

Syllabus for Multi-Disciplinary Minor Degree

In

Food Science and Technology

Under the National Education Policy (NEP 2020)



DEPARTMENT OF FOOD ENGINEERING AND TECHNOLOGY

INSTITUTE OF CHEMICAL TECHNOLOGY

(University Under Section-3 of UGC Act, 1956)

Elite Status and Center for Excellence

Government of Maharashtra

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A. Preamble

The evolution of the food system has been a multifaceted and dynamic process, mirroring the broader changes in society. The transformation from localized, small-scale agricultural practices to a globalized, industrialized food system has been influenced by various factors such as technological advancements, population growth, urbanization, and changes in consumer preferences. Food science and technology have played a crucial role in this evolution, shaping the way food is produced, processed, preserved, and distributed. The commitment of professionals in these fields has been instrumental in ensuring a safe, abundant, and diverse food supply for an increasingly global population. Department of Food Engineering and Technology has vision to provide demand-driven, value-based and quality technical education to make India a developed country through socio-economic transformation.

In tune of this, the minor degree course in “Food Science and Technology” has been designed to encompass different domains of food science and technology from fundamental knowledge to scientific and technological advancement. According to National Education policy guidelines, the course has been designed for a total of 14 credits as per the requirements of a minor degree.

B. PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1	Food Analysis: Able to apply analytical techniques for food safety, quality assurance
PSO2	Innovations in Food Products Development: Able to translate emerging science in developing innovative food products.
PSO3	Food Preservation: Able to apply principles of food preservation techniques in processed foods
PSO4	Food Biotechnology: Able to apply biological sciences in food processing and preservation
PSO5	Fostering collaboration: Facilitating understanding and working in interdisciplinary areas
PSO6	Food sustainability: Ability to work for food and nutritional security

C. **Recommended batch size: Minimum 15; Maximum 35**

D. **Duration: Three years**

E. **Eligibility criteria:**

Students enrolled in the Bachelor of Chemical Engineering and Bachelor of Technology programmes of Institute of Chemical Technology will be eligible. The allotment of minor degree programme will be as per the policy of the Institute.

1. PEDAGOGY/TEACHING METHOD:

Lecture/Discussions: These sessions will discuss the subject matters of the course

Experiential Learning: The sessions will involve hands on training.

Tutorials: Problem solving / case studies / relevant real-life applications / student presentations / home assignments / individual or group projects

2. Evaluation:

Theory course

Continuous Assessment Test (CAT): Continuous assessment will vary from course to course; the instructor will decide the evaluation mode. Two to three CATs will be conducted throughout the course, usually before and after the midsemester examination. These CATs will carry a total weightage of 20%. Depending on the instructor, class test, assignments, case studies, group discussions, report submission and seminar/presentation could also form part of the continuous assessment.

Mid-semester: Total 30 Marks (Theory paper)

End-semester: Total 50 Marks (Theory paper)

Practical course

Continuous assessment: 50 Marks

Performing given experiments as per the instructions, submission of lab journal on time, viva voce, group/personal discussions, and quizzes can be part of continuous assessment. The course instructor will discuss the composition of marks for these at the beginning of the course.

End Semester: 50 Marks (Lab experiment performance followed by viva-voce examination)

F. Structure of the Multidisciplinary Minor Courses:

Semester	Course Code	Subjects	Credits	Hrs/Week			Marks for various Exams			
				L	T	P	CA	MS	ES	Total
III	FDT1071	Principles of Food Microbiology	2	1	1	0	20	30	50	100
IV	FDP1013	Food Microbiology Lab	2	0	0	4	50	-	50	100
V	FDT1072	Fundamentals of Food Science and Technology	4	3	1	0	20	30	50	100
VI	FDT1073	Food Preservation Technology	2	1	1	0	20	30	50	100
VII	FDP1018	Food Analysis Lab	2	0	0	4	50	-	50	100
VIII	FDT1074	Food Quality and Regulations	2	1	1	0	20	30	50	100
		TOTAL:	14	6	4	8				

G. Instructors: (Tentative)

Semester	Course Code	Subjects	Faculty
III	FDT1071	Principles of Food Microbiology	VF
IV	FDP1013	Food Microbiology Lab	BSBT Faculty
V	FDT1072	Fundamentals of Food Science and Technology	SSA/ YSG
VI	FDT1073	Food Preservation Technology	USA/ SC
VII	FDP1018	Food Analysis Lab	JSG/ NJD
VIII	FDT1074	Food Quality and Regulations	RBW

VF: Visiting faculty; SSA: Dr. Shalini Arya; YSG: Dr. Yogesh Gat; USA: Prof. Uday Annappure; SC: Dr. Snehasis Chakraborty; JSG: Dr. Jyoti Gokhale; NDJ: Dr. Nirali Dedhia

Sem III

	Course Code: FDT1071	Course Title: Principles of Food Microbiology	Credits = 2		
			L	T	P
	Semester: III	Total contact hours: 30	1	1	0
List of Prerequisite Courses					
None					
List of Courses where this course will be Prerequisite					
Food Microbiology Lab; Food Preservation Technology; Fundamentals of Food Science and Technology; Food Quality and Regulations					
Description of relevance of this course in the MDM in Food Science and Technology					
<ul style="list-style-type: none"> • To understand the concept of general microbiological ecology and control of food and food-based products. • To identify the conditions, including sanitation practices, under which the important pathogens and spoilage microorganisms are commonly inactivated, killed or made harmless • To understand beneficial microorganisms in fermented foods and gut health (probiotics) 					
Sr. No.	Course Contents				Required Hours
1	General microbiology (bacteria, yeasts, fungi and heir physiological growth parameters) and the factors affecting spoilage; biochemical changes caused by microorganisms - putrefaction, lipolysis				06
2	Microbiological spoilage problems associated with typical food products such as dairy products, fruits and vegetables, grains and oilseeds, meat/fish and poultry, spices, and their control				06
3	Food borne infections and food poisoning, Microbial toxins, Emerging pathogens.				04
4	Detection methods for <i>E. coli</i> , <i>Staphylococci</i> , <i>Yersinia</i> , <i>Campylobacter</i> , <i>B. cereus</i> , <i>C. Botulinum</i> & <i>Salmonella</i> from food samples.				05
5	Indicator organisms, microbiological quality assurance systems in food industry, use of the hazard analysis critical control points system to ensure microbiological safety and quality of foods, microbiological food standards				04
6	Microbes in fermented foods and gut health				05
	Total				30
List of Textbooks / Reference Books					
1	Food Microbiology: Frazier W.C. and Dennis C. Westhoff 5th Edn. Tata McGraw-Hill Publishing Co. Ltd. (2013).				
2	Modern Food Microbiology- Jay, James M., Loessner, Martin J., Golden, David A, Aspen Publishers, Inc, 7th ed. (2004)				
3	Food Microbiology and Fundamentals and Frontiers: Doyle M.P, Beuchat L.R, Montville T.J.2nd Edn. ASM Press, Washington D.C. (2001)				
4	Food Borne Bacterial Pathogens: Doyle, M.P. Marcel Dekker Inc. (1989) Basic Food Microbiology; George J. Banwart, Chapman and Hall (1999)				

5	Food Microbiology (Third Edition). Martin R. Adams and Maurice O. Moss. RSC Publishing. ISBN 978-0-85404-284-5
Course Outcomes (Students will be able to.....)	
CO1	Describe the general microbiological ecology and different factors associated with microbial spoilage of food and the corresponding biochemical changes in it (K2)
CO2	Explain the spoilage and methods of controlling the microbial spoilage for specific food products and describing the fundamentals of food fermentation (K2)
CO3	Describe different food borne infections and food poisoning, microbial toxins and functions of newer pathogens (K2)
CO4	Describe and apply different detection methods of critical microorganism, rapid methods of microbial analysis, and applications of immunological techniques to food industry (K3)

Mapping of Course Outcomes (COs) with Programme Specific Outcomes (PSOs)							
		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
		K3	K4	K4	K3	K4	K3
CO1	K2	3	2	3	3	2	3
CO2	K2	3	2	3	3	2	3
CO3	K2	3	2	3	3	2	3
CO4	K3	3	2	3	3	2	3
Course	K3	3	3	2	3	2	3

3, Strong Contribution; 2, Moderate Contribution; 1, Low Contribution; – No Contribution
K, knowledge level from cognitive domain

Sem IV

	Course Code: FDP1013	Course Title: Food Microbiology Lab	Credits = 2		
			L	T	P
	Semester: IV	Total contact hours: 60	0	0	4

List of Prerequisite Courses
FDT1071: Principles of Food Microbiology
List of Courses where this course will be Prerequisite
Fundamentals of Food Science and Technology; Food Preservation Technology

Description of relevance of this course in the MDM in Food Science and Technology
<ul style="list-style-type: none"> • To understand the principles of different staining techniques used for specific group of microorganism and chemical compounds within the cells • To identify and enumerate the contaminating microorganisms in the food samples • To identify the microbial resistance towards different types of disinfectants and the effects of physiochemical factors for microbes • To develop a specific media and isolate microorganisms from different food samples

Sr. No.	Course Contents	Required Hours
1	Working and handling of common laboratory equipment and materials	04
2	Monochrome staining, Cell wall staining	04
3	Gram staining	04
4	Negative staining. Hanging drop technique	04
5	Capsule staining, Bacterial endospore staining	04
6	Study of Yeast, Mold and Bacteria	04
7	Phenol Coefficient of disinfectant	04
8	Microchemical test for reserve material	04
9	Isolation of Microbes from a food sample	04
10	Composition, preparation, sterilization of routine lab media	04
11	Enumeration, characterization, isolation and maintenance from air and surface	04
12	Effect of physicochemical factors and nutritional requirements on growth of microorganisms	04
13	Isolation and characterization of microbes based on morphological & physiological characteristics	04
14	Evaluations of microbial quality of milk and water samples	04
15	Spread Plate, pour Plate methods for cultivation of microbes, Streaking, and point inoculation methods for bacteria, fungi, and actinomycetes.	04
	Total	60

List of Textbooks / Reference Books
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1	Laboratory Experiments in Microbiology (10th Edition) - by Ted R. Johnson and Christine L. Case, (2012). Publisher: Benjamin Cummings, ISBN: 0321794389
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2	Microbiology Lab Manual (8th Edition) - by John Harley. (2010). Publisher: McGraw-Hill Science, ISBN: 0077292812
3	Fundamental Food Microbiology (3 rd Edition) – by Bibek Ray. CRC Press: ISBN - 0-8493-1610-3
4	Modern Food Microbiology (Seventh Edition) – by James M. Jay, Martin J. Loessner and David A. Golden. Springer-Food Science Text Series ISBN 0-387-23180-3
5	{FSSAI Lab Manual 14} Manual of Methods of Analysis of Foods [Microbiological Testing]. FSSAI, MoHFW, GoI – 2012
Course Outcomes (Students will be able to.....)	
CO1	Describe and analyze the principles of different staining techniques used for bacteria, yeast and chemical compounds within the cells (K4)
CO2	Describe and apply the procedure for enumerating the microorganisms in the food samples (K3)
CO3	Analyse the effect of different media composition and physiochemical factors for microbes (K4)
CO4	Isolate and characterize different microorganisms from food samples (K4)

Mapping of Course Outcomes (COs) with Programme Specific Outcomes (PSOs)							
		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
		K3	K4	K4	K3	K4	K3
CO1	K4	3	2	3	3	2	3
CO2	K3	3	2	3	3	2	3
CO3	K4	3	2	3	3	2	3
CO4	K4	3	2	3	3	2	3
Course	K4	3	2	3	3	2	3

3, Strong Contribution; 2, Moderate Contribution; 1, Low Contribution; – No Contribution
K, knowledge level from cognitive domain

Sem V

	Course Code: FDT1072	Course Title: Fundamentals of Food Science and Technology	Credits = 4		
			L	T	P
	Semester: V	Total Contact Hours: 60	3	1	0
List of Prerequisite Courses					
FDT1071: Principles of Food Microbiology; FDO1013: Food Microbiology Lab					
List of Courses where this course will be Prerequisite					
Food Preservation Technology, Food Analysis Lab; Food Quality and Regulations					
Description of relevance of this course in the MDM in Food Science and Technology					

- To understand basic physicochemical properties and chemical structures of food constituents and their role in food quality (sensory and aesthetic-texture, color and flavor), nutrition, food processing and preservation including water
- To understand the properties, method of preparation and applications of food constituents
- To understand the importance and mechanism of the reactions of food constituents taking place during food processing and storage,
- To understand the role of food constituents responsible for components in foods
- To apply course concepts in solving problems related to food constituents

Sr. No.	Course Contents (Topics and subtopics)	Required Hours
1	An introduction to food resources and its general composition. proximate analysis of foods, water in food systems – concept of free and bound water, water activity and its impact on food preservation and storage. Basic concept of taste, colour, flavour and texture, sensory analysis, anti-nutritional constituents in foods.	4
2	<p>Carbohydrates- classification, structure, properties. Chemical reactions such as caramelization, Maillard reaction, and dehydration; Sucrose – manufacture from sugar cane and sugar beet; hydrolysis of sucrose (inversion), Starches – isolation from varied sources; amylose/amylopectin, size/shape, gelatinization, gelation, retrogradation, pasting behaviour, functional properties, modification; Commercially important products – glucose, glucose syrup, high fructose corn syrup, maltodextrins.</p> <p>Glycosides in nature; pectin – structure, gelling behaviour of HMP vs. LMP, sources- manufacture and applications; Cellulose and other components of dietary fibre, hydrocolloids (plant/seaweed/ microbial polysaccharides), mucopolysaccharides; chitin and chitosan – sources, structure, manufacture and applications.</p> <p>Nutrition and nutraceutical aspects of carbohydrates</p>	16
3	<p>Proteins- chemistry of amino acids, structure, classification and their properties (isoelectric pH, solubility profile), special amino acids, non-protein amino acids; Peptides; Classification of proteins; protein structure (primary, secondary, tertiary and quaternary); Denaturation of proteins; determination of primary sequence; functional properties of proteins; Isolation of food proteins (soya, fish, whey); Maillard browning; Major food protein systems (milk, egg, wheat, meat)</p> <p>Nutrition and Nutraceutical aspects of proteins</p>	16
4	<p>Chemistry of lipids- fatty acids, mono-, di and triacylglycerols; Classification of lipids- simple, compound and derived; unsaponifiable constituents of lipids such as sterols and hydrocarbons and waxes;</p> <p>Rancidity and reversion of fats and oils and thermal stability- its measurement and inhibition; analytical parameters of oils and fats. Extraction, alkali refining, degumming, deodorization, winterization, inter-esterification, hydrogenation etc. of vegetable and animal fats</p> <p>Nutrition and Nutraceutical aspects of lipids</p>	12

5	Vitamins and minerals– classification- water soluble (all the B vitamins and C) and fat soluble (Vitamins A, D, E and K); Chemistry, structure and properties; physiological functions; absorption and metabolism; food sources, deficiency and hypervitaminosis; RDA Minerals in health and nutrition- Iron, calcium, zinc, sodium, potassium, magnesium and others- food sources, physiological functions, RDA, effect on food processing and preservation	12
Total		60

List of Textbooks / Reference Books

1	Belitz, H.D, Grosch, W., & Schieberle, P. Food Chemistry; 3 rd ed.; Springer, Germany; 2005.
2	Damodaran, S., & Parkin, K.L. Fennema's Food Chemistry; 5 th ed.; CRC Press, Boca Raton; 2017.
3	Velisek, J., The Chemistry of Food; Wiley-Blackwell; 2013.
4	Meyer, L.H., Food Chemistry. Cbs Publisher; 2004.
5	Velisek, J., Koplik, R., Cejpek, K. The Chemistry of Food; 2nd ed.; Wiley-Blackwell; 2020

Course Outcomes (Students will be able to....)

CO1	Describe the various constituents present in foods and their roles therein and solve practical problems in food quality (K3)
CO2	Describe the properties, method of preparation and applications of food constituents (K2)
CO3	Describe the mechanisms and significance of physicochemical reactions involved in food processing and storage (K2)
CO4	To apply course concepts in solving problems related to food constituents (K4)
CO5	Describe and demonstrate the role of food constituents on nutritional/anti-nutritional and aesthetic quality of raw and processed foods (K3)

Mapping of Course Outcomes (COs) with Programme Specific Outcomes (PSOs)

		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
		K3	K4	K4	K3	K4	K3
CO1	K3	3	3	2	2	2	3
CO2	K2	3	3	2	2	2	3
CO3	K2	3	3	2	3	3	3
CO4	K4	3	3	2	3	3	3
CO5	K3	3	3	2	2	3	3
Course	K4	3	3	2	2	3	3

3, Strong Contribution; 2, Moderate Contribution; 1, Low Contribution; – No Contribution

K, knowledge level from cognitive domain

Sem VI

	Course Code: FDT1073	Course Title: Food Preservation Technology	Credits = 2		
			L	T	P
	Semester: VI	Total Contact Hours: 30	1	1	0
List of Prerequisite Courses					
FDT1071: Principles of Food Microbiology; FDP:1013: Food Microbiology Lab; FDT1072: Introduction to Food Science and Technology					
List of Courses where this course will be Prerequisite					
Food Analysis Lab; Food Quality and Regulations					
Description of relevance of this course in the MDM in Food Science and Technology					
<ul style="list-style-type: none"> • To understand the fundamentals of food preservation through dehydration, high and low temperature processing of food • To explain the principles of advanced thermal and non-thermal processing of food • To explain the principles of food preservation by fermentation, chemical preservatives, bio-preservatives and hurdle technology 					
Sr. No.	Course Contents (Topics and subtopics)				Required Hours
1	Introduction to food preservation: Food spoilage; Underlying principles of different modes of food preservation; Preservation methods with emphasis on inactivation, inhibition, and avoiding recontamination.				02
2	Dehydration and drying of foods: Drying curve and drying time calculation; Water activity and moisture absorption isotherms; Psychometric chart; Different types of dryers-Conductive, convective, and combined; IMF foods; osmotic dehydration.				05
3	Thermal processing of food products: Sterilization and Pasteurization; Canning of food products; Classifications and structure of cans, corrosion, Lacquering; Spoilage in canned foods (1) Thermal death time (TDT) concept; Process time calculation for canned foods; Retort processing; Aseptic packaging.				07
4	Newer techniques in thermal processing: Concept of HTST; UHT; Ohmic, Dielectric, Infra-red Heating; Microwave heating; Frying method.				03
5	Non-thermal processing of food: High pressure processing; Pulsed electric field processing; Cold extrusion; Plasma processing; Ionizing Radiations; Ultrasound processing; UV and Pulsed light processing; Membrane Technology.				04
6	Low temperature storage and preservation: Chilling and Freezing; Freezing curve and water activity; Properties of frozen foods; Enthalpy change during freezing; Plank's equation for freezing time; Cold storage and Refrigeration load; Refrigeration cycle; Cryogenic freezing and IQF; Freeze concentration and freeze drying.				06
7	Hurdle technology: Role of acidity and pH in food preservation; Preservation by fermentation – Curing, Pickling and Smoking; Controlled and modified atmospheric packaging and storage; Chemical and Bio-preservatives; Antimicrobials.				03

	Total	30
List of Textbooks / Reference Books		
1	Toledo, R.T. Fundamentals of Food Process Engineering, Chapman and Hall; 2000,	
2	Fellows, P.J. Food Processing Technology: Principles and Practice, CBS Publishers; 2005.	
3	Rahman, M.S. Handbook of food preservation, CRC Press; 2007.	
4	Cullen, P.J., Brijesh, K.T., Vasilis, Valdramidis, P. Novel Thermal and Non-Thermal Technologies for Fluid Foods, Elsevier Academic Press; 2012.	
5	Zhang, H.Q., Barbosa-Cánovas, G.V., Balasubramaniam, V.M., Dunne, C.P., Farkas, D.F., Yuan, J.T.C. Non-thermal Processing Technologies for Food, John Wiley & Sons; 2011.	
6	Shakuntala, N., & Many, O. Food: Facts and Principles, New Age International; 2001.	
Course Outcomes (Students will be able to....)		
CO1	Apply the principles and develop operations using thermal technologies for food preservation (K4)	
CO2	Apply the principle, technology and operations of various non-thermal technologies for food preservation (K3)	
CO3	Apply the principles of hurdle technology in food preservation (K3)	
CO4	Solve the problems related to the food preservation and safety (K4)	

Mapping of Course Outcomes (COs) with Programme Specific Outcomes (PSOs)							
		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
		K3	K4	K4	K3	K4	K3
CO1	K4	3	2	3	3	2	3
CO2	K2	3	3	3	3	3	3
CO3	K2	3	3	3	2	3	3
CO4	K3	3	2	3	2	2	3
Course	K3	3	2	3	3	3	3

3, Strong Contribution; 2, Moderate Contribution; 1, Low Contribution; – No Contribution
 K, knowledge level from cognitive domain; A, Affective domain; S, Psychomotor domain

Sem VII

	Course Code: FDP 1018	Course Title: Food Analysis Lab	Credits = 2		
			L	T	P
	Semester: VII	Total Contact Hours: 60	0	0	4
List of Prerequisite Courses					
FDT1071: Principles of Food Microbiology; FDP:1013: Microbiology Lab; FDT1072: Introduction to Food Science and Technology; FDT:1073: Food Preservation Technology					
List of Courses where this course will be Prerequisite					
Food Quality and Regulations					
Description of relevance of this course in the MDM in Food Science and Technology					
<ul style="list-style-type: none"> • To give students hands on training on chemical analysis or food compositions (moisture, fat, protein, fibre, ash and carbohydrate) determinations of wide range of fruit, vegetables, cereal, legum- based food products available in the market • To train them acquire laboratory skills required for performing a range of chemical and physicochemical analyses of food components • To train them for the understanding of nutritional labelling 					
Sr. No.	Course Contents (Topics and subtopics)				Required Hours
1	Analysis of tea and coffee				04
2	Analysis of liquid milk, condensed milk and skim milk powder				08
3	Analysis of honey and golden syrup				04
4	Analysis of wheat flour				04
5	Analysis of beer and wine				08
6	Analysis of jam, jelly and squash				08
7	Analysis of fish				04
8	Analysis of spices				04
9	Analysis of vinegar				04
10	Analysis of ghee and edible oil				04
11	Analysis of bread				04
12	Analysis of Cake, Biscuits				04
Total					60
List of Textbooks / Reference Books					
1	Sehgal S. (2016). A Laboratory Manual of Food Analysis. I.K. International Publishing House Pvt. Ltd.				
2	Nielsen, S. Suzanne (2017). Food Analysis Laboratory Manual II. (Ed.) 5th edition. Springer, New York				
3	The Food Safety and Standards Act along with Rules and Regulations (2011). Delhi: Commercial Law Publishers (India) Pvt Ltd.				
Course Outcomes (Students will be able to....)					
CO1	Apply the fundamental knowledge in the analysis of plantation crops/animal-based products/dairy based products (K3)				
CO2	Analyse the unit operations involved in the processing of different plantation crops/animal				

	products/milk and dairy products (K4)
CO3	Select and demonstrate a suitable extraction/isolation technique for high value compounds from plantation crops/milk/animal products (K4)
CO4	Develop new products and processes for value-addition of plantation crop/dairy/animal products (K4)
CO5	Develop strategies related to processing of dairy/plantation crops/animal-based products and do troubleshooting (K4)

Mapping of Course Outcomes (COs) with Programme Specific Outcomes (PSOs)							
		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
		K3	K4	K4	K3	K4	K3
CO1	K3	3	3	2	2	2	3
CO2	K4	3	3	2	2	2	3
CO3	K4	3	3	2	2	2	3
CO4	K4	3	3	2	2	3	3
CO5	K4	3	3	2	2	3	3
Course	K4	3	3	2	2	2	3

3, Strong Contribution; 2, Moderate Contribution; 1, Low Contribution; – No Contribution
K, knowledge level from cognitive domain

Sem VIII

	Course Code: FDT1074	Course Title: Food Quality and Regulations	Credits = 2		
			L	T	P
	Semester: VIII	Total contact hours: 30	1	1	0
List of Prerequisite Courses					
FDT1071: Principles of Food Microbiology, FDT1072: Introduction to Food Science and Technology, FDT1073: Principles of Food Preservation					
List of Courses where this course will be Prerequisite					
None					
Description of relevance of this course in the MDM in Food Science and Technology					
<ol style="list-style-type: none"> To explain the functional role and safety issues of food contaminants, food adulteration, To describe the hygiene and sanitation in food processing plant, equipment, storage and handling To explain the various quality attributes of food and emphasizing on microbial quality control in food and water quality To conduct a food safety-based risk assessment at different stages of production of food and thereby designing the HACCP, VACCP and TACCP system To explain the role, standard and law set by Indian and global regulatory authorities with respect to food quality control 					
Sr. No.	Course Contents (Topics and subtopics)				Required Hours
1	India Regulations Overview of FSSAI. Detail of FSS Regulations relevant to products and labelling. (FSS Licensing & Registration including Schedule IV, Product Standards & Additives, Labelling & Display, Advertisement & Claims)				10

	Introduction to food safety and security: Hygienic design of food plants and equipment,	
2	Food quality: Various Quality attributes of food, Instrumental, chemical and microbial Quality control. Sensory evaluation of food and statistical analysis. Water quality and other utilities.	08
3	Food Safety Management System: Food Safety, Threat and Fraud Management based on international standards (HACCP / VACCP / TACCP)	07
4	Global regulations: FAO, Technical Cooperation programmes, Bio-security in Food and Agriculture, World Health Organization (WHO), World Animal Health Organization (OIE), International Plant Protection, Convention (IPPC) Codex Alimentarius Commission - Codex India – Role of Codex Contact point, National Codex contact point (NCCP), National Codex Committee of India – ToR, Functions, Shadow Committees etc. Overview of US and EU regulations for food	05
	Total	30

List of Textbooks / Reference Books

1	Handbook of Food Toxicology by S. S. Deshpande
2	The Food Safety Information Handbook by Cynthia A. Robert, 2009
3	Nutritional and Safety Aspects of Food Processing by Tannenbaum SR
4	Microbiological Safety of Food by Hobbs BC, 1973
5	Food Safety Handbook by Ronald H. Schmidt, Gary E. Rodrick

Course Outcomes (Students will be able to....)

CO1	Describe the functional role and safety issues of food contaminants, food adulteration, food additives, food packaging & labelling (K2).
CO2	Design the hygiene and sanitation in food processing plant, equipment, storage, and handling (K3)
CO3	Analyse the various quality attributes of food and especially on microbial quality control of food and water in Food Processing Industry (K4)
CO4	Identify and analyze the critical quality control point in different stages of production of food and thereby designing the HACCP system. (K4)
CO5	Explain the role, standard and law set by Indian and global regulatory authorities with respect to food quality control (K2)

Mapping of Course Outcomes (COs) with Programme Specific Outcomes (PSOs)

		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
		K3	K4	K4	K3	K4	K3
CO1	K3	3	3	2	2	3	3
CO2	K4	3	3	2	2	3	3
CO3	K4	3	3	2	2	2	3
CO4	K4	3	3	2	2	3	3
CO5	K4	3	3	2	2	3	3
Course	K4	3	3	2	2	2	3

3, Strong Contribution; 2, Moderate Contribution; 1, Low Contribution; – No Contribution
K, knowledge level from cognitive domain