

TEACHING-LEARNING PLAN

Programme: B.Tech. Food Processing & Technology **Academic Session:** 2023-2024

Semester: II

Batch: 2023-2027

Course Code: FT-111

Credits (L-T-P): 2 (2-0-0)

Course Name : **Introduction to Food Technology**

Faculty Name : Dr. Shivani Rustagi (SR)

Course Objective : This course aims to introduce students to the area food science and technology and the significance of food processing. It will enable the students to understand the functions of different nutrients, basic concepts of digestion and absorption and deficiency diseases.

Course Outcome : Students will gain knowledge in various aspects of food science and technology, different components of food and their utilization. Student will also acquire basic knowledge of microbes associated with food, their importance and characterization.

Assessment/Evaluation : Mid-Sem: 25 marks (1hr. 30 mins.), End-Sem: 60 marks (3:00 hrs. duration), Internal Assessment-15 marks, Total: 100 marks.

Teaching Schedule:

Sr. No.	Topic	Classes required (No.)	Faculty
1.	Introduction to food, food science, food technology and different terminology related; Objectives and application of food science and technology.	3	SR
2.	Status of food processing industry in India and abroad; growth of food industry, market scenario and potential and future.	2	SR
3.	Human health and nutrition, Recommended Dietary Allowances, nutrients and factors affecting their bioavailability.	3	SR
4.	Desirable and potentially undesirable food constituents and their importance.	2	SR
5.	Status of malnutrition in India and abroad: common nutritional deficiencies such as PEM, iron, vitamin A and D, iodine, calcium, zinc etc.; emerging common degenerated disorders.	3	SR
6.	Living cells, organization of living system, plant and animal diversity.	2	SR
7.	Digestion and absorption of biomolecules.	3	SR
8.	Characterization, classification and identification of microorganisms; morphology and structure.	2	SR
9.	Microscopy	2	SR
10.	Reproduction growth and cultivation	2	SR
11.	Pure culture and its characteristics	2	SR

12.	Control of microorganisms; beneficial uses of microbes in foods.	2	SR
13.	General principles of food hygiene	2	SR

Suggested Readings:

1. Potter, N.H. (1998). Food science. New Delhi: CBS Publication.
2. Manay, N.S. and Shadak sharaswamy, M. (1987) Food- facts and principles. New Delhi: New Age International (P) Ltd. Publishers.
3. Frazier, William C. and Westhoff, Dennis C. (2004). Food microbiology. New Delhi: TMH.
4. Garbutt, John. (1997). Essentials of food microbiology. London: Arnold.
5. Pelczar, M.J., Chan E.C.S and Krieg, Noel. R. (1993) Microbiology, 5th Ed. New Delhi: TMH.
6. Longvah, T., Ananthan, R., Bhaskarachary, K. and Venkaiah, K. (2017). Indian food composition tables. Hyderabad: National Institute of Nutrition, Indian Council of Medical Research, Department of Health Research, Ministry of Health and Family Welfare, Government of India.
7. Platt, G.C. (2011). Food science and technology. John Wiley & Sons.
8. Nelson, David L. (David Lee). 1942-. (2005). Lehninger principles of biochemistry. New York: W.H. Freeman.

TEACHING –LEARNING PLAN

Programme: B.Tech. Food Processing and Technology	Academic Session: 2023-2024
Semester: IV	Batch: 2022-2026
Course Code: FT-204	Credits (L-T-P): 3 (3-0-0)
Course Name	: Unit Operations in Food Processing
Faculty Name	: Dr. Ruchi Verma (RV)/Ms. Reshma Saroj (RS)
Course Objective	: To expose students to the fundamental knowledge of different unit operations used in food industry like size reduction, evaporation, drying, fluid flow and food freezing.
Course Outcome	: The learners would understand the principles of separation methods and the different equipment developed for separation.
Assessment/Evaluation	: Mid-Sem: 25 marks (1hr. 30 mins.), End-Sem: 60 marks (3:00 hrs. duration), Internal Assessment-15 marks, Total: 100 marks.

Teaching Schedule:

Sr. No.	Topic	Classes Required (No.)	Faculty
1.	Review of Basic engineering mathematics: units and dimensions; mass and energy balance.	4	RV
2.	Principles of Fluid Flow-Introduction to stress-strain behavior in materials; Newtonian and Dilatant fluids.	4	RV
3.	Properties of fluid viscosity: capillary tube viscometer; power law equations for Pseudoplastic; flow in pipes-friction; laminar and turbulent flow equations; considerations in pumping fluids.	4	RV
4.	Introduction to Unit operation: Cleaning, grading and sorting, mixing, kneading, blending, Homogenization.	4	RS
5.	Sedimentation, Extraction, Leaching, Agitation, Unit Operation involved in the development of various food products.	4	RS
6.	Food Freezing: Properties of frozen foods, freezing point depression, and general introduction to enthalpy change during freezing, Plank's equation for predicting freezing time.	4	RS
7.	Evaporation: Thermodynamics of evaporation; boiling point of elevation; heat during evaporation; heat transfer coefficients, design of evaporation system; retention time; single effect and multiple effect system; thermo-compression system.	5	RS
8.	Size Reduction-Principles: types of equipment's, applications and energy laws, screening of solids, size measurements and analysis, standard sieves.	4	RV
9.	Separation Process: Membrane separation process, mixing: objectives, Equipment's for solid, liquid mixing, energy requirements, mixing indices.	4	RV

10.	Food dehydration: Basic principles of dehydration, Constant rate and falling film rate periods of dehydration; equilibrium moisture content.	4	RV
11.	Fixed bed dehydration; drum dehydration, fluidized bed drying; Spray drying of liquid foods, different types of dryers and their applications in food processing sector.	4	RV

Suggested Readings:

1. Fellows, P., Food Processing Technology, Director, Midway Technology and Visiting Fellow in Food Technology at Oxford Brookes University, Second Edition.
2. Gavhane, K.A (2015). Unit operation-1 (fluid flow and mechanical operations) published by Nirali Prakashan
3. Sahay, K.M and Singh, K.K (2009). Unit operation of Agricultural Process. Second Revised and Enlarged Edition. Published by Vikas publishing house Pvt. LTD.
4. Wilson, D.I. (2017). Flow: Rheology, Fluid Flow: chapter in Eye advance online publication.
5. Cossa, K.N (2019). Basic concepts on rheology and application of shear-thickening fluids in protective gear: Research Article. SN Applied Sciences. 1:1284.
6. Shakuntala Manay (2008). N. Foods Facts and Principles. NEW AGE Publisher ISBN-13: 978-8122422153.
7. Srivastava, R.P and Kumar, S (2002). Fruit and vegetable preservation principles and practices. Revised and enlarged third edition. Published by CBS distributors Pvt Ltd.

TEACHING –LEARNING PLAN

Programme: B.Tech. Food Processing and Technology **Academic Session:** 2023-2024

Semester: IV

Batch: 2022-2026

Course Code: FT-202

Credits (L-T-P): 3 (3-0-0)

Course Name : **Food Chemistry and Nutrition**

Faculty Name : Dr. Vinita Sharma (VS)

Course Objective : The course is targeted to develop the knowledge of students in food chemistry at fundamental level. This is necessary for effective understanding of various aspects of food processing and technology.

Course Outcome : On completion of the course, the students will be well-versed with the significance of food biomolecules and their functional role.

Assessment/Evaluation : Mid-Sem: 25 marks (1hr. 30 mins.), End-Sem: 60 marks (3:00 hrs. duration), Internal Assessment-15 marks, Total: 100 marks.

Teaching Schedule:

Sr. No.	Topic	Classes required (No.)	Faculty
1.	Introduction about course structure and understanding the course content	2	VS
2.	Water in Foods: Structure, Properties, Interactions, Water activity and sorption isotherm, molecular mobility and food stability.	3	VS
3.	Carbohydrates: Classification, Functions, Reactions and properties of simple and complex carbohydrate.	3	VS
4.	Selection of Natural or Modified carbohydrates for incorporation into processed food.	3	VS
5.	Lipids: Classification, Consistency of commercial fat, Lipolysis, Auto oxidation, Thermal decomposition and effect of ionizing radiation.	3	VS
6.	Refining of oils, Modification of oils and fats, Role of food lipids in flavor, Nutritional and safety aspects of natural and modified fats.	5	VS
7.	Proteins: Classification, nutritional and functional properties of food proteins, Nutritive value and its Determination.	4	VS
8.	Chemical reactions and interactions of amino acids and proteins, Denaturation and its implications,	3	VS
9.	Functional properties of food proteins, Modification of food proteins in Processing, storage, and its implications.	4	VS
10.	Vitamins, Minerals and Pigments: Sources, Functions, Deficiency diseases, Chemistry and stability of water and fat-soluble vitamins during processing	3	VS

11.	Chemical properties of minerals and their bioavailability, Enrichment and fortification.	4	VS
12.	Natural pigments in foods and their retention in processed foods	3	VS
13.	Food Nutrition: Concepts of nutrition, Basal metabolism- BMR, Body surface area and factors affecting BMR. BV, NPU, BMR, PER calculations, Classification of balanced diet, Malnutrition, Type of Malnutrition, Causes and preventions of malnutrition.	5	VS

Suggested Readings:

1. Manay, S. (2008). Foods Facts and Principles, NEW AGE Publisher ISBN-13: 978-8122422153
2. Rahman, M.S (2007). Handbook of food preservation, CRC Press, 2nd Edition. ISBN-13: 978-1-57444-606-7
3. Fennema, O.R. (1996). Food Chemistry. Marcel Dekker, Inc., New York. ISBN 0-8247-9346-3
4. Bertolini. A.C. (2010) Handbook of Starches Characterization, Properties, and Applications, CRC Press, International Standard Book Number: 978-1-4200-8023-0
5. Srilakshmi, B. (2017). Nutrition Science, New Age International Publishers; Sixth Edition, ISBN-13: 978-9386418883

TEACHING-LEARNING PLAN

Programme: B.Tech. Food Processing and Technology **Academic Session:** 2023-2024

Semester: IV

Batch: 2022-2026

Course Code: FT-206

Credits (L-T-P): 3 (3-0-0)

Course Name : **Food Process Engineering**

Faculty : Dr. Nitin Sonkar (NS)

Course Objectives : To understand the basic concepts of material and energy balance, fluid dynamics, thermal process and calculations involved.

Course Outcome : After the completion of the course, the students will understand the various basic aspects of food engineering and grasp the knowledge about the fluid flow of foods.

Assessment/Evaluation : Mid-Sem: 25 marks (1 hr. 30 mins.), End-Sem: 60 marks (3:00 hrs. duration), Internal Assessment-15 marks, Total: 100 marks

Teaching Schedule:

Sr. No.	Topic	Classes required	Faculty
1.	Motivation for the course and understanding the course contents.	1	NS
2.	Introduction to food process engineering.	1	NS
3.	Material balance for two component system, equation for operating lines and feed line. Numerical problems on material and energy balance related to food processing.	3	NS
4.	Kinetics of biological reactions - kinetics of reactions occurring in processed foods, reaction velocity constant, order of reaction.	3	NS
5.	Quality changes during storage of foods; application of Arrhenius equation to biological reactions.	3	NS
6.	Evaporation: Boiling point elevation, Duhring rule.	3	NS
7.	Basic principles of evaporators; capacity and economy of evaporator.	2	NS
8.	Multiple effect evaporator: operation and various feeding systems.	2	NS
9.	Calculation of heat transfer area in single and multiple effect evaporators.	1	NS
10.	Thermal vapor recompression and Mechanical vapor recompression system to improve evaporator economy; numerical problems.	3	NS
11.	Principles of thermodynamics and heat transfer applied to food engineering.	2	NS
12.	Fundamentals of heat and analogy to mass transfer in food processing.	2	NS
13.	Modes of heat transfer and overall heat transfer coefficient; thermal properties of foods: specific heat, thermal conductivity.	3	NS

14.	Fourier's law, steady state and unsteady state conduction; energy balances; rate of heat transfer; thermal boundary layer.	2	NS
15.	Natural and forced convections heat transfer; heat transfer to flat plate and in non-Newtonian fluids; heat transfer in turbulent flow; heating and cooling of fluids in forced convection outside tubes.	4	NS
16.	Principle of filtration, types of filtration equipment.	1	NS
17.	Settling classifiers, flotation and centrifugation, types of centrifuges.	2	NS
18.	Freezing and Crystallization: Basic concepts, theories of crystallization; Depression in freezing point.	2	NS
19.	Planks equation and other modified equations for prediction of freezing time.	2	NS
20.	Freezing time calculations for a product having uniform temperature (negligible internal resistance), different types of freezers and crystallizers.	3	NS

Suggested Readings:

1. Food Engineering Operation – Brennan, Butters, Cowell and Lilly.
2. Food Process Engineering – Heldman, D. R. and Singh, R. P.
3. Fundamental of Food Process Engineering – Romeo T. Toledo
4. Unit Operation of Chemical Engineering – Mc Cabe, Smith and Harriot
5. Mass Transfer Operation – Treybal, R. E.
6. Chemical Engineering (Vol. I and II) – Coulson, J. M. and Richardson, J. F.
7. Unit operations in food processing – R. L. Earle and M.D. Earle

TEACHING –LEARNING PLAN

Programme: B.Tech. Food Processing and Technology **Academic Session:** 2023-2024

Semester: IV

Batch: 2022-2026

Course Code: FT-252

Credits (L-T-P): 2 (0-0-2)

Course Name : **Food Chemistry Lab**

Faculty Name : Dr. Nitin Sonkar

Course Objective : To distinguish how individual food components contribute to the overall quality of food, understand the important chemical/biochemical reactions amongst various food components and how they influence food quality.

Course Outcome : Students will understand the chemistry and reactions of various foods and their components. It will help students to scientifically infer the food chemistry experiments.

Assessment/Evaluation : Lab record-20 marks, Viva-20 marks, End-Sem: 60 marks, Total-100 marks.

Laboratory Schedule:

Sr. No.	List of Experiments
1.	To determine the moisture content of food sample
2.	To determine the ash content by AOAC methods
3.	To estimate the crude fat by Soxhlet extraction method in food
4.	Determination of acid insoluble ash in given sample
5.	To estimate the amylose content in the given starch sample
6.	To determine the water/oil absorption capacity of flour/ starch sample
7.	To determine Iodine value of given oil/fat sample
8.	To estimate the DPPH content in given food sample
9.	To estimate protein content by Lowry method of a given food sample
10.	To estimate calorific value by Bomb calorimeter of a given food sample
11.	To estimate phytic acid content of given food sample

Suggested Readings:

1. Rangana, S. (2002). Handbook of Analyzer and Quality Control for Fruit and Vegetable Products. 2nd Ed. Tata Megraw Hill pub. Co. Ltd. New Delhi.
2. AOAC, (2012). Official methods and quality control for fruit and vegetable products. Tata Mc Graw Publishing company Limited, New Delhi.

TEACHING –LEARNING PLAN

Programme: B.Tech. Food Processing and Technology	Academic Session: 2023-2024
Semester: VI	Batch: 2021-2025
Course Code: FT-304	Credits (L-T-P): 3 (3-0-0)
Course Name	: Food Texture and Rheology
Faculty	: Dr. Ruchi Verma (RV)
Course Objective	: To understand the concepts of food texture, rheology and methods of measurement.
Course Outcome	: Students will understand the importance of quality control, food packaging and learn the strategies to extend the shelf-life of fluid and solid food material.
Assessment/Evaluation	: Mid-Sem: 25 marks (1 hr. 30 min.), End-Sem: 60 marks (3:00 hrs. duration), Internal Assessment-15 marks, Total Marks:100 marks.

Teaching Schedule:

Sr. No.	Topic	Classes Required (No.)	Faculty
1.	Introduction to food rheology: Concept of rheology and rheological model of fluid and solid particle.	3	RV
2.	Classification of rheology: elastic, plastic and viscous behavior, viscoelasticity.	3	RV
3.	Rheological models and its constitutive equations.	3	RV
4.	Aerodynamic and hydrodynamic: characteristics and their classifications.	2	RV
5.	Rheology of chocolate: Basic concept of Newtonian and Non- Newtonian fluids.	3	RV
6.	Casson fluid equation with numerical.	3	RV
7.	Chocolate application, Factors affecting chocolate manufacturing step by step.	3	RV
8.	Food Texture: Introduction and basic concept of food texture, Principles of determining food texture.	2	RV
9.	Texture measurement instrument, Texture of food: compression, snapping-bending, cutting shear, puncture, penetration, texture profile analysis.	3	RV
10.	Rheological properties of flour: dough testing instruments-farinograph and mixograph, extensograph and alveograph, amylograph.	3	RV
11.	Texture properties: Textural attributes of fruits and vegetables.	2	RV
12.	Textural attributes of pasta and baked products.	3	RV
13.	Textural properties of meat and their instrumental measurement used in food industry.	3	RV

14.	Methods of evaluation texture: calculation by subjective and objective measurements methods.	3	RV
15.	Food Emulsions: Introduction and Basic concept of emulsion.	3	RV
16.	Textural characteristics of food emulsion, Functions of emulsifier in relation to food texture.	3	RV

Suggested Readings:

1. Food Texture and Viscosity: Concept and Measurement by Malcolm C. Bourne. (2002). Publisher: Elsevier Science & Technology Books. ISBN: 0121190625.
2. Day, L., Golding, M. (2016). Reference Module in Food Sciences in Food Structure, Rheology, and Texture.
3. Cossa, K.N (2019). Basic concepts on rheology and application of shear-thickening fluids in protective gear: Research Article. SN Applied Sciences. 1:1284
4. Hulya Dogan and Jozef L. Kokini (2006). Handbook of Food Engineering. Published by Taylor and Francis Group, LLC
5. Shafi, F., Reshi, M., Aiman and Bashir, I (2018). Chocolate Processing. IJABR, 8 (3):408-419.
6. Apshara, S.E and Hubballi, N.B (2013). Cocoa to chocolate. Training Manual Published by CPCRI, Regional Station, Vittal, Karnataka.
7. Judith A. Abbott (2004). Quality of Fresh and Processed Foods. Edited by Shahidi et al. Kluwer Academic/Plenum Publishers.
8. Alessandra Marti, Maria Ambrogina Pagani, Koushik Seetharaman. (2014). Textural attributes of wheat and gluten free pasta (Chapter 9). Edited by Yadunandan Lal Dar, Joseph M. Light.
9. Kassama, L.S., Ngad, M.O & Raghavan, GSV (2003) Structural and Instrumental Textural Properties of Meat Patties Containing Soy Protein, International Journal of Food Properties, 6(3): 519-529
10. Shakuntala Manay (2008). N. Foods Facts and Principles. NEW AGE Publisher ISBN-13: 978-8122422153

TEACHING –LEARNING PLAN

Programme: B.Tech. Food Processing & Technology	Academic Session: 2023-2024
Semester: VI	Batch: 2023-2025
Course Code: FT- 306	Credit (L-T-P): 3 (3-0-0)
Course Name	: Plantation Products and Spices Technology
Faculty	: Ms. Reshma Saroj (RS)
Course objectives	: To gain knowledge about the different spices and plantation products and the procedures involved in their processing.
Course outcome	: Students will understand the processing steps involved for different spices and plantation products.
Assessment/Evaluation	: Mid-Sem: 25 marks (1 hr. 30 mins.), End-Sem: 60 marks (3:00 hrs. duration), Internal Assessment-15 marks, Total- 100 marks.

Teaching Schedule:

Sr. No.	Topic	Classes Required (No.)	Faculty
1.	Introduction to plantation products and spices technology	2	RS
2.	Production, processing of coffee cherries by wet and dry methods to obtain coffee beans.	4	RS
3.	Manufacturing steps: Grinding, storage and preparation of brew, soluble/instant coffee.	4	RS
4.	Use of chicory in coffee, decaffeinated coffee and quality grading of coffee.	4	RS
5.	Tea: Occurrences, chemistry of constitutes, types of tea- green tea, oolong tea etc.	4	RS
6.	Manufacturing process of green tea, instant tea, oolong tea and grading of tea.	3	RS
7.	Production, processing and chemical composition of cocoa beans.	3	RS
8.	Cocoa Processes: Cleaning, roasting, alkalization, cracking and fanning, Nib grinding for cocoa liquor, cocoa butter and cocoa powder.	4	RS
9.	Manufacturing steps of chocolate: Ingredient, mixing, refining, conching, tempering and moulding.	4	RS
10.	Major Spices: Method of manufacturing of Pepper, cardamom, ginger and turmeric.	4	RS
11.	Chemistry of the volatiles, Enzymatic synthesis of flavor identical and quality control.	4	RS
12.	Minor species: Cumin, coriander, Cinnamon, Fenugreek, garlic, clove, vanilla, Oleoresin and essential oils, Present trends in synthesis of volatiles.	5	RS

Suggested Readings:

1. B Srilakshmi. Food science, seventh edition.
2. Manikantan, M.R., Muralidharan, K., Shameena Beegum, P.P., and Pandiselvam, R.
3. Handbook of spices and plant crops processing, organized by ICAR- Central plantation crop.
4. Research institute kasaragod, Kerala, India.
5. Srinivasa Reddy, I.V. Production technology of spices, aromatic, medicinal and plantation crops.
6. Taylor and Francis. Chemistry and Technology.
7. Poornima and R. Preetha (2017). Biosynthesis of Food flavor and Fragrances: A Review.
8. Asian journal of chemistry. 29(11): 2345-2352.

TEACHING-LEARNING PLAN

Programme: B.Tech. Food Processing and Technology	Academic Session: 2023-2024
Semester: VI	Batch: 2021-2025
Course Code: FT-310	Credits (L-T-P): 3 (3-0-0)
Course Name	: Technology of Fats and Oils
Faculty Name	: Ms. Rachna Mishra (RM)
Course Objective	: This course will provide detailed information on the basic chemistry of fatty acids, sources of oils and fats, processing, handling, packaging and storage.
Course Outcome	: Students will understand the chemistry of oils and fat, physico-chemical properties of fatty acids, extraction processes and industrial application of fats and oils.
Assessment/Evaluation	: Mid-Sem:25 marks (1hr. 30 mins.), End-Sem:60 marks (3:00 hrs. duration), Internal Assessment-15 marks, Total:100 marks.

Teaching Schedule:

Sr. No.	Topic	Class required (No.)	Faculty
1.	Introduction: Status of fats and oils processing sector, Issue and challenges facing edible oils and fats producing industry.	1	RM
2.	Sources & Nutritional value: Sources and availability of edible oils and fats- plant & animal; nutritional value and health benefits.	2	RM
3.	Classification, composition & function of lipids: Fatty acids-saturated, unsaturated (MUFA, PUFA) and branched; cis and trans, essential fatty acids.	3	RM
4.	Edible Oils: Chemical nature, Physico-chemical properties; Polymerization, Crystallization and melting, Polymorphism, Hydrolysis, Hydrogenation, Saponification, oxidation and polymerization.	4	RM
5.	Processing of Oil and Fats: Pre-treatments of oilseeds - cleaning, dehulling, heat treatment, flaking, milling, etc.; enzymatic pre-treatments.	2	RM
6.	Oil extraction methods: Mechanical expression - Hot and cold; <i>Ghani</i> , Rotary, Hydraulic & screw presses. Expellers - batch & continuous, Filter press	2	RM
7.	Solvent Extraction of Edible Oils: Principles and mechanism, solvent types & properties, factors affecting solvent extraction process, batch & continuous process	3	RM
8.	Solvent extraction process of rice bran, soybean and sunflower oil, extraction process for groundnut and cotton seed	3	RM
9.	Production of special oils: palm oil, virgin coconut oil	3	RM

10.	Refining of Oils: Objectives and principles; Refining - filtration, degumming, neutralization, bleaching, deodorization and physical refining.	3	RM
11.	Modifications of Oils and Fats: Hydrogenation, interesterification, fractionation, winterization, plasticization.	3	RM
12.	Animal and Dairy Fats: Production process of Vanaspati, <i>Ghee</i> , Margarine, production of special fats: butter: types, production and storage.	3	RM
13.	Packaging of oils: Packaging - material characteristics and technology; packaging for Vanaspati and <i>ghee</i>	3	RM
14.	Storage: Handling & storage requirements, changes during storage of oil	2	RM
15.	Quality Standards: Quality and safety attributes & measurement techniques; FSSAI regulations,	2	RM
16.	Nutritional enrichment of oil: Oil blending and fortification	1	RM
17.	Non edible oils: Castor oil, linseed oil, vegetable waxes: production and processing.	3	RM
18.	Industrial applications of fats and oils: manufacture of soap, candle, paints and varnishes.	2	RM

Suggested Readings:

1. Damodaran, S., Parkin, K. L., and Fennema, O. R. (Eds.). (2007). Fennema's food chemistry. CRC press.
2. Gunstone F.D. (2008) "Oils and Fats in Food Industry", Blackwell Publishing, United Kingdom, ISBN – 13: 9781405171212.
3. Gunstone, F. D. (2011). Vegetable oils in food technology: composition, properties and uses. John Wiley & Sons.
4. Lawson, H. W. (1995). Food oils and fats: technology, utilization and nutrition. Springer Science & Business Media.
5. Obrien, R. D. (2008). Fats and oils: formulating and processing for applications. CRC press.
6. Talbot, G. (Ed.). (2015). Specialty oils and fats in food and nutrition: properties, processing and applications. Woodhead publishing.

TEACHING-LEARNING PLAN

Programme: B. Tech. Food Processing and Technology **Academic Session:** 2023-2024

Semester: VI

Batch: 2021-2025

Course Code: FT-312

Credits (L-T-P): 3 (3-0-0)

Course Name : **Food Processing Waste Management**

Faculty : Dr. Shivani Rustagi

Course Objectives : To impart knowledge related to wastewater treatment systems, processing of by-products of food industry, their effects on the quality of environment, and measures to minimize the production of wastes and food.

Course Outcome : Students will gain knowledge on basic and applied aspects treatment of waste from food processing industry.

Assessment/Evaluation : Mid-Sem: 25 marks (1 hr. 30 mins.), End-Sem: 60 marks (3:00 hrs. duration), Internal Assessment-15 marks, Total: 100 marks

Teaching Schedule:

Sr. No.	Topic	Classes required	Faculty
1.	Motivation for the course and understanding the course contents	1	SR
2.	Food Industry Wastes and Environmental Pollution: Characterization of food industry effluents, Physical and chemical parameters.	3	SR
3.	Oxygen demands and their interrelationships, Residues (solids), fats, oils and grease; Forms of nitrogen, sulphur and phosphorus, anions and cations, surfactants, colour, odor, taste and toxicity.	4	SR
4.	Unit concept of treatment of food industry effluents, screening, sedimentation / floatation as pre-and primary reactants.	3	SR
5.	Food Industry By-products and their Utilization: Characterization and utilization of by-products from cereals, pulses, oilseeds, fruits, vegetables, plantation crops, fermented foods, milk, fish, meat, egg and poultry processing industries.	4	SR
6.	Case study: Advanced technologies for effluent treatment in food industry in India: Dairy Industry, Fruits & Vegetables processing Industry & Meat Processing Industry.	4	SR
7.	Biological Oxidation: Objectives, Organisms involved, Reactions, Oxidation ditch.	3	SR
8.	Oxygen requirements, Aeration device systems: Lagoon, Activated sludge process.	3	SR
9.	Rotating biological contactor-variations and advanced modifications.	3	SR

10.	Waste Water Management: Wastewater treatment systems.	3	SR
11.	Physical separations, Micro-strainers, Filters, Ultra filtration and reverse osmosis.	3	SR
12.	Physico-chemical separations activated carbon adsorption, ion-exchange, electro dialysis and magnetic separation.	3	SR
13.	Chemical oxidation and treatment-coagulation and flocculation.	2	SR
14.	Disinfection: Handling disposal of sludge.	2	SR
15.	Standards and Acts: Food industry wastes, Food waste treatment-ISO 14001 standards.	1	SR
16.	Standards for emission or discharge of environmental pollutants from food processing industries according to Environment (Protection) Act 1986.	1	SR
17.	Elements of importance in the efficient management of food processing wastes.	2	SR

Suggested Readings:

1. Lawrence K. W., Howard, H. Y. and Yapijakis, C. (2005). Waste Treatment in the Food Processing Industry, CRC Press, New York.
2. Loannis, P and Arvanitoyannis, S. (2008). Waste Management for the Food Industries, Elsevier Publishers, New York.
3. Rao, M.N and Datta, A.K (2008). Waste Water Treatment, Oxford and IBH Publishing Co Pvt. Ltd, New Delhi.
4. Metcalf, P. and Eddy, L. (2013). Wastewater Engineering Treatment and Resource Recovery, 5th Edition, McGraw Hill Publication, New York.
5. Wang, C. and Taylor, Lo H. (2006). Waste Treatment in the Food Processing Industry, CRC Press, New York.

TEACHING-LEARNING PLAN

Programme: B. Tech. Food Processing and Technology **Academic Session:** 2022-2023

Semester: VI

Batch: 2021-2025

Course Code: FT-302

Credits (L-T-P): 3 (3-0-0)

Course Name : **Technology of Cereals, Pulses and Oilseeds**

Faculty : Dr. Vinita Sharma (VS)

Course Objectives : The course aims to develop the knowledge of students in the area of cereals, pulses and oilseeds processing. This is necessary for effective understanding of specific aspects of processing related to these foods.

Course Outcome : Student will acquire knowledge of technologies used for processing of cereals, pulses and oilseeds.

Assessment/Evaluation : Mid-Sem: 25 marks (1 hr. 30 mins.), End-Sem: 60 marks (3:00 hrs. duration), Internal Assessment-15 marks, Total: 100 marks

Teaching Schedule:

Sr. No.	Topic	Classes required (No.)	Remarks, if any/Faculty
1.	Composition, Structure and Processing characteristic of Cereal grains.	5	VS
2.	Legumes and oilseeds, Post harvest, Processing practices for their safe storage.	3	VS
3.	Parboiling and milling of paddy, Quality characteristics, Curing and aging of rice, Processed rice products.	3	VS
4.	Current status and future scenario of world wheat production and uses.	2	VS
5.	Criteria of wheat quality– physical and chemical. Wheat and its quality characteristics for milling into flour and semolina, Flour milling, Turbo grinding and air classification, Flour grades and their suitability for baking purposes,	5	VS
6.	Assessment of flour quality and characteristics, Milling of Durum wheat, Macaroni products. Functionality of wheat proteins, carbohydrates and lipids in bakery products. Enzymes of wheat and their technological significance.	5	VS
7.	Ingredients, Technology and quality parameters for baked products: Bread, Biscuits and cakes; Breakfast cereals.	4	VS
8.	Processing of Oilseeds: Composition, processing of oilseeds as protein concentrations, properties and uses of oilseed meals	5	VS

9.	Technology vegetable protein isolates; Barrier compounds in the utilization of oilseed proteins. Low-cost protein foods from oilseeds.	4	VS
10.	Chemical, technological and nutritional aspects of sorghum, oats and millets. Dry and Wet milling of corn, Starches and its conversion products,	5	VS
11.	Malting of barley, Pearling of Millets, Milling of legume-pulses by traditional and improved processes.	4	VS

Suggested Readings:

1. Manay, S. (2008). Foods Facts and Principles. NEW AGE Publisher ISBN-13: 978-8122422153
2. Srilakshmi, B. (2017). Nutrition Science, New Age International Publishers; sixth edition ISBN-13: 978-9386418883
3. Rosentrater, K.A., & Evers, A. D. (2017). Kent's technology of cereals: An introduction for students of food science and agriculture. Woodhead Publishing. ISBN: 978-0-08-100529.
4. Bertolini. A.C. (2010). Handbook of STARCHES: Characterization, Properties, and Applications CRC Press International Standard Book Number: 978-1-4200-8023-0
5. Owens, G. (2001). Cereals Processing Technology. CRC Press CRC Press ISBN 0-8493-1219-1
6. Khatkar, B.S. (2010). Baking Science and Technology. Arihant Prakashan Pvt Ltd., New Delhi.

TEACHING –LEARNING PLAN

Programme: B.Tech. Food Processing and Technology **Academic Session:** 2023-2024

Semester: VI

Course Code: FT-304

Credits (L-T-P): 2 (2-0-0)

Course Name : **Food Engineering Lab**

Faculty : Dr. Ruchi Verma

Course Objective : The intent of this is to assist students in comprehending the most essential food processing unit operations. They will develop ideas regarding the design of food equipment as well. They will get knowledge of the fundamental parts of various process equipment.

Course Outcome : Students will be able to apply principles of food engineering in industry. They will acquire knowledge of physico-chemical principles underlying food processing and storage to the design of food processes and equipment.

Assessment/Evaluation : Lab record- 20 marks, Viva- 20 marks, End-Sem: 60 marks, Total: 100 marks

Laboratory Schedule:

Sr. No.	List of Experiments
1.	Laboratory equipment used in food engineering lab
2.	To determine the bulk and tapped density of raw material
3.	Determine the angle of repose of wheat flour
4.	Determination of thousand kernel weight of cereal grains
5.	Determination of average size of grains by using sieving shaker
6.	To determine the physical properties of egg
7.	Determine the mass and energy balance theory of the any food product
8.	Determine of rehydration properties of dehydrated foods
9.	To determine coefficient of static friction of food grains
10.	Study the drying characteristics of a food material during convective dehydration
11.	Determination of moisture diffusivity of a food material during dehydration
12.	Determination of cooking properties of parboiled and raw rice

Suggested Readings:

1. AOAC, 2012. Official methods of analysis, 4th edition Association of official Analytical Chemist, Washington DC.
2. Ranganna, S. (2005). Handbook of analysis and quality control for fruit and vegetable products. Tata Mc Graw-Hill Publishing Company Limited, New Delhi.
3. Gruenwedel, D.W. and Whitaker, J.R. (1984). Food Analysis: Principles and Techniques, Marcel Dekker, New York.
4. Ikegwu, T. M., Balogu, V. T., Balogu, D. O., Kolo, S. I., and Babatunde, J (2016). Physical Properties of Hen's Egg. Journal of Foods, Natural and Life Sciences. 1:16 -23
5. Ozyalcin, Z.O., Kipcak, A.S (2023). Rehydration characteristics and kinetics of traditionally dried mussels at different temperatures. Sigma J Eng Nat Sci. 41(4): 858-867

TEACHING-LEARNING PLAN

Programme name: B.Tech. Cereal and Pulses Processing **Academic Session:** 2023-2024

Semester: VI

Course code: FT-352

Credits (L-T-P): 2 (2-0-0)

Course Name : Cereal and Pulses Processing Lab

Faculty : Ms. Rachna Mishra

Course objective : This course will provide basic understanding of cereals and pulses processing and their physico-chemical analysis.

Course Outcome : Students will understand the various quality parameters of cereals and pulses. They will learn to analyse and interpret data.

Assessment/ Evaluation : Lab record- 20 marks, Viva- 20 marks, End-Sem: 60 marks, Total-100 marks

Laboratory Schedule:

Sr. No.	List of Experiments
1.	Determination of moisture content of grain by hot air oven method
2.	Physical properties of cereal and pulses
3	Functional properties of different cereal and pulses flour
4.	Comparison of different flours on the basis of their gluten content
5.	To study the process of germination
6	To study the fermentation process
7.	Phenol test for cereals grain
8.	Determination of sedimentation value of wheat flour
9.	To study the cooking quality of rice
10.	To study microscopic structure of cereal starches

Suggested Readings:

1. AOAC (1980). Official methods of analysis Association of Analytical Chemist, Washington 4, DC.
2. FSSAI Manual of Methods of Analysis of Foods – Cereal and Cereal Products -2nd edition.
3. Nielsen, S.S. (2010) Food Analysis. 4th Edition, Food Science Text Series, Springer, USA,
4. Ranganna, S. (1986). Handbook of Analysis and Quality Control for Fruit and Vegetable Products. Tata McGraw Hill Publishing Co. Ltd., New Delhi.

TEACHING-LEARNING PLAN

Programme: B.Tech. Food Processing and Technology **Academic Session:** 2023-2024

Semester: VI

Course Code: FT- 254

Credits (L-T-P): 2 (0-0-2)

Course Name : **Food Processing Lab**

Faculty : Dr. Vyakhaya

Course Objective : It aims to provide practical knowledge to students regarding the different physical, functional and chemical parameters of food commodity. They will learn processing and preservation techniques utilized in the development of food products.

Course Outcome : Students will acquire knowledge of different processing and preservation techniques used in development of products and their analyses.

Assessment/Evaluation : Lab record- 20 marks, Viva- 20 marks, End-Sem: 60 marks, Total- 100 marks

Laboratory Schedule:

Sr. No.	List of Experiments
1.	Determination of rehydration ratio of dehydrated foods
2.	Determination of moisture content using different dehydration methods
3.	Experiment of food extruder – Noodle Making
4.	Experiment on properties of food through microwave oven heating
5.	To estimate the Water Absorption Capacity (WAC) of given samples
6.	To estimate the Oil Absorption Capacity (OAC) of given samples
7.	Particle size profiling of the given sample
8.	To make cellulose based edible films with CMC
9.	Determination of titratable acidity of fruit juice
10.	To study sensory attributes of given food sample
11.	Determination of sodium chloride (salt content) in brine

Suggested Readings:

1. Ranganna, S. (2002). Handbook of Analysis of quality control for fruit and Vegetables products 2nd Ed. Tata Mcgraw Hill pub. Co. Ltd. New Delhi.
2. Fellows, P. J. (2022). *Food processing technology: principles and practice*. Woodhead publishing.
3. Fellows, P., & Hampton, A. (1992). *Small-scale food processing: a guide to appropriate equipment*. Intermediate Technology Publications.
4. Manay, S. and Shadaksharaswami, M. (2004). *Foods: facts and principles*. New Age Publishers.
5. Lelieveld, H. L., & Motarjemi, Y. (Eds.). (2013). *Food Safety Management: A Practical Guide for the Food Industry*. Academic Press.