

**Scheme & Syllabus of**  
**Master of Science in Food Technology**  
**M.Sc. Food Technology**

**Batch 2024 onwards**



By

Board of Study Food Science and Engineering

Department of Academics

**I.K. Gujral Punjab Technical University**

**Vision:**

To create competent professionals those, contribute towards the economic development of the nation by going in line with the policy of Government of India in the field of food processing food safety and security.

**Mission:**

- Development of human resources in the field of food science and technology to serve the cause of the nation
- Providing a strong theoretical and practical background across the food science discipline with an emphasis on developing sustainable resources to cater to food and nutrition-related challenges
- Development of human resources in the area of clinical nutrition and research to contribute effectively to making India healthy
- Create a favorable environment for innovation to translate theoretical knowledge into practical applications
- Inculcating professional ethical values, innovative research capabilities, and leadership abilities
- Holistic development of the youth through the process of self-evaluation and continuous improvement

<b>Program Name:</b>	Master of Science in Food Technology <b>Or</b> M.Sc. in Food Technology
<b>Program Level</b>	Postgraduate (PG) Program
<b>Duration</b>	2 years (4 Semesters)
<b>Eligibility for Admission</b>	Passing of Bachelor of Science / Applied Science in any subject/ B. Tech Food Technology / Biotechnology/ Sugar Technology/ Sugar and Alcohol Technology/ Fermentation Technology / Dairy Technology/ B.Voc. Food Science and Technology or any Allied Field/Agri-Food Technology/Food Processing/ Bachelor in Hotel Management and Catering Technology or any other examination recognized equivalent thereto with atleast 50% marks in aggregate
<b>Year of Implementation</b>	New Syllabus will be implemented from 2024 onwards.
<b>Medium of Instruction</b>	English

**Program Education Objectives (PEOs):**

<b>POE1</b>	<b>Technical Proficiency:</b> Students will demonstrate advanced knowledge and technical skills in food technology, encompassing food processing, preservation, and safety, enabling them to address complex challenges in the food industry.
<b>POE2</b>	<b>Research and Innovation:</b> Students will engage in cutting-edge research and innovation, contributing to the development of sustainable and efficient food technologies, while keeping abreast of emerging trends and scientific advancements.
<b>POE3</b>	<b>Professional Development:</b> Students will exhibit strong leadership, ethical practices, and effective communication skills, preparing them for successful careers in academia, industry, and regulatory bodies within the food sector.
<b>POE4</b>	<b>Global Competence:</b> Students will be equipped with a global perspective on food technology issues, understanding international standards, regulations, and market dynamics, allowing them to thrive in diverse and multicultural environments.
<b>POE5</b>	<b>Problem-Solving Excellence in Food Science and Technology:</b> Students will possess the capability to identify, formulate, and solve complex problems in food science and technology, ensuring innovative and effective solutions for industry challenges.

**Program Outcomes (POs):**

<b>PO1</b>	Students will demonstrate advanced knowledge and technical skills in food technology, focusing on food processing, preservation, and safety to tackle industry challenges.
<b>PO2</b>	Students will engage in cutting-edge research, developing sustainable and efficient food technologies, and staying updated with emerging scientific advancements.
<b>PO3</b>	Students will exhibit strong leadership, ethical practices, and effective communication, preparing for careers in academia, industry, and regulatory bodies.
<b>PO4</b>	Students will understand international food technology standards, regulations, and market dynamics, thriving in diverse and multicultural environments.
<b>PO5</b>	Students will have ability to identify, formulate, and solve food science and technology problems

**Mapping of Program Outcomes with Program Education Objectives: -**

<b>PO \ POE</b>	<b>POE1</b>	<b>POE2</b>	<b>POE3</b>	<b>POE4</b>
<b>PO1</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>1</b>
<b>PO2</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>1</b>
<b>PO3</b>	<b>1</b>	<b>1</b>	<b>3</b>	<b>2</b>
<b>PO4</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>2</b>
<b>PO5</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>3</b>

**Course Type Coding:**

<b>DSC</b>	Discipline Core
<b>DSE</b>	Discipline Elective
<b>QP-NOS</b>	Qualification Pack - National Occupational Standards.
<b>SEC-SB</b>	Skill Enhancement Course- Skill Based
<b>SEC-VB</b>	Skill Enhancement Course- Value Based
<b>AECC</b>	Ability Enhancement Course
<b>OE</b>	Open Elective

**Important Notes:**

1. Theory courses will be of 04 hours and practical will be of 04 hours duration per week. For all lecture courses, one credit per lecture/week/semester will generally be adopted. One laboratory hour per week per semester will be assigned half credit.
2. No elective course will be run unless the number of students registered for the elective course is five or more.

### Program Scheme & Syllabus

#### Semester I

Course Code	Course Title	Course Type	Load			Marks Distribution		Total	Credits
			L	T	P	Internal	External		
MSFT411-24	Principles of Food Science	DSC	4	0	0	40	60	100	4
MSFT412-24	Food Processing & Preservation	DSC	4	0	0	40	60	100	4
MSFT413-24	Food Analysis and Preservation (Lab) Science	DSC	0	0	4	30	20	50	2
MSFT414-24	Food Microbiology	DSC	4	0	0	40	60	100	4
MSFT415-24	Food Microbiology (Lab)	DSC	0	0	4	30	20	50	2
FIC/Q9005	Industrial Production Worker – Food Processing <sup>#</sup>	QP-NOS	4	0	0	40	60	100	4
SEC111-24	Digital Fluency	SEC-SB	4	0	0	40	60	100	4
SEC112-24	Digital Fluency (Lab)	SEC-SB	0	0	4	30	20	50	2
MSFT416-24	Industrial Visit and FoSTaC course <sup>##</sup>	AECC	0	0	3	40	--	40	3
	<b>Total</b>		<b>20</b>	<b>0</b>	<b>13</b>	330	360	690	29

<sup>#</sup> Students will learn the practical application of Industrial Production Worker – Food Processing skills in the food industry through industrial visits in first semester and summer training after their first year.

<sup>##</sup> FoSTaC - Basic Manufacturing course must be completed from <https://www.skillindiadigital.gov.in/home> or any FSSAI recognized Training center

# SEMESTER- I

**MSFT411-24: Principles of Food Science**

**Total marks: 100**

<b>L</b>	<b>T</b>	<b>P</b>
<b>4</b>	<b>0</b>	<b>0</b>

**Course objective:**

Introduce students to the fundamentals of food science, including its historical development and composition, structure, and nutritional value of foods derived from plants and animals.

**Course outcome:** At the end of the course, the students will be able to

CO1	Explain the basics of food science and technology, and the status of the food industry in India and globally.
CO2	Analyze the functions and changes of nutrients during food processing and storage.
CO3	Describe the properties of water and its impact on food quality and spoilage.
CO4	Evaluate the composition, nutritional value, and processing techniques of plant-based foods.
CO5	Assess the composition, nutritional value, and processing effects on animal-based foods and understand the concept of healthy foods.

**Mapping of Course Outcomes with Program Outcomes:** Formulation of Course Outcomes-Program Outcomes matrix with correlation values as 1 (Low), 2 (Medium), 3 (High)

<b>PO</b> <b>CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>
<b>CO1</b>	3	2	1	3	2
<b>CO2</b>	3	3	2	2	3
<b>CO3</b>	2	2	1	1	3
<b>CO4</b>	3	2	2	2	3
<b>CO5</b>	3	2	2	2	3

Details of the Course Content - Principles of Food Science (MSFT411-24)

Unit	Contents	Contact Hours
I	<p><b>Introduction to Food Science and Fundamentals</b></p> <ol style="list-style-type: none"> <li><b>1. Introduction to Food Science, Food Technology, and Food Engineering:</b> Overview of food science, its importance, and interdisciplinary nature; Distinctions and interrelationships between food science, food technology, and food engineering</li> <li><b>2. Status of the Food Industry in India and Abroad:</b> Current trends and statistics of the food industry in India; Comparison with global food industry trends; Key challenges and opportunities in the food industry</li> <li><b>3. Nutrients and Functions of Food:</b> Carbohydrates, Proteins, Lipids, Vitamins, Minerals: Types, functions, dietary sources, importance in the diet, and Changes in nutrient composition during food processing and storage</li> <li><b>4. Physical Properties of Water and Ice:</b> Chemical nature and structure of the water molecule; Physical properties of water and ice; Absorption phenomena and types of water solutions; Colligative properties of water; Distinction between free and bound water; Water activity and its role in food spoilage; Freezing and ice structure: Impact on food preservation and quality</li> </ol>	12
II	<p><b>Food Dispersions and Plant-Based Foods</b></p> <ol style="list-style-type: none"> <li><b>1. Food Dispersions:</b> Introduction to food dispersions; Structure and classification of different types of food dispersions (e.g., solutions, suspensions, emulsions, gels); Stability factors and mechanisms affecting food dispersions</li> <li><b>2. Cereals and Millets:</b> Definition, types, composition, nutritional value, structure (Wheat and rice), factors affecting and changes in major cereals and millets during processing (cooking and germination)</li> <li><b>3. Pulses:</b> Definition, types, composition, nutritional value, factors affecting and changes in major pulses during processing (Soaking, Germination, Decortication, Cooking, Fermentation); Identification and implications of antinutritional factors in pulses</li> </ol>	11
III	<p><b>Composition and Nutritive Value of Plant-Based Foods</b></p> <ol style="list-style-type: none"> <li><b>1. Nuts &amp; Oilseeds:</b> Definition, types, composition, and nutritional value of nuts and oilseeds; Processing techniques for oilseeds such as soybeans and coconut; Production and applications of protein isolates and texturized vegetable protein (TVP)</li> <li><b>2. Fruits &amp; Vegetables:</b> Definition, classification, composition, and nutritional value of fruits and vegetables; Vegetable cookery: Techniques and nutritional implications; Changes in fruits and vegetables during maturation, ripening, storage, and cooking;</li> </ol>	11



	<p>Concept and mechanisms of enzymatic browning in fruits and vegetables</p> <p>3. <b>Spices &amp; Herbs:</b> Definition, classification, composition, and nutritional value of spices and herbs; Culinary and preservative uses of spices and herbs; Overview of essential oils and oleoresins: Extraction, properties, and applications.</p>	
IV	<p><b>Composition and Nutritive Value of Animal-Based Foods and Health Foods</b></p> <p>1. <b>Eggs:</b> Structure, composition and nutritional value of eggs; Grading and quality assessment of egg; Changes in eggs during cooking and storage</p> <p>2. <b>Meat &amp; Fish:</b> Structure, types, composition and nutritional value of meat and fish; Different processing methods and their effects on meat and fish quality and nutritional value</p> <p>3. <b>Dairy Products:</b> Definition, types, composition, nutritional value of milk; Overview of different types of market milk and milk products; Changes during milk processing such as pasteurization and homogenization; Storage and its effects on milk and milk products</p> <p>4. <b>Health Foods:</b> Functional foods and nutraceuticals; definition, classification and their role in health; Organic foods: Definition and advantages; Genetically modified (GM) foods: Concept and Implications.</p>	14

### Recommended Books and Resources

1. Potter, N. N., & Hotchkiss, J. H. (1998). *Food science* (5th ed.). Springer.
2. DeMan, J. M. (2014). *Principles of food chemistry* (4th ed.). Springer.
3. Manay, N. S., & Shadaksharaswamy, M. (2009). *Food facts and principles*. New Age International.
4. Srilakshmi, B. (2016). *Food science* (4th ed.). New Age International.
5. Frazier, W. C., & Westhoff, D. C. (2008). *Food microbiology* (5th ed.). Tata McGraw-Hill Education.
6. Fellows, P. J. (2017). *Food processing technology: Principles and practice* (4th ed.). Woodhead Publishing.
7. De, S. (2015). *Outlines of dairy technology* (3rd ed.). Oxford University Press.
8. Vaclavik, V. A., & Christian, E. W. (2014). *Essentials of food science* (4th ed.). Springer.
9. Mudambi, S. R., & Rao, S. M. (2007). *Food science*. Oxford University Press
10. Singh, R. P., & Heldman, D. R. (2014). *Food engineering: Fundamentals and applications* (2nd ed.).
11. Sharma, D. (2018). *The food industry in India: Challenges and opportunities*.
12. Whitney, E. N., & Rolfes, S. R. (2018). *Understanding nutrition* (15th ed.).
13. McCain, V. B. (2010). *Water in foods*.
14. Walstra, P. (2003). *Physical chemistry of foods*.
15. Fennema, O. R. (Ed.). (1996). *Food chemistry* (3rd ed.).
16. deMan, J. M. (1999). *Principles of food chemistry* (3rd ed.). Springer.
17. Grumezescu, A. M., & Holban, A. M. (Eds.). (2019). *Handbook of plant-based food and beverage technology*.
18. Li, T. S. C. (2006). *Vegetables and fruits: Nutritional and therapeutic values*.
19. Walstra, P., Wouters, J. T. M., & Geurts, T. J. (2006). *Dairy science and technology* (2nd ed.).
20. Warriss, P. D. (2010). *Meat science: An introductory text* (2nd ed.).

21. Garg, M. L., & Berry Ottaway, P. (Eds.). (2011). *Functional foods: Principles and technology*.
22. Hui, Y. H. (Ed.). (2006). *Handbook of food science, technology, and engineering* (Vols. 1-4).
23. Brennan, J. G. (Ed.). (2006). *Food processing handbook*.
24. Hui, Y. H., Meunier-Goddik, L., Josephsen, J., Nip, W.-K., Stanfield, P. S., & Lam, A. S. T. (Eds.). (2004). *Handbook of food and beverage fermentation technology*.
25. Shortt, C., & O'Brien, J. (Eds.). (2004). *Handbook of functional dairy products*.
26. Shetty, K., Paliyath, G., Pometto, A., & Levin, R. E. (2008). *Food biotechnology* (2nd ed.). CRC Press.
27. Bagchi, D., Misra, L. K., Bagchi, M., & Kothari, S. C. (Eds.). (2014). *Nutraceutical and functional food processing technology* (2nd ed.). CRC Press.

**MSFT412-24: Food Processing & Preservation**

**Total marks: 100**

**L      T      P**

**Course objective:**

Equip students with comprehensive knowledge of historical and modern food preservation techniques, including thermal and non-thermal methods, microbial control, and emerging technologies, to enhance food safety, quality, and shelf life.

**Course outcome:** At the end of the course, the students will be able to

CO1	Understand the historical evolution and principles of food preservation, recognizing its importance in extending shelf life and ensuring food safety.
CO2	Classify various types of foods based on perishability and comprehend the factors influencing their shelf life.
CO3	Identify and explain different types of food spoilage and contaminants, and understand the role of microorganisms in food preservation.
CO4	Analyze and apply thermal and non-thermal preservation methods to maintain food quality and safety.
CO5	Evaluate emerging preservation technologies and their impact on food quality and microbial control.

**Mapping of Course Outcomes with Program Outcomes:** Formulation of Course Outcomes-Program Outcomes matrix with correlation values as 1 (Low), 2 (Medium), 3 (High)

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	1	3	2
CO2	2	2	1	2	3
CO3	3	2	1	2	3
CO4	3	3	2	2	3
CO5	3	3	2	2	3

**Details of the Course Content - Food Processing & Preservation (MSFT412-24)**

Unit	Contents	Contact Hours
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I	<p><b>Introduction to Food Preservation</b></p> <ol style="list-style-type: none"> <li>1. <b>Food Preservation:</b> Historical Perspectives: Early methods of food preservation; Evolution of food preservation technologies; Principles of Food Preservation: Importance and objectives of food preservation.</li> <li>2. <b>Types of Foods and Shelf Life:</b> Classification of foods: Perishable foods, Semi-perishable foods, Shelf-stable foods; Definition of shelf life</li> <li>3. <b>Food Spoilage and Contaminants:</b> Concept and types of spoilage (biological, chemical, physical); Concept, sources and types of contaminants.</li> <li>4. <b>Food Microbiology:</b> Microorganisms associated with foods: bacteria, yeast, mold and their importance in the food industry; Classification and growth curve of microorganisms; Food infection and food intoxication.</li> </ol>	11
II	<p><b>Thermal Preservation Methods</b></p> <ol style="list-style-type: none"> <li>1. <b>Heat Processing:</b> Thermal Processing: Principles of thermal processing, Thermal resistance of microorganisms, Thermal Death Time and Lethality concept, Characterization of heat penetration data, Thermal process calculations; Commercial Heat Preservation Methods: Sterilization and commercial sterilization, Pasteurization and Blanching. Effect of thermal processing on food. Process of canning, Equipment and materials used, Safety and quality control in canning.</li> <li>2. <b>Microwave and Ohmic Heating:</b> Mechanisms and applications, Advantages and limitations. Effects of microwave and ohmic heating on food.</li> <li>3. <b>Drying and Dehydration:</b> Definition, Principles of drying, heat and mass transfer, factors affecting rate of drying, normal drying curve, Types of dryers; Impact on food quality. Psychrometric Charts: Introduction, Data Interpretation and Application.</li> <li>4. <b>Evaporation:</b> Definition and factors affecting evaporation, Types of evaporators used in the food industry</li> </ol>	13
III	<p><b>Non-Thermal Preservation Methods</b></p> <ol style="list-style-type: none"> <li>1. <b>Food Preservation by Low Temperature:</b> Introduction to refrigeration, cool storage, and freezing; Refrigeration: Mechanism and effects on microbial growth, Types of refrigeration systems; Freezing: Principles and equipment, Types of freezing (slow, fast, cryogenic), Freezing curve and quality changes during freezing and storage, Introduction to thawing and its effects on food.</li> <li>2. <b>Chemical Preservation:</b> Types of preservatives, GRAS (Generally Recognized As Safe) substances, Use of chemical preservatives, Safety and regulatory aspects.</li> <li>3. <b>Biological Preservation:</b> Fermentation definition, Principles and benefits, Types of fermented foods.</li> <li>4. <b>Modified Atmosphere Packaging (MAP):</b> Definition, Principles and techniques, Applications and advantages.</li> </ol>	12
IV	<p><b>Emerging Technologies</b></p>	12

	<ol style="list-style-type: none"> <li><b>1. Pulsed Electric Fields (PEF):</b> Principles and applications, Effects on microorganisms and food quality.</li> <li><b>2. Irradiation:</b> Mechanisms and types (gamma rays, X-rays, electron beams), Safety and regulatory concerns.</li> <li><b>3. High-Pressure Processing (HPP):</b> Principles and mechanisms, Impact on microorganisms and food quality, Applications and limitations</li> <li><b>4. Cold plasma technology:</b> Principles and potential applications,</li> </ol>	
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**Recommended Books and Resources**

1. Potter, N. N., & Hotchkiss, J. H. (1998). *Food Science* (5th ed.). Springer.
2. Desrosier, N. W., & Desrosier, J. N. (1987). *The Technology of Food Preservation* (4th ed.). AVI Publishing Company.
3. Fellows, P. (2009). *Food Processing Technology: Principles and Practice* (4th ed.). Woodhead Publishing.
4. Rahman, M. S. (2020). *Handbook of Food Preservation* (3rd ed.). CRC Press.
5. Hui, Y. H. (2006). *Handbook of Food Science, Technology, and Engineering* (Vol. 4). CRC Press.
6. Barbosa-Cánovas, G. V., & Juliano, P. (2008). *Food Engineering: Thermal Processing Systems*. Springer.
7. Singh, R. P., & Heldman, D. R. (2022). *Introduction to Food Engineering* (6th ed.). Academic Press.
8. Heldman, D. R., & Lund, D. B. (2006). *Handbook of Food Engineering* (2nd ed.). CRC Press.
9. Leistner, L., & Gorris, L. G. M. (1995). *Food Preservation by Combined Processes*. CRC Press.
10. Gould, G. W. (2000). *New Methods of Food Preservation*. Springer.
11. Zhang, H. Q., Barbosa-Cánovas, G. V., Balasubramaniam, V. M., Dunne, C. P., Farkas, D. F., & Yuan, J. T. C. (2011). *Nonthermal Processing Technologies for Food*. Wiley-Blackwell.
12. Hendrickx, M., & Knorr, D. (2001). *Ultra High Pressure Treatments of Foods*. Springer.
13. Barbosa-Cánovas, G. V., Tapia, M. S., & Cano, M. P. (2004). *Novel Food Processing Technologies*. CRC Press.
14. Rosenthal, I. (2010). *Pulsed Electric Fields Technology for the Food Industry*. Springer.
15. Heldman, D. R. (2023). *Food Preservation Process Design*. Springer.
16. Ghosh, D., & Kumar, A. (2024). *Emerging Technologies in Food Preservation*. Wiley-Blackwell.
17. Datta, A. K. (2023). *Food Processing and Preservation*. CRC Press.
18. Smith, J. P., & Hongshun, Y. (2022). *Food Processing: Principles and Applications* (3rd ed.). Wiley-Blackwell.

**MSFT513-24: Food Analysis and Preservation (Lab)**

**Total marks: 50**

<b>L</b>	<b>T</b>	<b>P</b>
<b>0</b>	<b>0</b>	<b>4</b>

**Course objective:**

To equip students with practical skills and comprehensive knowledge in the analysis and preservation of food products, ensuring proficiency in laboratory techniques, safety protocols, and quality evaluation methods essential for preserving the food products in the food technology field.

**Course outcome:** At the end of the course, the students will be able to

CO1	Demonstrate proficiency in using laboratory equipment and adhering to safety protocols in a food testing lab.
CO2	Apply fundamental techniques for food sampling, preparation, and proximate as well as physio-chemical analysis.
CO3	Perform microbial analysis, including total plate count, coliform, and E. coli detection, to ensure food safety and quality.
CO4	Evaluate the quality characteristics of various food products preserved by methods such as drying, freezing, blanching, pickling, and canning.
CO5	Compare and contrast conventional and modern food processing methods, and analyze their effects on the nutritional and microbial stability of food products.

**Mapping of Course Outcomes with Program Outcomes:** Formulation of Course Outcomes-Program Outcomes matrix with correlation values as 1 (Low), 2 (Medium), 3 (High)

CO \ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	1	2	3
CO2	3	2	1	2	3
CO3	3	2	1	2	3
CO4	3	2	2	2	3
CO5	3	3	2	2	3

**Details of the Course Content - Food Analysis and Preservation (Lab) (MSFT513-24)**

Practical no.	Contents	Contact Hours
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1*	Overview of the laboratory processes	1
2*	Introduction to the quality analysis process	1
3*	Attributes of an assistant lab technician -Food and Agricultural Commodities and laboratory ethics	1
4*	Prepare and Maintain Work Area and Equipment for Food Lab Testing (FIC/N7601)	1
5*	Prepare for Quality Analysis and Manage Housekeeping for Food Lab Activities (FIC/N7602)	1
6*	Food Safety, Hygiene and Sanitation for Food Lab Testing (FIC/N7605)	1
7*	Sampling and Quality Analysis for Food Lab Activities (FIC/N7603)	2
8*	Complete Documentation and Record Keeping Related to Performing Lab Activities (FIC/N7604)	2
9	Moisture and ash content determination in food samples (Gravimetric method).	2
10	Determination of pH in Various Foods Using pH Meter	2
11	Determination of protein content (Kjeldahl method).	2
12	Estimation of fat content (Soxhlet extraction method).	2
13	Determination of dietary fibre content in food samples.	2
14	Estimation of total carbohydrate content in food samples (Titrimetric or spectrophotometric method).	2
15	Identification and Classification of Cereals and Millets.	2
16	Quality Evaluation of Spices and Condiments.	2
17	Quality Characteristics of Foods Preserved by Drying/Dehydration.	2
18	Quality Characteristics of Frozen Foods.	2
19	Blanching of Vegetables and Its Effects.	2
20	Pickling Process and Quality Analysis.	2
21	Comparison of Conventional and Microwave Processing of Foods.	2
22	Preservation of Food by Canning and Cut-Out Analysis.	2

\*Mandatory to teach from FIC/Q7601 manual

### **Recommended Books and Resources**

1. FICSI. FIC/Q7601- Assistant Lab Technician Food and Agricultural Commodities.
2. Food Safety and Standards Authority of India (FSSAI). (n.d.). Manual of Methods of Analysis for Various Food Products. Retrieved from <https://fssai.gov.in/cms/manuals-of-methods-of-analysis-for-various-food-products.php>.
3. Food Analysis Laboratory Manual (In-house developed manual with specific methods).
4. American Public Health Association, American Water Works Association, & Water Environment Federation. (2017). Standard Methods for the Examination of Water and Wastewater (23rd ed.). Washington, DC: American Public Health Association.
5. Food Safety and Standards Authority of India (FSSAI). (2018). Manual on Food Safety Laboratory Practices. New Delhi, India: FSSAI.
6. International Organization for Standardization (ISO). (n.d.). ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories. Geneva, Switzerland: ISO.
7. AOAC International. (2019). Official Methods of Analysis of AOAC International (21st ed.). Gaithersburg, MD: AOAC International.
8. Prosky, L., Asp, N.-G., Schweizer, T. F., DeVries, J. W., & Furda, I. (1985). Determination of Insoluble, Soluble, and Total Dietary Fiber in Foods and Food Products: Interlaboratory Study. *Journal of the Association of Official Analytical Chemists*, 68(4), 677-679.
9. American Spice Trade Association. (2000). ASTA Method of Analysis. Washington, DC: American Spice Trade Association.
10. Nielsen, S. S. (Ed.). (2010). *Food analysis* (4th ed.). Springer.
11. Sarker, D. K., & Nahar, N. (Eds.). (2016). *Handbook of food analysis* (3rd ed.). CRC Press.

12. BeMiller, J. N., & Whistler, R. L. (Eds.). (2009). *Carbohydrate chemistry for food scientists* (3rd ed.). AACC International.
13. Yanniotis, S., & Taoukis, P. (Eds.). (2013). *Food process monitoring and control* (1st ed.). Woodhead Publishing.
14. Wrolstad, R. E., Acree, T. E., Decker, E. A., Penner, M. H., Reid, D. S., Schwartz, S. J., Shoemaker, C. F., & Smith, D. M. (Eds.). (2019). *Handbook of food analytical chemistry* (1st ed.). Wiley.
15. Valero, D., & Valverde, J. M. (Eds.). (2012). *Postharvest biology and technology of horticultural crops: Principles and practices for quality maintenance* (1st ed.). Woodhead Publishing.
16. Nollet, L. M. L., & Toldrá, F. (Eds.). (2012). *Handbook of analysis of active compounds in functional foods* (1st ed.). CRC Press.
17. Smith, J. L., & Charter, E. R. (Eds.). (2012). *Food chemical safety* (1st ed.). Springer.
18. Velasco, V., & Meléndez-Martínez, A. J. (Eds.). (2010). *Handbook of food science, technology, and engineering* (4th ed.). CRC Press.
19. Nielsen, S. S. (Ed.). (2016). *Food analysis laboratory manual* (2nd ed.). Springer.

**MSFT414-24: Food Microbiology**

**Total marks: 100**

**L      T      P**



**Course objective:**

To comprehensively understand the role, significance, and classification of microorganisms in food, their growth, nutrition, and impact, along with advanced practices for preservation, microbial inactivation, factors affecting microbial proliferation, spoilage, fermentation, public health implications, and adherence to food safety standards.

**Course outcome:** At the end of the course, the students will be able to

CO1	Demonstrate an understanding of the historical developments, classification systems, and differentiation between procaryotes and eucaryotes in microbiology.
CO2	Analyze the types of microorganisms associated with food and their impact on food contamination, spoilage, and safety during handling and processing.
CO3	Identify intrinsic and extrinsic factors affecting microbial growth and apply advanced preservation techniques to control food spoilage.
CO4	Evaluate the role and significance of fermentation in food microbiology, including the production of fermented foods and beverages.
CO5	Assess public health implications of foodborne illnesses, microbial toxins, and implement food safety standards such as HACCP and hurdle technology.

**Mapping of Course Outcomes with Program Outcomes:** Formulation of Course Outcomes-Program Outcomes matrix with correlation values as 1 (Low), 2 (Medium), 3 (High)

<b>CO \ PO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>
<b>CO1</b>	3	2	1	2	2
<b>CO2</b>	3	2	1	2	3
<b>CO3</b>	3	2	1	2	3
<b>CO4</b>	3	2	2	2	3
<b>CO5</b>	3	2	2	2	3

**Details of the Course Content - Food Microbiology (MSFT414-24)**

Unit	Contents	Contact Hours
I	Introduction to microbiology: Historical developments, Classification – A brief account, basis of classification. Three and five kingdom classification, Prokaryotes and Eucaryotes. Microbial growth and nutrition. Introduction to food microbiology: Classification of microbes, Types of micro-organism normally associated with food- mold, yeast, and bacteria. Contamination of foods- vegetables, cereals, pulses, oilseeds, milk and meat during handling and processing. Best Practices to Avoid Food Spoilage, Microbiological Hazards	12
II	Factors affecting microbial growth: Intrinsic and extrinsic factors, Biochemical changes caused by micro-organisms, deterioration of various types of food product. Microbiology of food preservation, heating process, irradiation, low temperature storage, chemical preservatives, high-pressure processing, control of water activity.	12
III	Fermented and microbial foods: Fermented milk and milk products, fermented fruits and vegetables, fermented meat and fish products, fermented beverages (beer, vinegar and wine), single cell protein.	12
IV	Food microbiology and public health: food poisoning and microbial toxins, types of food poisonings. Bacterial agents of food borne illness. Non-bacterial agents of food borne illness- poisonous algae, fungi and food borne viruses. Microbial standards for different foods. HACCP and food safety, hurdle technology and its applications. Microbiological Food Safety Standards and Regulations. Food Safety and Hygiene Audits	12

### Recommended Books and Resources

1. Frazier, W. C., & Westhoff, D. C. (2015). **Food Microbiology** (5th ed.). Tata McGraw Hill Publication, New Delhi.
2. Adams, M. R., & Moss, M. O. (2016). **Food Microbiology** (4th ed.). Royal Society of Chemistry, Cambridge.
3. James, M. J., Loessner, M. J., & Golden, D. A. (2018). **Modern Food Microbiology** (8th ed.). Springer.
4. Stanier, R. Y. (2006). **General Microbiology** (5th ed.). MacMillan, Hampshire.
5. Creager, J. G., Black, J. G., & Davison, V. E. (1990). **Microbiology: Principles & Applications**. Prentice Hall, New Jersey.
6. Battcock, M., & Azam-Ali, S. (1998). **Fermented Fruits and Vegetables: A Global Perspective**. FAO Agricultural Services Bulletin No. 134.
7. Campbell-Platt, G. (2017). **Fermented Foods of the World: A Dictionary and Guide**. Butterworth-Heinemann.
8. Doyle, M. P., & Beuchat, L. R. (2019). **Food Microbiology: Fundamentals and Frontiers** (4th ed.). ASM Press.
9. Fellows, P. J. (2017). **Food Processing Technology: Principles and Practice** (4th ed.). Woodhead Publishing.
10. Forsythe, S. J. (2010). **The Microbiology of Safe Food** (2nd ed.). Wiley-Blackwell.
11. Leistner, L., & Gorris, L. G. M. (1995). **Food Preservation by Hurdle Technology**. Springer.
12. Madigan, M. T., & Martinko, J. M. (2018). **Biology of Microorganisms** (15th ed.). Pearson.

13. Madigan, M. T., Martinko, J. M., Bender, K. S., Buckley, D. H., & Stahl, D. A. (2018). **Brock Biology of Microorganisms** (15th ed.). Pearson.
14. Mead, P. S., Slutsker, L., Dietz, V., McCaig, L. F., Bresee, J. S., Shapiro, C., ... & Tauxe, R. V. (1999). **Food-Related Illness and Death in the United States**. *Emerging Infectious Diseases*, 5(5), 607-625.
15. Motarjemi, Y., & Adams, M. (2006). **Emerging Foodborne Pathogens**. CRC Press.
16. Pelczar, M. J., Chan, E. C. S., & Krieg, N. R. (2008). **Microbiology** (5th ed.). McGraw-Hill.
17. Ray, B., & Bhunia, A. (2013). **Fundamental Food Microbiology** (5th ed.). CRC Press.
18. Sperber, W. H., & Doyle, M. P. (2009). **Compendium of the Microbiological Spoilage of Foods and Beverages**. Springer.
19. Tortora, G. J., Funke, B. R., & Case, C. L. (2020). **Microbiology: An Introduction** (14th ed.). Pearson.

**Total marks: 50**

<b>L</b>	<b>T</b>	<b>P</b>
<b>0</b>	<b>0</b>	<b>4</b>

**Course objective:**

To equip students with the skills necessary to establish and sustain microbiological laboratories, encompassing the operation and maintenance of laboratory equipment, implementation of sterilization techniques, application of precise sampling methods, adherence to aseptic practices, maintenance of microbial cultures, and execution of comprehensive microbiological analyses for food and water quality assurance.

**Course outcome:** At the end of the course, the students will be able to

CO1	Gain proficiency in establishing and sustaining microbiological laboratories, including the operation and maintenance of essential lab equipment.
CO2	Develop the ability to maintain high standards of hygiene and sanitation within the work area to ensure a contamination-free environment.
CO3	Master the preparation of culture media, sterilization using autoclaves, and conducting aseptic sampling and inoculation procedures.
CO4	Acquire skills in various microbiological analysis techniques, including staining, dilution, bacterial isolation, and the testing of food and water samples.
CO5	Be capable of maintaining pure microbial cultures, accurately reporting test results, and conducting environmental monitoring in food processing units for quality assurance.

**Mapping of Course Outcomes with Program Outcomes:** Formulation of Course Outcomes-Program Outcomes matrix with correlation values as 1 (Low), 2 (Medium), 3 (High)

PO CO	PO1	PO2	PO3	PO4	PO5
<b>CO1</b>	3	2	2	2	3
<b>CO2</b>	3	2	2	2	3
<b>CO3</b>	3	2	1	2	3
<b>CO4</b>	3	2	2	2	3
<b>CO5</b>	3	2	2	2	3

### Details of the Course Content - Food Microbiology (Lab) (MSFT515-24)

Practical no.	Contents	Contact Hours
1*	Prepare and Maintain Work Area and Lab Equipment (FIC/N7609) a. Setting up Microbiological Laboratory b. Working Principle, Operations and Maintenance of Tools, Equipment and Glassware c. Maintaining Hygiene and Sanitation at Work Area	3
2*	Culture Media Preparation	1
3*	Sterilization Using Autoclave	1
4*	Sampling for Microbiological Assay	1
5*	Preparation of the workspace (Laminar Air Flow Cabinet)	1
6*	Aseptic Sample Inoculation	1
7*	Pure Culture Maintenance	2
8*	Reporting Microbiological Test Results	2
9*	Environmental Monitoring in Food Processing Units	2
10*	Quality Assurance (QA) Programme for Food Microbiology Laboratory	2
11	Bright field microscopy and examination of living micro-organisms	2
12	Direct microscopic count of micro-organisms– use of Neubauer counting chamber	2
13	Staining techniques: a. Simple staining, b. Gram staining, c. Spore staining and d. Negative staining etc.,	4
14	Dilution technique.	2
15	Isolation of bacteria by a. Serial dilution (streak plate), b. Pour plating and spreading, c. Bacterial population count- standard plate count.	3
16	Microbiological analysis of food products- i. Bacterial count, ii. Yeast and mold count, iii. Coliform count, iv. Standard plate count of milk and direct microscopic count of milk, v. Reductase Test (MBRT).	4
17	Microbiological testing of water- I. Quantitative test, ii. Bacteriological quality testing (MPN).	2

\*Mandatory to teach from [FIC/Q7603 manual](#)

#### **Recommended Books and Resources**

1. FICSI. FIC/Q7603- Food Microbiologist.
2. Food Safety and Standards Authority of India (FSSAI). (2021). Food Safety and Standards (Food Product Standards and Food Additives) Regulations. Retrieved from <https://www.fssai.gov.in/>
3. Bureau of Indian Standards (BIS). (2018). IS 5403: 1999 Methods for Yeast and Mould Count of Foodstuffs and Animal Feeds. Retrieved from <https://www.bis.gov.in/>
4. AGMARK. (2021). Agricultural Produce (Grading and Marking) Act, 1937. Retrieved from <https://dmi.gov.in/gradesstandards.aspx>

5. International Organization for Standardization (ISO). (2016). ISO 4833-1:2013 Microbiology of the food chain — Horizontal method for the enumeration of microorganisms — Part 1: Colony count at 30 degrees C by the pour plate technique. Retrieved from <https://www.iso.org/>
6. AOAC International. (2020). Official Methods of Analysis of AOAC INTERNATIONAL. Retrieved from <https://www.aoac.org/official-methods-of-analysis-21st-edition-2019/>
7. Vanderzant, C., & Splittstoesser, D. F. (1992). Compendium of methods for the microbiological examination of foods. American Public Health Association.
8. Adams, M. R., & Moss, M. O. (2008). Food Microbiology. Royal Society of Chemistry.
9. Jay, J. M., Loessner, M. J., & Golden, D. A. (2005). Modern Food Microbiology. Springer.
10. FSSAI. (2020). Manual of Methods of Analysis of Foods - Microbiological Testing. Retrieved from <https://www.fssai.gov.in/>
11. ISO. (2017). ISO 21528-2:2017 Microbiology of the food chain — Horizontal method for the detection and enumeration of Enterobacteriaceae — Part 2: Colony-count technique. Retrieved from <https://www.iso.org/>
12. Cappuccino, J. G., & Sherman, N. (2013). Microbiology: A Laboratory Manual. Pearson.
13. Willey, J. M., Sherwood, L., & Woolverton, C. J. (2017). Prescott's Microbiology. McGraw-Hill Education.
14. FSSAI. (2021). Hygiene and Sanitation Guidelines for Food Processing Units. Retrieved from <https://www.fssai.gov.in/>
15. European Food Safety Authority (EFSA). (2019). Microbiological Risk Assessment Guidance for Food Safety. Retrieved from <https://www.efsa.europa.eu/>
16. National Center for Biotechnology Information (NCBI). (2020). Methods of Microbial Analysis. Retrieved from <https://www.ncbi.nlm.nih.gov/>
17. Food and Agriculture Organization (FAO). (2021). Food Microbiology and Safety. Retrieved from <https://www.fao.org/>
18. Bacteriological Analytical Manual (BAM). (2021). US FDA's Bacteriological Analytical Manual. Retrieved from <https://www.fda.gov/>
19. National Institute of Food and Agriculture (NIFA). (2020). Food Safety and Microbiology. Retrieved from <https://nifa.usda.gov/>
20. Merck Microbiology Manual. (2018). Microbiological Culture Media: Principles and Practice. Retrieved from <https://www.merckgroup.com/>
21. Society for Applied Microbiology (SfAM). (2020). Guidelines for Microbiological Quality Assurance in Food Laboratories. Retrieved from <https://www.sfam.org.uk/>
22. Royal Society of Biology. (2021). Microbiology Teaching Resources. Retrieved from <https://www.rsb.org.uk/>
23. National Institute of Standards and Technology (NIST). (2020). Microbiological Testing Standards. Retrieved from <https://www.nist.gov/>
24. ASM International. (2021). Microbial Testing Guidelines. Retrieved from <https://www.asm.org/>
25. WHO. (2021). Guidelines for the Safe Use of Wastewater, Excreta and Greywater in Agriculture. Retrieved from <https://www.who.int/>
26. FDA. (2020). Guidance for Industry: Microbiological Considerations for Food and Beverages. Retrieved from <https://www.fda.gov/>

**Total marks: 100**

<b>L</b>	<b>T</b>	<b>P</b>
<b>4</b>	<b>0</b>	<b>0</b>

**Course objective:**

To equip students with comprehensive training aligned to the Qualification Pack for Industrial Production Worker - Food Processing (FIC/Q9005) and Food Product Handler (FIC/Q9010) at NSQF level 2, covering understanding of industry standards, proficiency in hygiene and safety, practical skills in machinery operation and maintenance, and knowledge of documentation and compliance practices.

**Course outcome:** At the end of the course, the students will be able to

CO1	Demonstrate comprehensive knowledge of the food processing industry, including its organizational standards, norms, and regulatory requirements.
CO2	Exhibit proficiency in maintaining high standards of personal hygiene and workplace ethics as per food safety guidelines.
CO3	Possess practical skills in cleaning, sanitizing, and maintaining work areas and processing machinery to ensure optimal production conditions.
CO4	Competently operate and troubleshoot various processing machinery used in bakery, fruits and vegetable processing, milk and milk products, and meat processing industries.
CO5	Understand the importance of documentation and record-keeping in maintaining quality standards and regulatory compliance within food processing operations.

**Mapping of Course Outcomes with Program Outcomes:** Formulation of Course Outcomes-Program Outcomes matrix with correlation values as 1 (Low), 2 (Medium), 3 (High)

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	2	3	3
CO2	3	2	3	2	3
CO3	3	2	2	2	3
CO4	3	2	2	2	3
CO5	3	2	2	3	3

**Details of the Course Content -Industrial Production Worker – Food Processing (FIC/Q9005)**

Unit	Contents	Contact Hours
I	<p><b>Introduction to the Training Program of Industrial Production Worker - Food Processing and (based on the Qualification Pack (QP) code FIC/Q9005) and Overview of Food Processing Industry (FIC/N9020):</b> Introduction to the training program; Food Processing and Technology: An overview, Classification of Food and Agro-Processing Industry</p> <p><b>Organizational Standards and Norms (CSC/N1336):</b> Roles and Responsibilities Industrial Production Worker - Food Processing; Knowledge and understanding of the organization; Workplace ethics; Personal hygiene guidelines for food handlers; Food Safety and hygienic standards for workplace</p>	12
II	<p><b>Prepare And Maintain Work Area And Processing Machineries For Production (FIC/N9020):</b> Cleaning and sanitation; Prepare and maintain the work area and processing machineries for the production process; Machine maintenance and troubleshooting; Waste management</p> <p><b>The Production Process (FIC/N9020):</b> Operation of machineries and equipment's; Post Production cleaning and storage of tools</p>	12
III	<p><b>The Production Process (FIC/N9020):</b> Manufacturing Process and Controls in Bakery industry, Fruits and Vegetable Processing industry, milk and milk products processing industry, meat processing industry</p> <p><b>Documentation And Record Keeping (FIC/N9020):</b> Need of documentation and record keeping; Process of documenting records</p>	12
IV	<p><b>Basic Health And Safety Practices At Food Processing Workplace (FIC/N9002):</b> Workplace safety, Types of Safety and safety measures, Methods to build safety in daily operations, Emergency response and evacuation, Rescue techniques during emergency, Basic first aid methods , Methods of accident prevention, Managing the safety hazards in different industries</p>	12

**Recommended Books and Resources**

1. F Food Industry Capacity & Skill Initiative (FICSI). (2023). *Industrial Production Worker – Food Processing*.  
[https://www.ficsi.in/upload/participant\\_handbook/PH\\_English\\_Industrial%20Production%20Worker\\_FICQ9005\\_V3.0.pdf](https://www.ficsi.in/upload/participant_handbook/PH_English_Industrial%20Production%20Worker_FICQ9005_V3.0.pdf)
2. F Food Industry Capacity & Skill Initiative (FICSI). (2023). *Food Product Handler PH V.10: English*.  
[https://www.ficsi.in/upload/participant\\_handbook/Food%20Product%20Handler%20PH%20V.10-%20English.pdf](https://www.ficsi.in/upload/participant_handbook/Food%20Product%20Handler%20PH%20V.10-%20English.pdf)



3. Food Safety and Standards Authority of India. (2022). *Food Safety and Standards (Licensing and Registration of Food Businesses) Regulations, 2011*. Retrieved from <https://www.fssai.gov.in>
4. Bureau of Indian Standards. (2018). *IS 14596: Food Hygiene - General Principles - Code of Practice*. Retrieved from <https://www.bis.gov.in>
5. AGMARK. (2021). *Agricultural Produce (Grading and Marking) Act, 1937*. Retrieved from <https://agmarknet.gov.in>
6. International Organization for Standardization. (2018). *ISO 22000:2018 - Food Safety Management Systems - Requirements for Any Organization in the Food Chain*. Retrieved from <https://www.iso.org>
7. International Organization for Standardization. (2018). *ISO 19011:2018 - Guidelines for Auditing Management Systems*. Retrieved from <https://www.iso.org>
8. Food Safety and Standards Authority of India. (2022). *Training Videos*. Retrieved from <https://www.fssai.gov.in/home/training/videos.html>
9. Bureau of Indian Standards. (2022). *BIS Standards*. Retrieved from <https://www.standards.bis.gov.in>
10. International Organization for Standardization. (2022). *ISO Standards*. Retrieved from <https://www.iso.org/standards.html>
11. *Food Processing Machinery Standards*. (2022). Retrieved from <https://www.nsf.org/knowledge-library/food-equipment-standards>
12. National Qualifications Register. (2022). *FIC/N9020: Monitor the food production on a mechanized production line for processed food items*. Retrieved from <https://www.nqr.gov.in/qualification-title/nqr-title/fic/n9020>
13. National Qualifications Register. (2022). *FIC/N9002: Use basic health and safety practices at a food processing workplace*. Retrieved from <https://www.nqr.gov.in/qualification-title/nqr-title/fic/n9002>
14. National Qualifications Register. (2022). *CSC/N1336: Work effectively with others*. Retrieved from <https://www.nqr.gov.in/qualification-title/nqr-title/csc/n1336>
15. FICSI - Food SSC (2022). *Overview of Food Processing Industry*. Retrieved from <https://youtu.be/wMu0EpUgCd4>
16. FICSI - Food SSC. (2022). *Industrial Production Worker*. Retrieved from <https://youtu.be/0tThA3DYX2c>
17. FICSI - Food SSC. (2022). *Introduction to Bread & Bakery Industry*. Retrieved from <https://youtu.be/mcpVs3CVNIw>
18. FICSI - Food SSC. (2022). *Overview of fruits and vegetable processing*. Retrieved from <https://youtu.be/hW10tq2fWfY>
19. FICSI - Food SSC. (2022). *Overview of Dairy Industry*. Retrieved from <https://youtu.be/4XuvGYvKGnE>
20. FICSI - Food SSC. (2022). *Overview of Meat and Poultry Industry*. Retrieved from <https://youtu.be/UZ7nMyVQWCU>
21. FICSI - Food SSC. (2022). *Documentation and record keeping in food processing unit*. Retrieved from <https://youtu.be/HesWbNFSQS4>
22. FICSI - Food SSC. (2022). *Introduction to entrepreneurship*. Retrieved from <https://youtu.be/BzeoC3mSDgg>
23. FICSI - Food SSC. *Traits of Entrepreneur*. Retrieved from <https://youtu.be/3uEqWH9oWls>

**SEC111-24: Digital Fluency**

**Total marks: 100**

<b>L</b>	<b>T</b>	<b>P</b>
<b>4</b>	<b>0</b>	<b>0</b>

**Course objective:**

Equip students with comprehensive digital fluency, encompassing fundamental computer skills, effective digital communication and collaboration, office productivity tools, e-learning, digital content creation, e-commerce, cybersecurity, emerging technologies, and ethical considerations to proficiently navigate and leverage the digital landscape.

**Course outcome:** At the end of the course, the students will be able to

CO1	Demonstrate a thorough understanding of digital fluency, including the use of essential digital tools and platforms.
CO2	Exhibit proficiency in basic computer skills, operating systems, and file management.
CO3	Apply effective digital communication techniques and utilize office productivity tools for various professional tasks.
CO4	Create and manage digital content, engage in e-commerce transactions securely, and understand cybersecurity measures.
CO5	Analyze and evaluate the impact of digital emerging technologies on the food industry and society, while adhering to ethical and legal standards in the digital world.

**Mapping of Course Outcomes with Program Outcomes:** Formulation of Course Outcomes-Program Outcomes matrix with correlation values as 1 (Low), 2 (Medium), 3 (High)

<b>CO \ PO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>
<b>CO1</b>	2	2	3	2	2
<b>CO2</b>	2	2	3	2	2
<b>CO3</b>	2	2	3	2	2
<b>CO4</b>	3	2	3	2	3
<b>CO5</b>	3	3	2	3	3

**Details of the Course Content - Digital Fluency (SEC111-24)**

Unit	Contents	Contact Hours
I	<p><b>Introduction to Digital Fluency and Basic Computer Skills</b></p> <ol style="list-style-type: none"> <li>1. <b>Introduction to Digital Fluency:</b> Importance of digital fluency, Overview of digital tools and platforms</li> <li>2. <b>Basic Computer Skills:</b> An Overview of the Computer, Block Diagram of the Computer, Evolution and Generations of Computers, Software and its types, Operating systems: types of operating systems: Windows, macOS, Linux; major functions of the operating systems; File management and organization.</li> </ol>	10
II	<p><b>Digital Communication and Collaboration</b></p> <ol style="list-style-type: none"> <li>1. <b>Digital Communication:</b> Email etiquette and management; Online communication tools: messaging apps, and video conferencing; Netiquette and digital footprint</li> <li>2. <b>Office Productivity Tools:</b> Creating and Editing: Word processing (Microsoft Word, Google Docs), Spreadsheets (Microsoft Excel, Google Sheets), Presentations (Microsoft PowerPoint, Google Slides), Google form: Creating and analysis of response; Google Drive- uploading and sharing of files and folders.</li> </ol>	12
III	<p><b>E-learning, Digital Content Creation, E-commerce and Security Aspects</b></p> <ol style="list-style-type: none"> <li>1. <b>E-learning:</b> Introduction to e-learning platforms such as Swayam and MOOC.</li> <li>2. <b>Digital Content Creation:</b> Basics of graphic design (Canva); Video creation and editing</li> <li>3. <b>E-Commence:</b> Basic Web Commerce Concept, E- payment methods: E-cash Payment System, Credit Payment System, Types of Electronic Payment Systems: Credit Card • Debit Card • Smart Card • E-Money • Electronic Fund Transfer (EFT).</li> <li>4. <b>Cyber Security and Online Privacy:</b> Threats and Prevention, Viruses and its types, Antivirus, HTTP vs HTTPS, Firewall, Cookies, Hackers and Crackers, Safe browsing practices, Protecting personal information online</li> </ol>	14
IV	<p><b>Emerging Technologies and Ethical Issues</b></p> <p><b>Emerging Technologies:</b> Introduction to emerging technologies and their applications in the food industry- Artificial Intelligence, IoT, Cloud Computing, Machine learning, Big Data, Blockchain, ChatGPT; Impact of emerging technologies on society; Future trends in technology</p> <p><b>Ethical and Legal Issues in the Digital World:</b> Understanding digital rights and responsibilities; Intellectual property and copyright issues; Ethical considerations in digital technology</p>	12

### **Recommended Books and Resources**

1. Fundamentals of computers - V. Rajaraman - Prentice- Hall of India.
2. Computer Fundamentals - P. K. Sinha Publisher: BPB Publications
3. Digital Promise. Digital literacy. Retrieved from <https://digitalpromise.org/initiative/digital-literacy/>
4. Norton, P. (2018). Introduction to Computers. McGraw-Hill Education.
5. Shelly, G. B., & Vermaat, M. E. (2012). Discovering Computers: Fundamentals. Cengage Learning.
6. Coursera. Email Etiquette: Tips and Tricks for Professionals. Retrieved from <https://www.coursera.org/learn/email-etiquette>
7. Poatsy, M. A., & Mulbery, K. (2019). Exploring Microsoft Office 2019 Introductory. Pearson.
8. Microsoft Office Support. Retrieved from <https://support.microsoft.com/en-us/office>
9. LinkedIn Learning. Office 365 Essential Training. Retrieved from <https://www.linkedin.com/learning/office-365-essentials>
10. Bates, A. W. (2019). Teaching in a Digital Age: Guidelines for Designing Teaching and Learning. Tony Bates Associates Ltd.
11. SWAYAM. Retrieved from <https://swayam.gov.in/> & <https://www.aicte-india.org/bureaus/swayam>
12. edX. Introduction to MOOCs. Retrieved from <https://www.edx.org/>
13. Canva Design School. Retrieved from <https://www.canva.com/learn/>
14. Adobe Creative Cloud. Video Production and Editing. Retrieved from <https://www.adobe.com/creativecloud/video/discover.html>
15. Laudon, K. C., & Traver, C. G. (2020). E-Commerce 2020: Business, Technology, Society. Pearson.
16. Coursera. Introduction to E-Commerce. Retrieved from <https://www.coursera.org/learn/e-commerce>
17. Stallings, W. (2020). Network Security Essentials: Applications and Standards. Pearson.
18. Cybersecurity & Infrastructure Security Agency (CISA). (n.d.). Retrieved from <https://www.cisa.gov/>
19. Russell, S., & Norvig, P. (2020). Artificial Intelligence: A Modern Approach. Pearson.
20. Coursera. Introduction to AI. Retrieved from <https://www.coursera.org/learn/ai>
21. Spinello, R. A., & Tavani, H. T. (2016). Cyberethics: Morality and Law in Cyberspace. Jones & Bartlett Learning.
22. Quinn, M. J. (2016). Ethics for the Information Age. Pearson.
23. edX. Cybersecurity and Privacy. Retrieved from <https://www.edx.org/course/cybersecurity-and-privacy-in-the-iot>.
24. Digital 101 Course offered by Future Skill Prime Platform <https://learn.futureskillsprime.in/>
25. Gmail Creating links:
26. <https://clubrunner.blob.core.windows.net/00000000961/en-ca/files/homepage/how-to- create-a-gmail-account/HowtoCreateaGmailAccount.pdf>
27. Google Forms: [https://pdst.ie/sites/default/files/Google%20Drive\\_1.pdf](https://pdst.ie/sites/default/files/Google%20Drive_1.pdf)
28. Google Meet: <https://edvance.hawaii.hawaii.edu/wp-content/uploads/Google-Meet- Tutorial-Getting-Started-and-Recording-a-Lecture.pdf>
29. Security Aspects - <https://ncert.nic.in/textbook/pdf/lcsl112.pdf>
30. E-Commence: <http://www.aagasc.edu.in/cs/msccs/ECommerce%20Unit%201.pdf>
31. E- payment methods: <http://www.dspmuranchi.ac.in/pdf/Blog/e%20business%20UnitIII,%20%202020.pdf>

### SEC112-24: Digital Fluency (Lab)

**Total marks: 50**

<b>L</b>	<b>T</b>	<b>P</b>
<b>0</b>	<b>0</b>	<b>4</b>

**Course objective:**

To equip students with practical skills and comprehensive knowledge in the analysis and preservation of food products, ensuring proficiency in laboratory techniques, safety protocols, and quality evaluation methods essential for preserving the food products in the food technology field.

**Course outcome:** At the end of the course, the students will be able to

CO1	Demonstrate proficiency in using laboratory equipment and adhering to safety protocols in a food testing lab.
CO2	Apply fundamental techniques for food sampling, preparation, and proximate as well as physio-chemical analysis.
CO3	Perform microbial analysis, including total plate count, coliform, and E. coli detection, to ensure food safety and quality.
CO4	Evaluate the quality characteristics of various food products preserved by methods such as drying, freezing, blanching, pickling, and canning.
CO5	Compare and contrast conventional and modern food processing methods, and analyze their effects on the nutritional and microbial stability of food products.

**Mapping of Course Outcomes with Program Outcomes:** Formulation of Course Outcomes-Program Outcomes matrix with correlation values as 1 (Low), 2 (Medium), 3 (High)

PO CO	PO1	PO2	PO3	PO4	PO5
<b>CO1</b>	3	2	1	2	3
<b>CO2</b>	3	2	1	2	3
<b>CO3</b>	3	2	1	2	3
<b>CO4</b>	3	2	1	2	3
<b>CO5</b>	3	3	2	2	3

### Details of the Course Content - Digital Fluency- Lab (SEC112-24)

Practical no.	Contents	Contact Hours
1	Identifying the configuration and version of a computer system (PC), laptop, and a mobile phone.	3
2	Finding the background and foreground processes on Task manager.	2
3	Translating English into Punjabi/Hindi words in Google embedded with AI.	2
4	Use Google assistant on any android smartphone to dictate commands and to launch apps	2
5	Downloading your e-aadhar, mask e-aadhar and locked e-aadhar.	2
6	Creating resume in Word processor.	2
7	Creating powerpoint presentation for your department introduction and apply transitions and animations.	2
8	Create your marksheet in Microsoft Excel.	2
9	Simple computation using spread sheet.	2
10	Create an email-ID and sending and forwarding.	2
11	Attaching files and downloading files in email.	2
12	Creating a Google form and send it to Ten users.	2
13	Scheduling a virtual meet and invite peoples to join the Google meet/Zoom/skype.	2
14	Creating a hotspot from a mobile phone, and allowing others to use the hotspot.	2
15	Sign in and create account e-learning platforms such as Swayam and MOOC.	2
16	Creating an account on the railway reservation website, IRCTC, and finding trains and running status.	2
17	Demo of online order placing for books using Flipkart/Amazon, etc.	2
18	Install any antivirus app on your mobile and scan.	2
19	Demonstrate unsecured (HTTP) and secured (HTTPS) websites	2
20	Demonstrate setup of printer, scanner and projector with laptop or PC	2

### Recommended Books and Resources

1. Fundamentals of computers - V. Rajaraman - Prentice- Hall of India.
2. Computer Fundamentals - P. K. Sinha Publisher: BPB Publications
3. Digital Promise. Digital literacy. Retrieved from <https://digitalpromise.org/initiative/digital-literacy/>
4. Norton, P. (2018). Introduction to Computers. McGraw-Hill Education.
5. Shelly, G. B., & Vermaat, M. E. (2012). Discovering Computers: Fundamentals. Cengage Learning.
6. Coursera. Email Etiquette: Tips and Tricks for Professionals. Retrieved from <https://www.coursera.org/learn/email-etiquette>
7. Poatsy, M. A., & Mulbery, K. (2019). Exploring Microsoft Office 2019 Introductory. Pearson.
8. Microsoft Office Support. Retrieved from <https://support.microsoft.com/en-us/office>
9. LinkedIn Learning. Office 365 Essential Training. Retrieved from <https://www.linkedin.com/learning/office-365-essentials>
10. Bates, A. W. (2019). Teaching in a Digital Age: Guidelines for Designing Teaching and Learning. Tony Bates Associates Ltd.

11. SWAYAM. Retrieved from <https://swayam.gov.in/> & <https://www.aicte-india.org/bureaus/swayam>
12. edX. Introduction to MOOCs. Retrieved from <https://www.edx.org/>
13. Canva Design School. Retrieved from <https://www.canva.com/learn/>
14. Adobe Creative Cloud. Video Production and Editing. Retrieved from <https://www.adobe.com/creativecloud/video/discover.html>
15. Laudon, K. C., & Traver, C. G. (2020). E-Commerce 2020: Business, Technology, Society. Pearson.
16. Coursera. Introduction to E-Commerce. Retrieved from <https://www.coursera.org/learn/e-commerce>
17. Stallings, W. (2020). Network Security Essentials: Applications and Standards. Pearson.
18. Cybersecurity & Infrastructure Security Agency (CISA). (n.d.). Retrieved from <https://www.cisa.gov/>
19. Russell, S., & Norvig, P. (2020). Artificial Intelligence: A Modern Approach. Pearson.
20. Coursera. Introduction to AI. Retrieved from <https://www.coursera.org/learn/ai>
21. Spinello, R. A., & Tavani, H. T. (2016). Cyberethics: Morality and Law in Cyberspace. Jones & Bartlett Learning.
22. Quinn, M. J. (2016). Ethics for the Information Age. Pearson.
23. edX. Cybersecurity and Privacy. Retrieved from <https://www.edx.org/course/cybersecurity-and-privacy-in-the-iot>.
24. Digital 101 Course offered by Future Skill Prime Platform <https://learn.futureskillsprime.in/>
25. Gmail Creating links:
26. <https://clubrunner.blob.core.windows.net/00000000961/en-ca/files/homepage/how-to-create-a-gmail-account/HowtoCreateaGmailAccount.pdf>
27. Google Forms: [https://pdst.ie/sites/default/files/Google%20Drive\\_1.pdf](https://pdst.ie/sites/default/files/Google%20Drive_1.pdf)
28. Google Meet: <https://edvance.hawaii.hawaii.edu/wp-content/uploads/Google-Meet-Tutorial-Getting-Started-and-Recording-a-Lecture.pdf>
29. Security Aspects - <https://ncert.nic.in/textbook/pdf/lecs112.pdf>
30. E-Commence: <http://www.aagasc.edu.in/cs/msccs/ECommerce%20Unit%201.pdf>
31. E-payment methods:  
<http://www.dspmuranchi.ac.in/pdf/Blog/e%20business%20UnitIII,%20%202020.pdf>

## MSFT416-24: Industrial Visit and FoSTaC Course

**Total marks: 40**

<b>L</b>	<b>T</b>	<b>P</b>
<b>0</b>	<b>0</b>	<b>3</b>

**Course objective:**

To equip students with practical industry exposure and essential food safety knowledge through industrial visits, expert lectures, and completion of the FoSTaC - Basic Manufacturing course, fostering their competence in food manufacturing, processing, and packaging practices.

**Course outcome:** At the end of the course, the students will be able to

CO1	Students will gain practical knowledge of food industry operations and standards through firsthand industrial exposure and expert insights.
CO2	Students will develop a comprehensive understanding of fundamental food safety principles, including personal hygiene and food handling practices.
CO3	Students will be proficient in managing food operations and controls, ensuring adherence to safety and quality protocols.
CO4	Students will acquire skills in proper packaging and distribution methods to maintain food integrity and safety during the supply chain.
CO5	Students will be able to compile and present detailed reports on their industrial visit/expert lecturer and FoSTaC course experiences, demonstrating their applied knowledge and analytical skills.

**Mapping of Course Outcomes with Program Outcomes:** Formulation of Course Outcomes-Program Outcomes matrix with correlation values as 1 (Low), 2 (Medium), 3 (High)

PO CO	PO1	PO2	PO3	PO4	PO5
<b>CO1</b>	3	2	2	3	3
<b>CO2</b>	3	3	2	3	2
<b>CO3</b>	2	2	3	3	3
<b>CO4</b>	2	2	2	3	3
<b>CO5</b>	3	3	2	2	2



**Details of the Course Content - Industrial Visit and FoSTaC Course (MSFT416-24)**

<b>Unit</b>	<b>Contents</b>	<b>Contact Hours</b>
I	Students are required to visit a food industry or attend a guest lecture by a food industry expert. Subsequently, they must submit a report to the Head of the Department and Course Coordinator.	10
II	Students must complete the FoSTaC - Basic Manufacturing course. This course should be completed through <a href="https://www.skillindiadigital.gov.in/courses/detail/43c98220-675c-4284-b998-7bd3d413d724">https://www.skillindiadigital.gov.in/courses/detail/43c98220-675c-4284-b998-7bd3d413d724</a> or <a href="https://fostac.fssai.gov.in/index">https://fostac.fssai.gov.in/index</a> or any FSSAI-recognized training center.	

**Recommended Books and Resources**

1. <https://www.skillindiadigital.gov.in/courses/detail/43c98220-675c-4284-b998-7bd3d413d724>
2. <https://fostac.fssai.gov.in/index>