

TEACHING-LEARNING PLAN

Programme: M.Sc. Food Science
Semester: II
Course Code: FS-408

Academic Session: 2023-2024
Batch: 2023-2025
Credits (L-T-P): 3 (3-0-0)

Course Name : **Technology of Meat, Fish and Poultry Products**
Faculty : Dr. Vinita Sharma (VS)
Course Objective : The course aims to develop the knowledge of students in the area of processing of animal products. This course will enable students to appreciate the application of scientific principles in the processing of these materials.
Course Outcome : Students shall be well-versed in different aspects processing, preservation and quality control of meat, poultry, egg and fish industry.
Assessment/Evaluation : Mid-Sem: 25 marks (1 hr. 30 mins.), End-Sem: 60 marks (3:00 hrs.), Internal Assessment – 15 marks, Total- 100 marks.

Teaching Schedule:

Sr. No.	Topic	Classes required (No.)	Faculty
1.	Introductory session about course	1	VS
2.	Scope of meat industry: Status and Introduction to meat, fish and poultry industry, Meat production, processing and consumption.	3	VS
3.	Structure, composition and nutritive value of meat tissues, Postmortem changes, Pre-slaughter handling, Death of the Animal–stunning and bleeding, dressing and cutting, Post slaughter care and post mortem inspection – classification and quality of meat.	5	VS
4.	Aging, Curing, Smoking, Canning, Irradiation, Freezing and Dehydration of Meat and Meat Products, Formed and Sectioned Meat Production Method, Meat Sausages-Classification, Ingredients and Production	6	VS
5.	Recent trends in meat processing.	2	VS
6.	Chemical composition and nutritive value of poultry meat, Pre-slaughter handling, Transport and Dressing of poultry, Antemortem and postmortem examination of poultry.	7	VS
7.	Egg: Structure, composition, and nutritional aspects of eggs. Grading, Storage and transportation of whole eggs.	5	VS
8.	Microbial spoilage of eggs, Preservation and maintenance of eggs, Processing of eggs and egg products (liquid and solid products)	6	VS
9.	Fish: Types of fish, Composition and Nutritive Value, Post-mortem changes in fish	5	VS
10.	Unit operations in fish processing. Canning, Smoking, Salting, Curing, Freezing and Drying/Dehydration of fishes. Fish spoilage, Fish sausages.	5	VS

Suggested Readings:

1. Manay, S. (2008). Foods Facts and Principles. NEW AGE Publisher ISBN-13:978-8122422153
2. Hui, Y.H. (2012). Handbook of Meat and Meat Processing, CRC Press; Second edition ISBN
3. -13: 978-1-4398-3684-2.
4. Heinz. G, and Hautzinger, P. (2007). Meat Processing Technology. Woodhead Publishing. ISBN: 978-974-7946-99-4.
5. George J.M. and Carmen R.P. (2017). Poultry Products Technology Third Edition, CRC Press, ISBN 1-56022-856-3.
6. Hui, Y.H. (2010). Handbook of Poultry Science and Technology:
7. Fernandes, R. (2009). Fish and Seafood.

TEACHING-LEARNING PLAN

Programme	: M.Sc. Food Science	Academic Session	:2023-2024
Semester	: II	Batch	:2023-2025
Course Code	: FS 406	Credits (L-T-P)	:3 (3-0-0)
Course Name	: Fruits and Vegetables Technology		
Faculty	: Dr. Shivani Rustagi (SR)		
Course Objective	: This course aims to make students understand the processing and preservation of fruits and vegetables. It will enable them to gain knowledge on maturity indices of fruits and vegetables and the use of technology to process and preserve fruits and vegetables. It will also help them to understand processing of plantation crops.		
Course Outcome	: Students will understand the concept of quality in relation to fruit and vegetable-based products as well as understand the processing and preservation of fruits and vegetables using various techniques. They will also gain detailed information on canning and bottling.		
Assessment/Evaluation	: Mid-Sem: 25 marks (1 hr. 30 mins.), End-Sem: 60 marks (3:00 hrs.), Internal Assessment – 15 marks, Total- 100 marks.		

Teaching Schedule:

Sr. No.	Topic	Classes required (No.)	Faculty
1.	Introduction to fruits and vegetables; present scenario of fruits and vegetables at global level and in India	2	SR
2.	Structural, compositional and nutritional aspects of fruits and vegetables	3	SR
3.	Post-harvest changes in fruits and vegetables	2	SR
4.	Storage, handling and preservation; controlled and modified atmosphere storage	4	SR
5.	Techniques of processing and preservation of fruits and vegetables by refrigeration and freezing	2	SR
6.	Techniques of processing and preservation of fruits and vegetables by drying and dehydration	2	SR
7.	Canning: Machinery and equipment; preservation by canning and bottling; canning of different fruits and vegetables and quality control	3	SR
8.	Technology of fruits and vegetable products: juices and pulps and quality control	3	SR
9.	Technology of fruits and vegetable products: concentrates and powders and quality control	2	SR
10.	Technology of fruits and vegetable products: Squashes, cordials, nectars, fruit drinks and carbonated beverages and quality control	4	SR
11.	Technology of fruits and vegetable products: jams, jellies and marmalades and quality control	3	SR
12.	Technology of fruits and vegetable products: preserves,	3	SR

	candies and crystallized fruits and quality control		
13.	Tomato products: purees, paste, ketchup, sauce and soup	3	SR
14.	Chutneys, pickles and other products. Condiments, spice oils, oleoresins	3	SR
15.	Processing of cashew nuts. Specialty fruits and vegetables products	6	SR

Suggested Readings:

1. Thompson, A.K., (2003). Fruits and vegetables; Harvesting, handling and storage. Blackwell Publishing.
2. Girdharilal., Siddappaa, G.S and Tandon, G.L. (1998). Preservation of fruits & vegetables. ICAR, New Delhi.
3. Arthey, D. and Ashurst, P.R. (2001). Fruit processing: nutrition, products, and quality management. Springer New York, NY.
4. Manay, S. and Shadaksharaswami, M. (2004). Foods: facts and principles. New Age Publishers.
5. Srivastava, R.P. and Kumar, S. (2006). Fruits and vegetables preservation- principles and practices. 3rd Ed. International Book Distributing Co.

TEACHING-LEARNING PLAN

Programme	: M.Sc. Environmental Science	Academic Session	: 2023-2024
Semester	: II	Batch	: 2023-2025
Course Code	: FT 312	Credits (L-T-P)	: 3 (3-0-0)
Course Name	: Food Processing Waste Management		
Faculty	: Dr. Shivani Rustagi (SR)		
Course Objective	: 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.), Internal Assessment – 15 marks, Total- 100 marks.		

Teaching Schedule:

Sr. No.	Topic	Classes required (No.)	Faculty
1.	Introduction to different food sectors in food industry; food waste, food loss and food wastage; effluent and sewage	2	SR
2.	Characterization of food industry effluents- Physical parameters	2	SR
3.	Characterization of food industry effluents- Chemical and biological parameters	2	SR
4.	Unit concept of treatment of food industry effluents- unit operations and unit processes; screening, sedimentation, floatation	3	SR
5.	Waste water treatment systems, physical separations, micro-strainers, filters, ultra filtration and reverse osmosis	4	SR
6.	Physico-chemical separations- activated carbon adsorption, ion-exchange, electro dialysis and magnetic separation	4	SR
7.	Chemical oxidation and treatment-coagulation and flocculation, disinfection; handling disposal of sludge	4	SR
8.	Objectives of biological objectives, organisms involved, reactions, oxygen requirements	2	SR
9.	Aeration device systems: lagoon, activated sludge process, oxidation ditch, rotating biological contractor-variations and advanced modifications	4	SR
10.	Characterization and utilization of by-products	4	SR

	from cereals, pulses and oilseeds processing industries		
11.	Characterization and utilization of by-products from fruits, vegetables, plantation crops and fermented products processing industries	4	SR
12.	Characterization and utilization of by-products from milk, fish, meat, egg and poultry processing industries	4	SR
13.	Food industry wastes, food waste treatment- ISO 14001 standards, standards for emission or discharge of environmental pollutants from food processing industries according to Environment (Protection) Act 1986	4	SR
14.	Elements of importance in the efficient management of food processing industries	2	SR

Suggested Readings:

1. Norman, G. Marriott. and Robert, B. Gravani. (2006). Principles of Food Sanitation, 5th edition
2. Potter, N.H. (1998). Food Science. New Delhi: CBS Publication.
3. Joshi, V.K. and Sharma, S.K. (2011). Food Processing Waste Management: Treatment and Utilization Technology. New Delhi: NIPA Publication.
4. Arvanitoyannis, Ioannis S. (2007). Waste Management for the Food Industries. Academic Press Inc.

TEACHING-LEARNING PLAN

Programme name: M.Sc. Food Science

Academic Session: 2023-2024

Semester: II

Batch: 2023-2025

Course code: FS-410

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

Course Name : **Technology of Functional Foods and Nutraceuticals**

Faculty : Ms. Rachna Mishra (RM)

Course Objective : To provide in-depth knowledge of the fundamentals of functional foods and nutraceuticals, their significance, regulatory issues and role in disease prevention.

Course Outcome : The student will understand the role of functional foods and nutraceutical in health promotion and disease prevention.

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

Teaching Schedule:

Sr. No.	Topic	Class required (No.)	Faculty
1.	Nutraceuticals and Functional Food: An introduction, Definition of Nutraceuticals and Functional Food, Applied aspects of the Nutraceutical Science.	1	RM
2.	Nutrient Components of Food and Effect of processing on Nutrients.	2	RM
3.	Sources of Nutraceuticals, link between nutrition and medicine	1	RM
4.	Classification: Classification of nutraceuticals based on the sources and chemical nature, Traditional Nutraceutical and Non-Traditional Nutraceutical	2	RM
5.	Phytochemical as Nutraceuticals: Types of Phytochemicals, chemical nature and health benefits.	2	RM
6.	Antioxidant Mechanism, Free radical and Oxidative stress	2	RM
7.	Flavonoids and Carotenoids as antioxidant: Isoflavones, beta carotene, Lycopene; Sources, Properties and Nutraceutical Benefits	3	RM
8.	Dietary fibers as functional food ingredient: Sources and role of Dietary fibers in disease prevention.	3	RM
9.	Protein: Soya protein as a Functional food ingredient.	2	RM
10.	Herbs as a Functional Food: Sources and functional components and applications in functional food and nutraceuticals.	3	RM

11.	Functional food from cereal Grains: Oat, wheat bran, rice bran etc. Sources of functional components, Functional food products.	3	RM
12.	Nutraceuticals from Fruits and Vegetables: Sources and health benefits	2	RM
13.	Beverages as Functional Food: (Tea, Coffee, fermented beverages) Wine and Tea Polyphenols and its nutraceutical health benefits	3	RM
14.	Nutritional Deficiencies: Major deficiencies and its correction through fortification of food.	3	RM
15.	Health benefits of Honey, <i>Spirulina</i> , Fish oil etc.	2	RM
16.	Nutraceuticals for diseases Prevention: Cancer, Heart disease, Stress, Hypertension, etc.	3	RM
17.	Introduction to Anti-nutritional Factors: Phytates, Saponins, Haemagglutinins, Protease inhibitors, Amylase inhibitors	2	RM
18.	Functional food for the gut: Probiotics, prebiotics and symbiotic, Health effect of probiotics microorganisms. Probiotics in various foods.	3	RM
19.	Quality Assurance of probiotics and safety	1	RM
20.	Nutraceutical and functional food Industry and Market Information: Marketing and Regulatory Issues for functional Foods and Nutraceuticals, Growth Opportunities, current status, Key challenges and Future aspects in Nutraceuticals and Functional Foods, Modern trend in nutraceutical and functional food.	2	RM

Suggested Readings:

1. Bao and Fenwick, (2004) "Phytochemicals in Health and Diseases". Marcel Decker, Inc. NY.
2. Ho, C. T., & Zheng, Q. Y. (Eds.). (2001). *Quality management of nutraceuticals*. American Chemical Society.
3. Kramer, K., Hoppe, P. P., & Packer, L. (Eds.). (2001). *Nutraceuticals in health and disease prevention* (Vol. 6). CRC Press.
4. Eskin, M., & Tamir, S. (2005). *Dictionary of nutraceuticals and functional foods*. CRC Press.
5. Schmidl, M.K. and T.P. Labuza. (2000). *Essentials of Functional Foods*. Aspen Publishers, inc., Gaithersburg, MD. ISBN 978-0-8342-1261-9
6. Altug, T. (2002). *Introduction to toxicology and food*. CRC press. Boca Raton, FL. ISBN 9780849314568
7. Wildman, R.E.C. (2001) "Handbook of Nutraceuticals and Functional Foods", CRC Press LLC. ISBN- 0849387345.

TEACHING –LEARNING PLAN

Programme: M. Sc. Food Science

Academic Session: 2023-2024

Semester: II

Batch: 2023-2025

Course Code: FS-424

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

Course Name	: Post-Harvest Technology
Faculty	: Ms. Reshma Saroj (RS)
Course objectives	: This course aims to develop the knowledge regarding biochemistry and physiology of fruits and vegetables and effect of pre- and post-harvest changes in product quality.
Course Outcome	: Students will able to understand biological, chemical and physical properties of fruits and vegetables, technologies involved in the processing, preservation and value addition of fruits and vegetables products.
Assessment/Evaluation	: Mid-Sem: 25 marks (1 hr. 30 mins.), End-Sem: 60 marks (3:00 hrs.), Internal Assessment-15 marks, Total- 100 marks.

Teaching Schedule:

Sr. No.	Topic	Classes Required (No.)	Faculty
1.	Current status of fruits and vegetables, production, classification, structure and composition.	3	RS
2.	Importance's and scope of post-harvest management of fruits and vegetables in Indian economy, post-harvest changes.	4	RS
3.	Pre-harvest affecting, post-harvest quality, post- harvest losses, maturity indices.	4	RS
4.	Physical and chemical changes indices of fruit, maturity, and crop maturity and ripening, Biochemical changes during maturation, ripening, processing and storage.	5	RS
5.	Advanced harvesting tools and their design aspects, advances in Post- Harvest Handling operation; Cleaning, washing of fruits and vegetables, types of cleaners, types of screens, rotary screen, vibrating screen, machinery for cleaning of fruits and vegetables.	4	RS
6.	Sorting and grading, methods of grading, size grading, color grading, methods of grading of fruits and vegetables, grading efficiency, care and maintenance.	3	RS

7.	Separation: magnetic separator, de stoner, electrostatic separator, pneumatic separator	2	RS
8.	Post- Harvest physiological and biochemical changes in fruits and vegetables, ripening of climacteric and non-climacteric fruits; changes during ripening.	4	RS
9.	Roles of ethylene in fruits ripening chambers, field heat of fruits and vegetables and primary processing operations.	3	RS
10.	Post-harvest handling and pre-cooling methods, post-harvest treatments, edible coating, cold chain and commercial cooling systems.	4	RS
11.	Post-harvest disorder, chilling injury and diseases. Biological, physical and chemical control of post-harvest diseases.	5	RS
12.	Advances in drying and packaging of fruits and vegetables, minimal processing involved in post-harvest technology	4	RS

Suggested Readings:

1. Adewoyin Q.B. (2023). Pre-Harvest and Postharvest Factors Affecting Quality and Shelf Life of Harvested Produce. New advances in postharvest Technology.
2. Gundewadi, G., Reddy, V. R., & Bhimappa, B. B. (2018). Physiological and biochemical basis of fruit development and ripening-a review. *Journal of Hill Agriculture*, 9(1), 7-21.
3. Londhe, D. H., Nalawade, S. M., Pawar, G. S., Atkari, V. T., & Wandkar, S. V. (2013). Grader: A review of different methods of grading for fruits and vegetables. *Agricultural Engineering International: CIGR Journal*, 15(3), 217-230. N. Shakuntala Manay and M.Shadaksharswamy, third edition.
4. Paltrinieri, G., & Staff, F. A. O. (2014). Handling of fresh fruits, vegetables and root crops: A training manual for grenada. *Rome, Italy: Food and Agriculture Organization of the United Nations*.
5. Ramaswamy, H. S. (2014). *Post-harvest technologies of fruits & vegetables*. DEStech Publications, Inc.
6. Siddiqui, M. W., Chakraborty, I., Ayala-Zavala, J. F., & Dhua, R. S. (2011). Advances in minimal processing of fruits and vegetables: a review.

TEACHING –LEARNING PLAN

Programme: M. Sc. Food Science

Academic Session: 2023-2024

Semester: II

Batch: 2023-2025

Course Code: FS-404

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

Course Name

: Cereals, Legumes and Oil Crop Technology

Faculty

: Ms. Reshma Saroj (RS)

Course Objectives

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

Course Outcome

: Students will be able to understand and identify the specific processing technologies used for pulses and oilseeds and the various products derived from these materials, understand the application of scientific principles in the processing technologies specific to the materials.

Assessment/Evaluation

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

Teaching Schedule:

Sr. No.	Topic	Classes Required (No.)	Faculty
1.	Current status and future scenario of world wheat production and their uses. Structure, physical and chemical composition of wheat grain.	3	RS
2.	Wheat milling- General principle, cleaning, condition and milling system.	4	RS
3.	Flour grades and their suitability for baking purpose, assessment of flour quality and their characteristics.	4	RS
4.	Rice chemistry and technology: Structure, composition and milling of rice. Modern rice milling operation.	4	RS
5.	Rice parboiling technology, Method of Parboiling, Properties of parboiled rice; changes during parboiling.	3	RS

6.	Advantage and disadvantage of parboiling, Quality characteristics, curing and ageing of rice, Processed rice products.	4	RS
7.	Ingredient Technology and quality parameters for baked products; Bread, Biscuit and cakes, Breakfast cereals.	4	RS
8.	Processing of oilseed: Composition, processing of oilseeds as protein concentrations.	3	RS
9.	Technology used in vegetable protein isolates.	3	RS
10.	Chemical, technological and nutritional aspects of sorghum, Oats and millets.	4	RS
11.	Malting of barley, Pearlring of millets, Corn technology; Dry and wet milling of corn and products of wet and dry milling of corn.	5	RS
12.	HFCS and their uses, milling of legume-pulses by traditional and improved processes and anti-nutrient in pulses and modes of elimination	4	RS

Suggested Reading:

1. N. Shakuntala Manay and M.Shadaksharswamy, 3rd Edition.
2. Miroslav S. Hadnađev, Tamara R. Dapčević Hadnađev, Milica M. Pojić, Bojana M. Šarić, Aleksandra Č. Mišan, Pavle T. Jovanov, Marijana B. Sakac. (2017). Progress in vegetable proteins isolation techniques: a review. *Food and Feed Research*, 44 (1), 11-21.
3. David A.V. Dendy. Sorgham and millets: chemistry and technology.
4. Vikrant kumar, Jaivir singh, Neelash Chauhan, Suresh Chandra, VivakKumar and M.K. Yadav (2018). Process of paddy parboiling and their effects on rice” A Review. *Journal of Pharmacognosy and Phytochemistry*. 2018; SP1: 1727-1734.
5. Jhauharotul Muchlisyyah, Rosnah Shamsudin, Roseliza Kadir Basha, Radhiah Shukri ,Syahmeer How, Keshavan Niranjana and Daniel Onwude (2023). Agriculture, 13, 1390. <https://doi.org/10.3390/agriculture13071390> <https://www.mdpi.com/journal/agriculture>

TEACHING - LEARNING PLAN

Programme: M.Sc. Food Science

Academic Session: 2023-24

Semester: II

Batch: 2023-2025

Course Code: FS-412

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

Course Name

: Food Additives

Faculty

: Dr. Vyakhaya (V)

Course Objective

: To learn about food additives used in food industry and their effect on shelf-life extension, processing aids and sensory appeal.

Course Outcome

: Understand about the use of food additives in food formulations, learn about the stability and usage level of food additives.

Assessment/Evaluation

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

Teaching Schedule:

Sr. No.	Topic	Classes Required (No.)	Faculty
1.	Food additives: Definition, Principle	4	V
2.	GRAS and regulatory aspects of food additives, functions, types, modes of action, risks and benefits.	8	V
3.	Food preservatives, emulsifying and stabilizing agents, anticaking agents, thickeners, firming agents.	8	V
4.	Flour bleaching agents and Bread improvers.	3	V
5.	Definitions, uses and functions: Acid, Base, Buffer systems, Salts and chelating/sequestering agents, Masticatory Substances.	8	V
6.	Nutritional and Nonnutritive sweeteners, polyols.	3	V
7.	Colorants, Flavoring agents and related substances	4	V
8.	Clarifying agents, gases and propellants	3	V
9.	Tracers and other additives	4	V

Suggested Readings:

1. Metcalfe, D. D., Sampson, H. A., & Simon, R. A. (Eds.). (2011). *Food allergy: adverse reactions to foods and food additives*. John Wiley & Sons.
2. Medhi, M., Gupta, A. K., Dhua, S., & Mishra, P. (2022). Food Additives. In *Advances in Food Chemistry: Food Components, Processing and Preservation* (pp. 255-292). Singapore: Springer Nature Singapore.
3. Furia, T. E. (1973). *CRC handbook of food additives* (Vol. 1). CRC press.
4. Jain, A., & Mathur, P. (2015). Estimation of Food Additive Intake—Overview of the Methodology. *Food Reviews International*, 31(4), 355-384.
5. Shikha, P., Arvind, K., & Gupta, A. (2021). Technological Advancement in Food Additives and Preservatives. *Food Chemistry: The Role of Additives, Preservatives and Adulteration*, 375-396.
6. Khatkar, B. S. (Ed.). (2007). *Food Science and Technology*. Daya Books.

7. Manay, N. S. O. (2001). *Food: facts and principles*. New Age International.
8. Nabavi, S. M., Nabavi, S. F., Loizzo, M. R., Tundis, R., Devi, K. P., & Silva, A. S. (Eds.). (2020). *Food Additives and Human Health*. Bentham Science Publishers.
9. Smith, J. (Ed.). (1991). *Food additive user's handbook*. Glasgow: BI

TEACHING LEARNING PLAN

Programme: M.Sc. Food Science

Academic Session: 2023-24

Semester: II

Batch: 2023-2025

Course Code: FS-422

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

Course Name

: Food Supply Chain Management

Faculty:

: Dr. Vyakhaya (V)/ Dr.Vinita Sharma (VS)

Course Objective

: Identify key components, stakeholders, and activities involved in food supply chain management, understand the impact of external factors, such as technology, regulations, and consumer preferences on food supply chains.

Course Outcome

: Students will understand the fundamental concepts, and principles related to food supply chain management.

Assessment/Evaluation:

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

Teaching Schedule:

Sr. No.	Topic	Classes Required (No.)	Faculty
1.	Introduction and overview of FSCM, Present Status of food supply chain in India.	2	VS
2.	Inbound and outbound logistics, Supply chain as a source of competitive advantage.	3	VS
3.	Inbound Logistics: Buyer-vendor coordination, procurement, vendor development and evaluation.	4	VS
4.	Sourcing and partnership- benefits, risks and critical success factors, multi-level supply control	5	VS
5.	Inventory control system of stock replenishment, cost elements, EOQ and its derivative model, use of computers for material functions.	6	VS
6.	Outbound logistics: System view of logistics-coordination and management of transportation	4	VS
7.	Inventory order processing- purchasing, warehouse materials handling, packaging and consumer service standards, Physical distribution, strategies and management.	4	V
8.	Transport infrastructure and management, facility location, material handling	4	V

9.	Porters Industry analysis and value chain models, the concept of total cost of ownership, supply team strategies, classification and development outlines	5	V
10.	Logistics engineering, measuring effectiveness of supply management, Bullwhip effect and supply management	5	V
11.	Operations Research Model for operational and strategic issues in SCM.	3	V

Suggested Readings:

1. Bournakis, M.A., & Weightman, P. W. (Eds.). (2008). *Food supply chain management*. John Wiley & Sons.
2. Eastham, J., Sharples, L., & Ball, S. (Eds.). (2007). *Food supply chain management*. Taylor & Francis.
3. Wisner, J.D., Tan, K.C., & Leong, K. (2021). *Principles of supply chain management: A balanced approach*. South-Western, Cengage Learning.
4. Hugos, M. H. (2018). *Essentials of supply chain management*. John Wiley & Sons.
5. Lu, D. (2011). *Fundamentals of supply chain management*. Bookboon.
6. Blanchard, D. (2021). *Supply chain management best practices*. John Wiley & Sons.
7. Leadley, C. (Ed.). (2015). *Innovation and future trends in food manufacturing and supply chain technologies*. Woodhead Publishing.
8. Russell, R. S., & Taylor-Iii, B. W. (2008). *Operations management along the supply chain*. John Wiley & Sons.
9. Zsidisin, G.A., & Ritchie, B. (Eds.). (2008). *Supply chain risk: a handbook of assessment, management, and performance* (Vol. 124). Springer Science & Business Media.
10. Stadtler, H., Stadtler, H., Kilger, C., Kilger, C., Meyr, H., & Meyr, H. (2015). *Supply chain management and advanced planning: concepts, models, software, and case studies*. Springer.
11. Meredith, J. R., & Shafer, S. M. (2023). *Operations and supply chain management for MBAs*. John Wiley & Sons.
12. Mangan, J., & Lalwani, C. (2016). *Global logistics and supply chain management*. John Wiley & Sons.
13. Ivanov, D., & Sokolov, B. (2009). *Adaptive supply chain management*. Springer Science & Business Media.

TEACHING-LEARNING PLAN

Programme: M.Sc. Food Science

Academic Session: 2023-2024

Semester: II

Batch: 2023-2025

Course Code: FS-418

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

Course Name

: Technology of Oilseeds and Fats

Faculty

: Dr. Nitin Sonkar (NS)

Course Objectives

: The course aims to develop the knowledge of students in the area of pulses and oilseeds processing. This course will enable students to appreciate the application of scientific principles in the processing of these materials.

Course Outcome

: The students will understand specific processing technologies used for pulses and oilseeds and the various products derived from these materials.

Assessment/Evaluation

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

Teaching Schedule:

Sr. No.	Topic	Classes required	Faculty
1.	Introduction: Importance and functions of fats and oils in foods and health.	1	NS
2.	Composition of fats/oils from different animal sources and oilseeds.	3	NS
3.	Oil extraction: Different methods of oil extraction, oil expression from oilseeds like, mustard/rapeseed, coconut, sunflower, groundnut, sesame, cotton. machines.	4	NS
4.	Mechanical expellers and solvent extractors used in the expression of oils; Calculations based on the extraction processes.	4	NS
5.	Oil/fat purification: Refining techniques, bleaching, refining losses and deodorization.	4	NS
6.	Batch and continuous refining losses. Hydrogenation:	2	NS
7.	Chemistry of hydrogenation, Effect of process conditions, Hydrogenation in Practice, Catalysts and catalysis.	4	NS

8.	Chemistry of fats and oils: Lipolysis, auto-oxidation, thermal decomposition.	3	NS
9.	Chemistry of frying oils.	2	NS
10.	Effects of ionizing radiation in fats, inter-esterification, reversion.	3	NS
11.	Technology of individual fat products: Butter, Margarine, Shortening.	3	NS
12.	Lard, Salad, cooking and frying oil.	3	NS
13.	Different quality parameters: Peroxide value, Saponification value, Iodine value, acid value, TBA, RM value, P-value, Kries value.	3	NS
14.	Adulteration in oils and fats.	2	NS
15.	Soap processing: Chemistry, physical properties of soap.	1	NS
16.	Processing and finishing, different types of soaps.	1	NS
17.	Soaps in cosmetics and toiletries.	2	NS

Suggested Readings:

1. Damodaran, S., Parkin, K. L., & Fennema, O. R. (Eds.). (2007). *Fennema's food chemistry*. CRC press.
2. Lawson Food oils and fats
3. Maran Fats in food products
4. Post Harvest Biotechnology of Legumes D.K. Salunkhe et al.
5. Post Harvest Biotechnology of Oil Seed D.K. Salunkhe et al.
6. Processed Protein Food Stuff A.M. Alschule
7. The Chemistry and Technology of Edible Oils and Fat A.E. Baily
8. Post Harvest Technology of Cereals, Pulses and Oil seeds Chakraborty
9. Oil Seed Processing Technology B.D. Shukla.

TEACHING-LEARNING PLAN

Programme: M.Sc. Food Science

Academic Session: 2023-2024

Semester: II

Course Code: FS- 519

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

Course Name : **Fruits and Vegetables Technology Lab**

Faculty : Dr. Shivani Rustagi

Course Objective : This course aims to provide practical knowledge to students about processing and preservation of fruits and vegetables using different techniques.

Course Outcome : Students will gain understanding of processing and preservation of fruit- and vegetable-based products using various techniques.

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 total soluble solids (TSS), pH, acidity, brix:acidity ratio in given samples
2.	Determination of ascorbic acid content in given samples
3.	Preparation of different tomato products
4.	Preservation of fruits and vegetables by dehydration method
5.	Preservation of fruits and vegetables by high concentration of sugar (Jam)
6.	Preservation of fruits and vegetables by using salt (pickling)
7.	Preparation of different fruit and vegetable beverages
8.	Preparation of jelly with different fruits
9.	Studying the effect of blanching in fruits and vegetables
10.	Determination of DPPH content in given food samples
11.	Food waste utilization and preparation of value-added product

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. Girdharilal., Siddappaa, G.S and Tandon, G.L. (1998). Preservation of fruits & vegetables. ICAR, New Delhi.
3. Arthey, D. and Ashurst, P.R. (2001). Fruit processing: nutrition, products, and quality management. Springer New York, NY.
4. Manay, S. and Shadaksharaswami, M. (2004). Foods: facts and principles. New Age Publishers.

TEACHING –LEARNING PLAN

Programme: M.Sc. Food Science

Academic Session: 2023-2024

Semester: II

Course Code: FS-517

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

Course Name : Cereals, Legumes and Oilseed Analysis Lab

Faculty : Dr. Ruchi Verma

Course Objective : To provide in-depth understanding of the fundamentals of cereals, pulses and oilseeds & perform various analysis.

Course Outcome : On successful completion of the subject, the students will learn to determine different properties of cereals, analyze data & develop skills to monitor various food processing operations related to cereal processing industry.

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 processing lab
2.	To determine the bulk and tapped density of different grains
3.	Determine the angle of repose of wheat flour
4.	Determination of thousand kernel weight of cereal grains
5.	Determination of dry and wet gluten of a given flour sample
6.	Determination of alcoholic acidity of flour
7.	Determination of dehulling efficiency and breakage in dehulling of pulse
8.	Pretreatments for milling of pulses
9.	Oil extraction methods of oil seeds by using different solvents
10.	Qualitative checking of various adulterants presence in cereals and legumes
11.	To determine the fat content by using Soxhlet apparatus
12.	Determination of saponification value

Suggested Readings:

1. Anderson, R.A., Conway, V.F.P. and Griffin, E.L. (1969). Gelatinization of Corn Grits by Rolland Extrusion-Cooking. Cereal Science Today, 14, 4-7.
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. Srivastava, R.P. and Kumar, S. (2006). Fruits and vegetables preservation- principles and practices. 3rd Ed. International Book Distributing Co.