

University of Lucknow, Lucknow
M.Sc. Food Processing and Food Technology
Semester- I

Course No.	Name of the Course	Credit	Remark
FPTCC-101	Biochemistry and Metabolism	04	Core Course
FPTCC-102	Food Microbiology and Biotechnology	04	Core Course
FPTCC-103	Food Engineering	04	Core Course
FPTCC-104	Food Evaluation	04	Core Course
FPTCC-105	Practical	04	Core Course
FPTVC-101	Instrumentation and Analytical Techniques	04	Value added (Credited)
Semester Total		24	

FPTCC-101: Biochemistry and Metabolism

04 Credit

Course Outcome:

- To provide the optimum knowledge of water, its structure and significance in food processing industries.
- To know the structure and function of biomolecules and their energy metabolism.
- Role of carbohydrates, proteins, fats found in food.
- Types and functional significance of vitamins and minerals found in Food.

Unit I

Water molecule, Hydrogen bonding, Different types of water, Physical properties of water, Water activity and its role in food processing and storage; Industrial and nutritional significance of water. pH and its significance in food technology. Introduction to henderson-hasselbalch equation.

Unit II

Introduction to Biomolecules, Amino Acids: Essential and non-essential Amino Acids Proteins: Introduction to different levels of protein structure, Types of proteins in food materials (milk, egg, meat, cereals and pulses),

Unit III

Carbohydrate: Definition and classification with examples, Significance of carbohydrates in food and food industry, Lipids: Definition and classification with examples, Essential and non-essential fatty acids, Lipids in food and food industry (including plant pigment)

Unit IV

Metabolism of carbohydrates, Glycolysis, TCA cycle, Gluconeogenesis and oxidative phosphorylation, Introduction to vitamins and micronutrients and their role in metabolism.

Unit V

Metabolism of Lipids: β and ω oxidation of fatty acids, cholesterol biosynthesis. Protein Metabolism, Degradation of protein, proteases.

References

1. Lehninger Principle of Biochemistry by David L Nelson and Michael M Cox, W. H. Freeman
2. Biochemistry by U Satyanarayana & U Chakrapani, Elsevier India, 2017.
3. Food Chemistry by Lillian Hoagland Meyer, Tuttle; Modern Asia ed edition, 1961.
4. Principles of Food Chemistry by J. M.deMan, J.Finley, W.J.Hurst, C. Lee, Springer
5. Fundamentals of Biochemistry by J L Jain, Sunjay Jain & Nitin Jain, S Chand 7th edition, 2016.
6. Essential of Food Science by Elizabeth W. Christian and Vickie A. Vaclavik, 3rd Ed. Springer Verlag New York.
7. Food Chemistry by Owen R. Fennema, Taylor & Francis.

Course Outcome:

- To get the knowledge of fundamental microbiology, biotechnology and their application in food industry.
- To gain knowledge of contamination and microbial spoilage various food products and diseases cost by microbes and preventive measures.
- The student will gain understanding of food safety in terms of microbial contamination in food.
- The student will be able to apply microbial aspects involved in different setting of food industry and application of biotech for food production and quality improvement.

Unit I

History and scope of Microbiology, general properties of prokaryotes and eukaryotes, morphology of bacterial cell, size, shape and classification of bacteria, structure function and chemical composition of bacterial cell wall, flagella, pili, capsule,

Unit II

Composition of prokaryotic and eukaryotic cell wall. Mode of sexual and asexual reproduction in bacteria: transformation, conjugation, transduction.

Unit III

Contamination and microbial spoilage of milk, fruits, vegetables, cereals, pulses & oilseeds, egg, meat and fish, Microbial toxins and toxoid, bacterial food-borne poisoning, infection and intoxication, bacterial with examples, general control measures for prevention of food-borne diseases. Mycotoxins, viruses, rickettsiosis.

Unit IV

Introduction of r-DNA technology application. Cloning Vectors: Plasmid, Bacteriophages, Cosmid, M13 and introduction to yeast vectors, introduction to restriction enzymes: Types and mode of action. Blotting techniques, concept of genomic and C-DNA library.

Unit V

Biotechnological application in food processing: genetically modified food- application, GMO Act-2004 and issues in the global practices. Concept of prebiotics and probiotics, symbiotics and bioactive foods.

References

1. Food Microbiology, 5th Edition by William C. Frazier, Dennis C. Westhoff, N.M. Vanitha, McGraw Hill Education Publication
2. Prescott's Microbiology, 10th Edition Joanne Willey, Linda Sherwood, Christopher J. Woolverton McGraw Hill Education Publication,
3. Food Microbiology, Adams MR, Moss MO, and McClure P. Fourth Edition. Royal Society of Chemistry.
4. Food Biotechnology (PB 2020), by Foster G N, CBS Publication
5. Modern Food Microbiology 7th Edition, by James M. Jay, Martin J. Loessner, David A. Golden. Springer
6. Fundamentals of Food Biotechnology by Lee BH, Wiley-Blackwell Publication
7. Industrial Biotechnology by K Watson, CBS Publication,
8. Quality Control for Value Addition in Food Processing. Raj D, Sharma R, and Joshi VK.. New India Publishing Agency.
9. Microbiology M Pelczar Jr, FCS Chan, Noel R Krieg McGraw Hill Education
10. Biotechnology: Expanding Horizons B.D. Singh, Kalyani Publications Edition 2015.

Course Outcome:

- To gain knowledge of different equipments in food industry along with their working principle.
- To know about material and energy balance, modes of heat transfer and rheology of fluid.
- The students will be able to understanding about unit operation in food processing, heat and mass transfer.
- To gain the knowledge about size reduction and separation techniques.

Unit I

Basic principle of food process engineering. Dimension and units. Material and energy balance: basic principles, material balances, energy balances. Fluid flow theory and applications: fluid statics, fluid dynamics. viscosity, streamline and turbulent flow, energy losses in flow. Measurement of fluid pressure and flow rate. Pumps and fans.

Unit II

Heat transfer: Theory of heat transfer; modes of heat transfer: Heat conduction, surface heat transfer, unsteady-state heat transfer. Radiation heat transfer. Convection heat transfer. Overall heat transfer coefficients. Heat transfer from condensing vapours. Heat transfer to boiling liquids. Heat transfer equipments in food industries.

Unit III

Drying: Basic drying theory. Drying curve, Psychrometry, Equilibrium moisture content, Drying method. Drying equipments. Evaporation: Single effect evaporators, Multiple effect evaporators. Vapour recompression. Boiling point elevation. Evaporation of heat sensitive materials. Evaporation equipments.

Unit IV

Theory of freezing, freezing curve, crystal growth, freezing time calculation, types of food freezers. Sterilization process engineering, D value, Z value, F value and F_0 value.

Unit V

Heat penetration characteristics and calculation of process time. Size reduction: Grinding and Cutting, Emulsification. Mixing: Characteristics of mixture, Measurement of mixing, Particle mixing, Liquid mixing, Mixing equipments. Mechanical Separation: Sedimentation, Centrifugal Separations, Filtration, Sieving.

References

1. Introduction to Food Engineering, by R. Paul Singh, Dennis R. Heldman" Academic Press
2. Concept of Food Process Engineering by Sanjana K Das, Nihar Ranjan Sahoo, Kalyani Publishers
3. Fundamental of Food Engineering Subir K Chakarwarty, Alpha Science International Ltd,
4. Fundamental of Food Engineering (Fourth Edition) by Stanely E Charam, MEDTECP Publisher
5. Unit Operation in Food Processing (IIInd edition) by R L Erale, Pergamon Press
6. Food Process Engineering and Technology, Zeki Berk, Academic Press
7. Conceptual Fluid dynamics in food processing by Da-wen sun, CRC Press
8. Fundamentals of food process engineering 2nd Ed. (pb 2000) by Toledo R.T. CBS Press

Course Outcome:

- To get knowledge of proximate analysis of Food.
- To understand basics sensory attributes.
- To understand the objective and subjective method of sensory evaluation and their application in industry.
- Understanding adulteration detection in different Foods.

Unit I

Proximate constituent of food and their analysis: Moisture, crude fibre, crude aft, ash value, pH and acidity, total solid content, crude protein and minerals.

Unit II

Methods of analysis of oils-moisture, insoluble impurities, acid value and free fatty acids, refractive index, specific gravity, iodine value, saponification value, unsaponifiable matter, color of oils. Tests for vegetable fat- melting point, peroxide value.

Unit III

Sensory evaluation: Evaluation of sensory qualities, laboratory set up, panel selection and training.

Unit IV

Test methods- Difference test, paired comparison, duo-trio test, triangle test. Rating test-ranking test, single sample test, two sample difference test, multiple sample difference test, hedonic rating test, numerical scoring test, composite scoring test, sensitivity threshold test, dilution test.

Unit V

Introduction to food adulterants, Tests for adulterants in tea, coffee, milk, honey, sugar, icing sugar, jaggery, soft drinks, semolina, supari, sago, pulses and cereals, saffron, spices, oils and fats.

References

1. Food Analysis, S. Suzanne Nielseon Editon: II to V, Springer
2. Food Science, B. Srilakshmi Editon: VII, New age International.
3. Sensory Evaluation of Food Principal and Practices II edition, Springer, Harry T. Lawless, Hildegared Heymann Food Science Text Series
4. Sensory Evaluation of Food: Statistical Methods and Procedure, Michel O'Mahony, Routledge Press
5. Food adulteration and its detection Jesse Park Battershall, Book on Demand Ltd.
6. Detect Adulteration with Rapid Test (DART) booklet FSSAI

FPTCC-105: Practical I**04 Credit**

1. Microscopic examination of molds
2. Microbial examination of bacteria
3. Gram staining
4. Standard plate count
5. Estimation of Reducing and non-reducing sugars
6. Estimation of ascorbic acid in the given food sample.
7. Estimation of Free Fatty Acids in Fats and Oils
8. Estimation of proteins
9. Estimation of moisture
10. Estimation of casein in milk
11. Estimation of crude fat
12. Estimation of Saponification Value of Fats and Oils
13. Estimation of Peroxide Value of Fats and oils
14. Estimation of Iodine Value of Fats and Oils
15. Estimation of moisture
16. Detection of total carbohydrate
17. Detection of crude fibre

18. Detection of minerals
19. Estimation of total soluble solids in different food items
20. Estimation of acidity
21. Identification of pigments by Paper Chromatography
22. Adulteration test in different food samples viz.- milk, fats, oils and redimade food products
23. Texture analysis of food materials
24. Gel electrophoresis for DNA/Protein

FPTVC-101: Instrumentation and Analytical Techniques

04 Credit

Course Outcome:

- Students will be able to know about principle and application of various equipments used in food processing and technology.
- They will get knowledge about testing equipments for toxic properties of food adulteration testing as well as toxicants testing.

Unit I

Spectroscopy: principle and applications of single beam, double beam spectrophotometers Introduction to Nuclear Magnetic Resonance. Atomic absorption spectroscopy and mass spectroscopy and their uses in food industry. Introduction to Inductively coupled plasma mass spectrometry.

Unit II

Microscopy: principle and application, Introduction to light, electron and phase contrast microscopes. Introduction to Enzyme linked immunosorbent assay In vitro models for food testing. Principle and application thermocycler.

Unit III

Principle and application of Electrophoresis (protein and DNA). Principle and application sonication. Principle and application Laminar air flow, Autoclave, Bioreactor.

Unit IV

Chromatography: Paper chromatography, Thin layer chromatography, Gas Chromatography, High Performance Liquid chromatography, Gel filtration chromatography, Affinity chromatography, Ion-exchange chromatography. Use of chromatography in food industry.

Unit V

Introduction to rheological and textural properties of food. Introduction to analysis of texture in cereals, meat, fruits & vegetables and dairy products using the instruments alveograph, viscoamylograph, falling number, mixolab, compressimeter, penetrometer.

References

1. Food Analysis: Theory and Practice by Yeshajahu Pomeranz, Clifton E. Meloan.
2. Food Analysis, S. Suzanne Nielseon Editon: II to V
3. Principles and Techniques of Biochemistry and Molecular Biology by Wilson and Walker
4. Analytical and Instrumental Techniques In Agriculture, Environmental and Food Engineering by A. Nag
5. Biological Instrumentation & Methodology by Bajpai P.K.