measurement
8. Color Analysis (DIY method)
9. Total Soluble Solids (TSS)
10. Water Activity (Aw) Approximation

Applied Biostatistics

1. Experimental Design Basics – CRD & RBD using sensory data from food samples.
2. Descriptive Statistics – Mean, median, SD calculation using Excel.
3. t-test & ANOVA in Food Data Comparing moisture content of two drying methods.
4. Correlation & Regression – Shelf-life days vs. sensory scores.
5. Chi-square Test – Sensory panel preference data analysis.
6. Graph Making & Data Interpretation

Textbook/References:

1. Ranganna, S. Handbook of Analysis and Quality Control for Fruit and Vegetable Products.
2. Montgomery, D.C. Design and Analysis of Experiments.

Dr. Yashpal

Harsh

Objective: Train students to detect common food toxins using simple tests, developing functional foods and nutraceuticals using locally available resources.

Outcomes: Detect natural toxins, develop functional foods and nutraceutical products.

Food Toxicology

1. Detection of Argemone Oil in Mustard Oil
2. Detection of Aflatoxins in Nuts/Grains
3. Pesticide Residue Screening
4. Detection of Heavy Metals
5. Cyanogenic Glycosides

Functional Foods

1. Preparation of Probiotic products.
2. Preparation of Fortified food.
3. Preparation of Antioxidant
4. Detection of Dietary Fiber Content
5. Shelf-life Study of Functional Food

Nutraceuticals

1. Extraction of Herbal Powders, Preparation of Herbal Capsules/Tablets
2. Detection of Total Phenolic and Total Flavonoids content
3. In-vitro Antioxidant Activity detection

References:

1. Ranganna, S. Handbook of Analysis and Quality Control for Fruit and Vegetable Products (adapted methods).
2. AOAC Official Methods (low-cost adaptations).
3. Arora, S. Food Toxicology.
4. Wildman, R.E.C. Handbook of Nutraceuticals and Functional

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OPTION-2

CC31: Food Crops, Spices & Flavor Technology

Credit-6

Objective: To provide comprehensive knowledge on the processing, quality evaluation, and technologies for cereals, legumes, oilseeds, and sugar crops, while acquainting students with food additives, spices, and flavor components relevant to the processed food industry for shelf-life extension, sensory appeal, and safety.

UNIT-I: Wheat Processing and Bakery Applications

1. **Wheat:** Types, structure, composition, and physicochemical characteristics.
2. **Wheat milling:** Products and by-products; factors affecting quality parameters; physical, chemical, and rheological tests on wheat flour, manufacturing of wheat-based products,
3. **Baking:** Principles of baking and several changes in baked products, formulation of premixes for bakery products, pasta goods, and processed cereal foods for infants.

UNIT-II: Rice Processing

1. **Rice:** Classification, structure, composition, physicochemical characteristics, and quality.
2. **Rice milling technology:** By-products of rice milling and their utilization; rice bran stabilization, oil extraction and refining; parboiling methods, criteria of quality, aging of rice (quality changes), and processed products based on rice.

UNIT-III: Corn, Barley and Oat Processing

1. **Corn:** Types and nutritive value; dry and wet milling; corn products including corn flakes, corn starch, snacks, tortillas, production of glucose syrups, dextrose, high fructose corn syrups, and modified corn starches.
2. **Barley:** Composition, milling, malting, changes during malting, uses of malt and its products.
3. **Oats:** Composition, types, processing of oats, and by-products of oat milling.

UNIT-IV: Legumes and Oilseed Processing

1. **Legumes and Oilseeds:** Composition, anti-nutritional factors, processing, hydrogenation, and storage; processing for production of edible oil, meal, flour, protein concentrates and isolates; development of low-cost protein foods.
2. **Oil extraction process:** mechanism, oil refining, utilization of by-products of oil milling.

UNIT-V: Processing of Sugar Crops

1. **Processing of sugar crops and tubers:** Sugar production and manufacturing
2. **Products of sugars and by-products of sugar manufacturing,** types and grades of sugars (sugar cane, sugar beets, and their differences).

UNIT-VI: Flavor Science

1. **Food flavor basics:** Olfactory perception of flavor and taste, relationship of taste-sweet, bitter, salt, sour; chemicals causing pungency, astringency, cooling effect, and properties.
2. **Flavors generated during processing:** Reaction flavors, flavor composites, stability of flavors during food processing.

UNIT- VII: Flavor Technology

1. **Flavor encapsulation-**need, methods and applications in food industry
2. **Flavor technology:** Types of flavors, classification of flavors (natural, nature identical, and synthetic).
3. Analysis of flavors, extraction techniques of flavors

UNIT- VIII: Spices Processing

1. **Major and minor spices:** Oleoresins and essential oils, method of manufacture, quality control, fumigation, and irradiation of spices.
2. **Techniques for flavor extraction:** Supercritical fluid extraction (continuous and semi-continuous methods), effects of types of solvents used, and its role in food industry.

Text Books and Reference:

1. Chakravarty, M.M. (2003). Chemistry and Technology of Oils and Fats. 1st Edition. Prentice Hall.
2. Dendy, D.A.V., & Braszczok, B.J. (2001). Cereal and Cereal Products. 1st Edition. Aspen.
3. Hamilton, R.J., & Bhati, A. (2000). Fats and Oils: Chemistry and Technology. 1st Edition. Aspen.
4. Hony, R.S. (2010). Principles of Cereal Science and Technology. 3rd Edition. App. Skippable.
5. Kay, D.E. (2017). Food Legumes. 5th Edition Tropical Products Institute.
6. Kent, N.L. (1983). Technology of Cereals. 4th Ed. Pergamon Press.
7. Food Flavors (2014). Morton, I.D. & Macleod, A.J. Part A. BC. Elsevier.
8. George, A.B. (2009). Fenaroli's Handbook of Flavor Ingredients. 6th Edition. CRC Press.
9. Fennema, O.R. (1976). Principles of Food Science Part-I Food Chemistry 5th Edition. Marcel Dekker, New York.
10. Andrew J. Taylor & Robert S.T (2010). Food flavor technology, 2nd Edition. Wiley-Blackwell.

Sugam
Harish

Objective: This course offers in-depth knowledge of processing, preservation, and quality control of dairy, meat, fish, and poultry products, covering composition, technology, legislation, and hygiene practices. Students will learn to apply sanitation measures, evaluate quality, implement storage, packaging, and marketing strategies, and utilize by-products effectively.

UNIT I -Composition, Collection & Processing of Raw Materials

1. Milk composition and characteristics; collection, chilling, transportation, cream separation.
2. Composition and classification of edible fish; average composition of fish; freshness evaluation.
3. Meat composition; carcass components, postmortem changes, glycolysis.

UNIT II -Processing Technologies for Milk & Liquid Products

1. Standardization, pasteurization (LTLT, HTST, UHT), homogenization.
2. Packaging, storage, and distribution of fluid milk.
3. Sanitary design of dairy plant; waste disposal.

UNIT III -Fish Processing & Preservation

1. Handling, storage, and transport of fish.
2. Preservation methods: canning, freezing, drying, salting, smoking, curing.
3. Fish products: fish meal, oil, and by-products.
4. Spoilage of fish and quality assessment.

UNIT IV -Meat Processing & Preservation

1. Slaughtering methods, meat preservation, and packaging. Pre and post-slaughter factors affecting meat quality.
2. PSE and DFD conditions.
3. Chilling, freezing, curing, and smoking of meat.
4. Meat industry in India: importance, application, growth rate.

UNIT V -Poultry Processing & Products

1. Pre-slaughter care, ante mortem examination, slaughtering, Preservation, chilling, freezing, and packaging of poultry meat.
2. Processed poultry products: smoked, canned, barbecued, curried poultry.
3. Tenderness factors and by-product utilization.

UNIT VI - Dairy Technology

1. Fermented milk products: curd, yoghurt, shrikhand.
2. Butter: manufacture, storage, packaging, and defects.
3. Cheese: manufacture of hard, semi-hard, soft, and processed varieties; storage and grading.

UNIT VII -Frozen, Indigenous, Evaporated & Dried Milk Products

1. Frozen milk products: ice cream, sherbets – classification, manufacture, defects.
2. Indigenous products: ghee, khoa, paneer, chhana.
3. Evaporated and dried milk: SMP, WMP, condensed milk – manufacture, storage, defects.

UNIT VIII - Eggs, By-products & Quality Evaluation

1. Egg structure, composition, nutritive value, functional properties.
2. Factors affecting egg quality and its measurement.
3. Industrial use of eggs; collection, grading, cleaning, storage.
4. Dairy by-products: skim milk, buttermilk, whey – utilization.
5. Quality parameters: appearance, texture, viscosity, flavour defects, contamination.

Textbooks & References

1. Robinson, R.K. (1996). Modern Dairy Technology, Vol. 1 & 2, 2nd Ed. Elsevier Applied Science.
2. Herington, B.L. (2009). Milk & Milk Processing. McGraw-Hill.
3. Lampert, L.H. (1998). Modern Dairy Products. Chemical Publishing Co.
4. Fox, P.F. (2016). Developments in Dairy Chemistry, Vol. 1 & 2, 2nd Ed. Springer.
5. De Sukumar. (2024). Outlines of Dairy Technology. Oxford Univ. Press.
6. Pearson, A.M., & Gillett, T.A. (1996). Processed Meats, 3rd Ed. CBS.
7. Toldra, F. (2022). Lawries Meat Science, 9th Ed. Woodhead Publishing.
8. Stadelman, W.J., et al. (1988). Egg and Poultry Meat Processing. Wiley-VCH.
9. Lawrie, R. (1991). Developments in Meat Science, Vol. 5. Applied Science Pub.
10. Stadelman, W.J., & Cotterill, O.J. (1995). Egg Science & Technology, 4th Ed. AVI Publ.
11. Borgstrom, G. (2012). Fish as Food, Vol. 1 & 2, CRC Press.

Syafarval

Harif A

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, Biscuits, Pizza base, Dinner roll, Cookies, Muffins, Nankhatai, Cakes.
13. Preparation of fermented products.
14. Quality evaluation of different biscuit sample—physical and chemical analysis.
15. To determine the foaming capacity of given flour sample.
16. Determination of protein content of flour by Kjeldahl Method
17. Estimation of curcumin in turmeric.
18. Determination of capsaicin in content in chilli.

Textbooks/References:

1. MIIR (2022). Handbook on spices. 6th Edition. National Institute of Industrial Research Board, Asia Pacific Business Press Inc.
2. Peeler EJ. (2000) Bakery Science & Technology. 3rd Edition. Vols. I, II Sosst and Publication.
3. Lorenz KL. Hand Book of cereals Science and Technology. Marcel Dekker.
4. Manual of Methods of Analysis of Cereal and Cereal Products. (2023) 2nd Edition, FSSAI.

Meghna
Nov 2023

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. Fat estimation in milk by Gerber Method.
3. Preparation of curd, lassi, shrikhand, ghee, khoa, chenna and paneer.
4. Determination of total solids in milk, skim milk, butter milk and whey by drying method.
5. Viscosity determination of Milk by Pipette method.
6. Test for fats: Bromothymol blue test.
7. Alcohol test for determining coagulability of milk.
8. Determination of salt content in butter.
9. Casein estimation in milk sample.
10. Preparation of fortified, reconstituted and flavoured milks.
11. Sensory analysis of food products: Paired comparison test, Duo-trio test, Hedonic test, Triangle test, Ranking test, Single sample test, Composite scoring test.

Textbooks/References: -

1. Herrington BL. (1948) Milk and Milk processing, 1st Edition. Mc Craw Hill Book Company.
2. De S. (2001). Outlines of Dairy Technology. 1st Edition. Oxford University Press.
3. Manual of Methods of Analysis of foods- Dairy and Dairy Products. (2022), 2nd Edition FSSAI.

Susanne

Alvin

Seminar

Credits-2

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 given due consideration. The average marking will be taken into consideration.

IV Semester

Research Thesis/ Research Project/ Patent

Credits-22

The research/thesis/patent/project component fosters independent inquiry, critical analysis, and innovative thinking. It enables students to apply scientific methods and technical knowledge to address real-world challenges and contribute original solutions.

Chyannul

Haripal

OPTION-3

III Semester

Research Thesis/ Research Project/ Patent

Credits-22

The research/thesis/patent/project component fosters independent inquiry, critical analysis, and innovative thinking. It enables students to apply scientific methods and technical knowledge to address real-world challenges and contribute original solutions.

IV Semester

Research Thesis/ Research Project/ Patent

Credits-22

The research/thesis/patent/project component fosters independent inquiry, critical analysis, and innovative thinking. It enables students to apply scientific methods and technical knowledge to address real-world challenges and contribute original solutions.

knowledge to address real-world