HINDUSTAN
INSTITUTE OF TECHNOLOGY & SCIENCE
(DEEMED TO BE UNIVERSITY)

M. Sc. FOOD TECHNOLOGY

(Duration: 2 Years)

CURRICULUM and SYLLABUS

(Applicable for Students admitted from Academic Year 2024-25)

DEPARTMENT OF FOOD TECHNOLOGY

SCHOOL OF SCHOOL OF BASIC AND APPLIED SCIENCES

HINDUSTAN INSTITUTE OF TECHNOLOGY AND SCIENCE

HINDUSTAN INSTITUTE OF TECHNOLOGY AND SCIENCE

Motto:

To Make Every Man *a* Success *and* No Man *a* Failure

Vision:

To be an International Institute of Excellence, providing a conducive environment for education with a strong emphasis on innovation, quality, research and strategic partnership blended with values and commitment to society.

Mission:

- *To create an ecosystem that promotes learning and world class research.*
- *To nurture creativity and innovation.*
- *To instill highest ethical standards and values.*
- *To pursue activities for the development of the Society.*
- *To develop national and international collaborations with institutes and industries of eminence.*
- *To enable graduates to become future leaders and innovators.*

Value Statement:

Integrity, Innovation, Internationalization.

DEPARTMENT OF FOOD TECHNOLOGY

Vision:

To excel in innovation and collaborative research, promoting technical and entrepreneurial skills

Mission:

- *To impart high-quality education to build the student's ability and enhance their skills to make them globally competitive Food technologists.*
- *To develop state-of-the-art research facilities to provide a collaborative environment that stimulates the opportunities to create, analyze, apply and disseminate knowledge.*

PROGRAM EDUCATIONAL OBJECTIVES (PEO'S):

PEO 1: To Provide professional training and skill development to students in food sciences, and related disciplines and nurture them to become responsible persons in society.

PEO 2: To upgrade from time to time based on scientific advancements, and societal relevance, so as to cater to the shifting global demands.

PEO3: Possess professional and ethical responsibilities with effective communication and managerial skills to prove as responsible leaders.

PEO 4: To become entrepreneurs, tackle business challenges, and continue their professional advancement through lifelong learning.

PEO 5: To produce competent graduates who shall pursue careers in the field of food technology, food processing and food regulations

PROGRAMME'S OUTCOMES (PO'S):

PO1: To acquire the theoretical knowledge and practical skills to meet the specific needs and challenges of the food industry, consumers, environment and society.

PO2: Apply the knowledge of technology and its fundamentals, to the solution of complex scientific problems in food science, nutrition and dietetics.

PO3: Competently work with professionals in related fields of post-harvest handling and processing of foods.

PO4: Identity, formulate and analyze complex scientific problems reaching substantial conclusions using principles of food and nutritional sciences

PO5: To integrate and apply the different principles of food chemistry and food Processing and its related sciences in sustainable food production and manufacturing practices.

PROGRAM SPECIFIC OUTCOMES (PSO'S):

A Postgraduate of the Food Technology program will demonstrate:

PSO1: The ability to process, preserve, package, or store food, according to food safety regulations and industrial requirements.

PSO2: The skill to apply standard practices and regulations in developing food and allied products.

PSO3: Anticipate and examine regulations in food quality and cutting-edge technologies in the realm of food analytics.

SEMESTER- I										
SL. NO	**COURSE CATEGORY**	**COURSE TYPE**	**COURSE CODE**	**NAME OF THE COURSE**	**L**	**T**	**P**	**C**	**S**	**TCH**
1	PC	TH	AFT12001	Advanced Food Chemistry and Components	3	1	0	4	1	4
2	PC	TH	AFT12001	Advanced Food Microbiology and Spoilage	3	1	0	4	1	4
3	DE	TH	AFT125**	Department Elective - I	3	0	0	3	1	3
4	DE	TH	AFT125**	Department Elective – II	3	0	0	3	1	3
5	PC	PR	AFT12400	Food Analytical Methods Lab	0	0	4	2	0	4
6	PC	PR	AFT12401	Advanced Food Microbiology and Spoilage Lab	0	0	4	2	0	4
7	AE	TH	GLS42001	Professional Writing Skills	1	0	0	1	1	1
				TOTAL	**13**	**2**	**8**	**19**	**5**	**23**
L = Lecture; **T** = Tutorial; **P** = Practical; **C** = Credits; **S**= Self Study; **TCH** = Total Contact Hour										

SEMESTER- II										
SL. NO	**COURSE CATEGORY**	**COURSE TYPE**	**COURSE CODE**	**NAME OF THE COURSE**	**L**	**T**	**P**	**C**	**S**	**TCH**
1	PC	TH	AFT12003	Technology of Fruit and Vegetable Processing	3	1	0	4	1	4
2	PC	TH	AFT12004	Advanced Research Methodology	3	1	0	4	1	4
3	DE	TH	AFT125**	Department Elective-III	3	0	0	3	1	3
4	DE	TH	AFT125**	Department Elective-IV	3	0	0	3	1	3
5	PC	PR	AFT12402	Bakery Confectionary and Pastry Lab	0	0	4	2	0	4
6	PC	PR	AFT12403	Processing of Fruits and Vegetable Lab	0	0	4	2	0	4
7	AE	PR	GLS42400	Presentation skills	0	0	2	1	1	2
				TOTAL	**12**	**2**	**10**	**19**	**5**	**24**
L = Lecture; **T** = Tutorial; **P** = Practical; **C** = Credits; **S**= Self Study; **TCH** = Total Contact Hour										

SEMESTER- III										
SL. NO	**COURSE CATEGORY**	**COURSE TYPE**	**COURSE CODE**	**NAME OF THE COURSE**	**L**	**T**	**P**	**C**	**S**	**TCH**
1	PC	TH	AFT12005	Technology of Meat, Fish, and Poultry Processing	3	1	0	4	1	4
2	PC	TH	AFT12006	Nutrigenomics and Artificial Intelligence for Food Technology Applications	3	1	0	4	1	4
3	PC	TP	AFT12007	Novel Food Product Development	3	0	2	4	1	5
4	DE	TH	AFT125**	Department Elective-V	3	0	0	3	1	3
5	DE	TH	AFT125**	Department Elective-VI	3	0	0	3	1	3
6	SI	IN	AFT12800	Summer Internship#	#	#	#	4	#	#
				TOTAL	**15**	**2**	**2**	**22**	**5**	**19**
L = Lecture; **T** = Tutorial; **P** = Practical; **C** = Credits; **S**= Self Study; **TCH** = Total Contact Hour										

#Students will undergo 1 month of internship during the II semester summer vacation and it will be evaluated in the III Semester.

SEMESTER- IV										
SL. NO	**COURSE CATEGORY**	**COURSE TYPE**	**COURSE CODE**	**NAME OF THE COURSE**	**L**	**T**	**P**	**C**	**S**	**TCH**
1	RP	PJ	AFT12801	Research Project	0	0	40	20	0	40
				TOTAL	0	0	40	20	0	40
L = Lecture; **T** = Tutorial; **P** = Practical; **C** = Credits; **S**= Self Study; **TCH** = Total Contact Hour										

Note:
Publication acceptance in Peer Reviewed or Indexed Journals/ Presenting & Publishing in Conference Proceedings/ Patent filing is mandatory.

DEPARTMENTAL ELECTIVES											
SL. NO	**SEM**	**COURSE CATEGORY**	**COURSE TYPE**	**COURSE CODE**	**NAME OF THE COURSE**	**L**	**T**	**P**	**C**	**S**	**TCH**
1	I	DE	TH	AFT12501/ AFT12502	Technology of Cereals, Pulses & Oilseed Processing / Food Packaging Technology	3	0	0	3	1	3
2	I	DE	TH	AFT12503/ AFT12504	Advanced Food Processing and Preservation Methods / Food Additives and Food Toxicology	3	0	0	3	1	3
3	II	DE	TH	AFT12505/ AFT12506/ AFT12507	Advanced Food Biotechnology / Food Adulteration Food Safety and Quality Control / Food Laws Auditing and Regulation	3	0	0	3	1	3
4	II	DE	TH	AFT12508/ AFT12509/ AFT12510	Advanced Fermented Foods / Entrepreneurship Development in Food Technology / Unit Operations in Food Processing	3	0	0	3	1	3
5	III	DE	TH	AFT12511/ AFT12512/ AFT12513	Value Addition to Food Industry Refuse and Management/ Technology of Spice Processing / Food Machines	3	0	0	3	1	3
6	III	DE	TH	AFT12514/ AFT12515/ AFT12516	Technology of Beverage Processing / Advanced Functional Foods and Nutraceuticals / Technology of Dairy Processing	3	0	0	3	1	3
L = Lecture; **T** = Tutorial; **P** = Practical; **C** = Credits; **S**= Self Study;**TCH** = Total Contact Hour											

SEMESTER I

COURSETITLE	ADVANCEDFOODCHEMISTRY AND COMPONENTS			CREDITS	4
COURSECODE	AFT12001	COURSECATEGORY	PC	L-T-P-S	3-1-0-1
VERSION	1.0	APPROVAL DETAILS		LEARNING LEVEL	BTL-3

ASSESSMENTSCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test/Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	Food chemistry and components is the discipline that mainly deals with chemical composition, digestion, and absorption of basic biomolecules of food. The functional and chemical properties of water and the role of enzymes in metabolic reactions will be dealt with in this course.
Course Objective	Enable students 1. To understand the chemistry of food constituents. 2. To apply food molecules interaction in developing technologies/processes. 3. To develop skills for experimenting with food systems. 4. To test various approaches for manipulating the chemical and / or functional properties of foods. 5. To predict how changes in overall composition are likely to change the reactivity of individual food components.
Course Outcome	Upon completion of this course, the students will be able to 1. Describe the general chemical structures of major components of foods (water, proteins, carbohydrates, and lipids) and selected minor components (vitamins and minerals). 2. Understand, plan, perform and analyze a range of chemical investigations with an emphasis on food analysis 3. Demonstrate the ability to relate the chemical composition of foods to their functional properties 4. Examine a molecular rationalization for the observed physical properties and reactivity of major food components. 5. Evaluate and determine the approaches that may be used to control the reactivity of those food components that are likely to impact the overall quality of finished products.
Prerequisites: Basics in Chemistry	

CO,PO AND PSO MAPPING							
CO	**PO -1**	**PO-2**	**PO-3**	**PO-4**	**PSO-1**	**PSO-2**	**PSO-3**
CO-1	**2**	**-**	**1**	**2**	**-**	**1**	**1**
CO-2	**1**	**-**	**2**	**1**	**-**	**-**	-
CO-3	**1**	**1**	**1**	**-**	**-**	**-**	-
CO-4	**-**	**2**	**-**	**-**	**1**	**1**	1
CO-5	**-**	**1**	**-**	**2**	**2**	**1**	1

1:Weakly related,2: Moderately relatedand3:Strongly related

MODULE 1:WATER AND ICE (9L+3P=12)	
Water – Structure of water & ice. Importance of water in foods. Concept of bound & free water. Sorption phenomena and sorption isotherms with example. Dispersed systems –Properties and factors affecting stability.	**CO-1 BTL-1**
MODULE 2: CHEMISTRY OF CARBOHYDRATE (9L+3P=12)	
Nomenclature, classification and structure of carbohydrates, chemical reactions of carbohydrates, General properties of monosaccharide, chemistry of polysaccharides, properties and preparation of pectic substances, gums, starch and its hydrolytic products, cellulose, process flow sheet for the production of cyclodextrins, maltodextrins, HFCS.	**CO-2 BTL-2**
MODULE 3: CHEMISTRY OF LIPIDS (9 L+3P=12)	
Nomenclature and classification of lipids. Basic Structures and chemistry of fatty acids. physical & chemical characteristics of fats & oils, Phospolipids, and unsaponifiables, auto-oxidation and hydrolysis, antioxidants. Process flow sheet for the manufacture of edible oils (refined and hydrogenated), fat interesterification.	**CO-3 BTL-2**
MODULE 4: CHEMISTRY OF PROTEINS (9 L+3P=12)	
Nomenclature, classification, structure and chemistry of amino acids, peptides & Proteins. Functional properties of Protein. Protein denaturation. Enzymes: Introduction, classification & nomenclature of enzymes. Immobilized enzyme – One example of working of each enzyme.	**CO-4 BTL-3**
MODULE 5: CHEMISTRY OF VITAMINS (9 L+3P=12)	
Fat-soluble and water soluble vitamins. Summary of vitamin stability – Toxicity and sources of vitamins–Bioavailability of vitamins–Reasons for the loss of vitamins in foods.	**CO-5 BTL-3**

TEXT BOOK

1. Srinivasan Damodaran, Kirk L.Parkin."Fennema'sFoodChemistry".5th Edition, Taylor&Francisgroup, (2019). ISBN- 9781315372914

REFERENCE BOOK

1. John M.deMan, John W. Finley, W.Jeffrey Hurst and Chang Yong Lee. "Principles of FoodChemistry",4thedition,Springer International Publishing.(2018).ISBN978-3-319- 63607-8

E-BOOKS

1. http://www.uprtou.ac.in/other_pdf/dvapfv_block_3.pdf
2. https://onlinecourses.swayam2.ac.in/cec19_ag04

COURSE TITLE	ADVANCED FOOD MICROBIOLOGY AND SPOILAGE			CREDITS	4
COURSE CODE	AFT12001	COURSE CATEGORY	PC	L-T-P-S	3-1-0-1
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	The Course deals with various microorganisms responsible for food spoilage, sources of contamination, adverse effects caused by them. Food preservation techniques are elaborately discussed.
Course Objective	Enable students 1. To understand the microorganisms associated with foods and 2. To learn about isolation methods of microorganisms from foods. 3. To know the methods of preservation of foods. 4. To have knowledge of the food safety standards and methods of detection of pathogens. 5. To learn about food-borne illness and food poisoning
Course Outcome	Upon completion of this course, the students will be able to 1. Identify the beneficial and spoilage microorganisms associated with foods and the conditions under which they will grow. 2. Understand the growth and methods of isolation of microorganisms from food. 3. Understand the principles that make a food product safe for consumption. 4. Know the spoilage and deterioration mechanisms in foods and methods for the detection of pathogens. 5. Evaluate the role of microorganisms in various foods and water. 6. Predict the causative agent and pathogenesis of disease-causing food borne pathogens and their toxins.

Prerequisites: Basics in Microbiology

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	2	1	1	2	2	1	1
CO-2	1	1	2	1	2	2	2
CO-3	1	1	1	1	2	2	2
CO-4	2	2	2	1	1	1	1
CO-5	1	1	2	2	2	1	1

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1 : HISTORY AND ISOLATION OF MICROORGANISMS (9 L+3P=12)	
History of Microorganisms in Food Development - Microorganisms associated with foods: Bacteria, Molds, Yeast and their importance – Nutritional requirements of bacteria- Factors affecting the growth of bacteria –Growth curve of bacteria - antimicrobial barriers and constituent - General Microbiological Methods of enumeration and isolation of bacteria and fungi,-Identification of bacteria and fungi by a staining method	**CO-1 BTL-1**
MODULE 2 MICROBIOLOGY OF WATER AND FOOD COMMODOTIES (9 L+3P=12)	
Microbiology of water and its importance in processing of foods in industries. MPN of coliforms, Membrane filtration Technique. Microbiology of milk –Phosphatase test. Hetero and homo fermentative Lactic acid bacteria – Yogurt and Cheese fermenting organisms-Importance of Biofilm and their role in the transmission of pathogens in dairy products and preventive strategies-Microbial spoilage of various food commodities	**CO-2 BTL-2**
MODULE 3:FOOD BORNE DISEASES AND INTOXICATION (9 L+3P=12)	
Food Poisoning and intoxication – food borne diseases – Symptoms of diseases caused by Bacillus spp., Clostridium botulinum, Escherichia coli, Salmonella spp, Staphylococcus aureus, Shigella spp., Hepatitis, Gastroenteritis viruses, Entamoeba histolytica – Mycotoxins, Bacterial toxins and Algal toxins.	**CO-3 BTL-2**
MODULE:4 METHOD FOR DETECTION OF PATHOGENS AND FOOD STANDARDS (9 L+3P=12)	
Rapid methods for detection of microorganisms and toxins- Immunological methods, Rapid methods for detection of microorganisms and toxins- DNA/RNA methodology, Hazard analysis Critical Control Point (HACCP), Food Safety Standards Authority of India(FSSAI), Food and Drug Administration, Food and Agriculture Organization, International Commission on Microbiological specification for Foods (ICMSF)	**CO-4 BTL-3**
MODULE 5: CONVENTIONAL METHODS OF FOOD PRESERVATION (9 L+3P=12)	
Thermal mode of preservation – Pasteurization, sterilization, and Canning –spoilage of canned foods and types of spoiled cans – aseptic packaging - Low-temperature storage. High-pressure processing – Pascalization - Irradiation – microwave, UV, and ionizing radiation - Use of chemical preservatives, Application of Probiotics and Prebiotics	**CO-5 BTL-3**

TEXT BOOK	
1.	Adams M.R and Moss M.O, “Food Microbiology”, Panima Publishing corporation, New Delhi, 2 nd Edition, Third reprint, ISBN-13:9788122410143,978-8122410143, 2017.
REFERENCE BOOK	
1	William C Frazier and Dennis C. Westoff, “Food Microbiology”, Special Edition, Springer, The Mc Graw-Hill Companies.2021. ISBN-9780070667181
E BOOKS	
1.	http://nuristianah.lecture.ub.ac.id/files/2014/09/fundamental-food-microbiology.pdf
MOOC	
1.	https://www.classcentral.com/course/swayam-food-microbiology-and-food-safety-17609

COURSE TITLE	FOOD ANALYTICAL METHODS LAB			CREDITS	2
COURSE CODE	AFT12400	COURSE CATEGORY	PC	L-T-P-S	0-0-2-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME					
First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	In Food analysis lab students will learn about the different analytical techniques used for different food stuffs. They will come to know about the different qualitative and quantitative parameters.
Course Objective	Enable students 1. To introduce the analysis methods of food commodities. 2. To provide technical skills on testing of foods. 3. To impart skills on interpreting the genuineness of the products based on the quality 4. To design and develop newer and better methods of analysis for improving the quality of a food product.
Course Outcome	Upon completion of this course the students will be able to 1. Understand the quality parameters of different types of food products 2. Classify food products based on their quality 3. Interpret results and decide on the quality 4. Compare two brands of the same product and decide the best one based on the quality 5. Evaluate newer products based on quality

Prerequisites: Food Science

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	1	1	2	2	1	2	1
CO-2	2	1	1	1	1	2	1
CO-3	1	2	1	1	1	2	1
CO-4	1	2	2	1	1	2	1
CO-5	1	1	1	1	1	1	1Cou

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: SUGAR RICH PRODUCTS LIKE JAMS, SQUASHES, MARMALADES, SUGAR AND JAGGERY (0L+4P)	
Analysis of total sugars, Determination of pectin, Determination of acidity, Determination of total fruit solids	**CO-1** **BTL-2**
MODULE 2: BAKERY PRODUCTS INCLUDING WHEAT (0L+4P)	
Determination of gluten content Determination of alcoholic acidity	**CO-2** **BTL-2**
MODULE 3: MILK AND MILK PRODUCTS (0L+4P)	
Determination of Fat content by Gerber method Determination of lactose content by Lactometer	**CO-3** **BTL-2**
MODULE 4: PHYTOCHEMICALS DETERMINATION IN PLANTS (0L+4P)	
Determination of Tannin content Determination of Caffeine	**CO-4** **BTL-2**
MODULE 5: VITAMINS, MINERALS, AND COLOURANTS (0L+4P)	
Estimation of anthocyanins Estimation of Chlorophyll	**CO-5** **BTL-2**
TEXT BOOKS	
1.	Sivasankar,B, "Food processing and preservation", Prentice - Hall of India, 2018. ISBN-13: 978-8120320864
REFERENCE BOOKS	
1	Rao, Chandra Gopala, "Essentials of food process engineering". B.S. Publications, 2019. ISBN 9781439803103.

COURSE TITLE	ADVANCED FOOD MICROBIOLOGY AND SPOILAGE LAB			CREDITS	2
COURSE CODE	AFT12400	COURSE CATEGORY	PC	L-T-P-S	0-0-4-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME					
First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	Course deals with microbial analysis of foods , the different types of microbes present in food stuffs, method of isolation, identification and also culture of organisms
Course Objective	Enable the students • To learn the parts of microscopes and their functions • To understand the basic concepts of isolation of microorganisms from food commodities • To identify the microorganisms using various staining techniques and biochemical tests. • To Isolate, cultivate and identify specific bacteria/fungi from different food sources.
Course Outcome	Upon completion of this course the students will be able to 1. Acquire Basic knowledge about Microbiological Laboratory safety 2. Learn media preparation, sterilization and identify the parts of a compound Microscope 3. Know about aseptic technology role in packaging of foods. 4. Study the isolation of pure culture techniques and staining techniques 5. Know the effect of food preservatives on spoilage microorganisms.

Prerequisites: Food Science

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	1	1	1	1	1	1	2
CO-2	1	2	2	1	1	1	1
CO-3	1	1	2	2	1	1	2
CO-4	1	1	2	2	2	1	2
CO-5	1	2	1	1	1	1	2

1: Weakly related, 2: Moderately related and 3: Strongly related	
MODULE:1 INTRODUCTION TO ASEPTIC TECHNIQUES	**(0L+4P)**
Introduction to Microbiology, aseptic techniques and safety – Study of Microscopes, Sterilization and Disinfection, Lab safety guidelines	**CO-1** **BTL-2**
MODULE 2: STREAK PLATE METHOD	**(0L+4P)**
Isolation of pure culture from mixed population- streak plate method.	**CO-2** **BTL-2**
MODULE 3: ISOLATION OF BACTERIA AND FUNGI	**(0L+4P)**
Isolation and enumeration of bacteria and fungi from fresh fruits and vegetables-Total plate count Method (Pour Plate/Spread Plate method)	**CO-3** **BTL-2**
MODULE 4: ISOLATION OF BACTERIA AND FUNGI	**(0L+4P)**
Isolation and enumeration of bacteria and fungi from spoiled fruits and vegetables.- Total plate count Method (Pour Plate/Spread Plate method)	**CO-4** **BTL-2**
MODULE 5: QUALITY CONTROL PROCEDURES IN MILK	**(0L+4P)**
Quality testing of Milk- Methylene Blue Reduction Test. Examination of Potable water – MPN Test	**CO-5** **BTL-2**
TEXT BOOKS	
1.	Adams M.R and Moss M.O, "Food Microbiology", Panima Publishing corporation, New Delhi, 2 nd Edition, Third reprint, ISBN-13:9788122410143, 2017.
1	William C Frazier and Dennis C. Westoff, "Food Microbiology", Special Edition, Springer, The Mc Graw-Hill Companies.2021. ISBN-9780070667181
E BOOKS	
1.	https://www.pdfdrive.com/bailey-scotts-diagnostic-microbiology-12th-edition-diagnostic-microbiology-bailey-scotts-e188885852.html
MOOC	
1	https://mooc.es/course/food-microbiology/

COURSE TITLE		PROFESSIONAL WRITING SKILLS			CREDITS	1
COURSE CODE		GLS42001	COURSE CATEGORY	AE	L - T – P – S	1 – 0 – 1 – 1
Version	1.0	Approval Details		LEARNING LEVEL		BTL – 1, 2, 3, 4

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test/Quiz	Attendance	ESE
15 %	15 %	10 %	5 %	5 %	50%

Course Description	This course is a complete course designed to provide students with the skills necessary to produce clear, effective, and engaging written communication in a professional context. Students will learn to balance professionalism with creativity, ensuring their writing is both functional and captivating. Students will develop their ability to communicate persuasively and effectively in various professional scenarios.
Course Objective	By the end of this course, students will have gained exposure to the various genres of professional and creative writing: 1. Understand and apply the principles of clear and effective business communication. 2. Develop and structure various types of professional documents such as business letters, emails, memos, reports, proposals, promotional videos, presentation, resume, report and executive Summaries 3. Write effectively for digital platforms, including websites, blogs, and social media, with a focus on online etiquette
Course Outcome	Upon successful completion of this course, students will: 1. Demonstrate proficiency in writing clear, concise, and professionally structured business documents. 2. Exhibit the ability to craft persuasive and engaging writings. 3. Apply creative writing techniques to produce compelling marketing content, brand stories, and case studies. 4. Effectively write and manage content for digital platforms, including social media, with an understanding of SEO principles. 5. Utilize storytelling and persuasive writing skills to pitch ideas and engage stakeholders in a professional context.

Prerequisites: Plus Two English-Intermediate Level

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PSO-1	PSO-2	PSO-3
CO-1	-	-	2	2	3	-	-	3	-	-	3

CO-2	-	-	**2**	**2**	**3**	-	-	**3**	-	-	**3**
CO-3	-	-	**3**	**2**	**3**	-	-	**3**	-	-	**3**
CO-4	-	-	**2**	**2**	**3**	-	-	**3**	-	-	**3**
CO-5	-	-	**2**	**2**	**3**	-	-	**3**	-	-	**3**

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE1: Introduction to Business & Professional Writing	**(6 hours)**
• Fundamentals of Business Writing: Understanding the importance of clear and effective communication in a professional setting. • Professional Tone and Style: Adapting writing style to suit different audiences and purposes. • Writing Process: Planning, drafting, revising, and proofreading. • Grammar and Punctuation: Key rules and common errors in professional writing.	**CO-1** **BTL-2**
MODULE 2:Advanced Document Design and Structure	**(6 hours)**
• Document Design Principles: Layout, readability, and visual aids. • Report Writing: Structuring reports for clarity and impact. • Proposal Writing: Crafting compelling proposals that win approval. • Executive Summaries: Creating concise and informative summaries for business executives. • Preparing minutes of the meeting.	**CO-2** **BTL-2,3**
MODULE3: Creative Writing for Professional Contexts	**(6 hours)**
• Creative Thinking in Business Writing: Incorporating creativity to enhance professional documents. • Storytelling Techniques: Using narrative elements to engage and inform. • Brand Voice Development: Crafting a unique voice for business communications.	**CO-3** **BTL-2,3,4**
MODULE 4 :Digital Communication	**(6 hours)**
• Digital Writing Skills: Writing for websites, blogs, and online platforms. • Online Etiquette: Best practices for professional communication in digital environments. • Create unique Promotional videos for inspiring customers to give great exposure for a cause, brand, or product	**CO-4** **BTL-2,3,4**
MODULE 5: Writing for Social Media	**(6 hours)**
• Social Media Content: Crafting posts for various social media channels. • Writing for Marketing and Advertising: Techniques for compelling and persuasive marketing content. • Creating content for flyers and banners	**CO-4** **BTL-2,3,4**

TEXT BOOKS	
1	Kesteven, L., Melrose, A. (2022). Professional Writing: Creative and Critical Approaches. Switzerland: Springer International Publishing.
2.	Acharya, T. (2021). Handbook of Professional, Business & Technical Writing, and Communication and Journalism: A Reference Guide to All Kinds of Writing. (n.p.): Lulu.com.
REFERENCE BOOKS	
1.	Baumgardner, A. (2020). Creative Success Now: How Creatives Can Thrive in the 21st Century. (n.p.): Indie Books International.
2.	Marsen, S. (2019). Professional Writing. United Kingdom: Bloomsbury Publishing.
3.	Alred, G. J., Brusaw, C. T., Oliu, W. E. (2011). The Business Writer's Handbook, Tenth Edition. United States: St. Martin's Press.
E -Book	
	MacRae, P. (2019). Business and Professional Writing: A Basic Guide - Second Edition. United Kingdom: Broadview Press.
MOOC Courses	
1	https://www.coursera.org/specializations/creative-writing
2	https://onlinecourses.nptel.ac.in/noc20_hs06/preview

SEMESTER II

COURSE TITLE	TECHNOLOGY OF FRUITS AND VEGETABLE PROCESSING			CREDITS	4
COURSE CODE	AFT12003	COURSE CATEGORY	PC	L-T-P-S	3-1-0-1
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	The course will provide knowledge about the processing of foods that are falling into the category of fruits and vegetables The various technology that are used in processing of fruits and vegetables will be dealt indepth.
Course Objective	Enable students 1. To develop the knowledge of students in the area of fruits and vegetable processing. 2. To know the formulation of various products, their manufacturing process, and equipment. 3. To enable the students to appreciate the application of scientific principles in the processing of fruits and vegetables 4. To develop skills in product development from fruits and vegetables
Course Outcome	Upon completion of the course students will be able to 1. Acquire knowledge on different physical, chemical and nutritional properties of fruits and vegetables. 2. Acquire insight in the various chemical and biochemical changes occur during processing. 3. Learn various ways of designing and monitoring processing chains 4. Know about laws, regulations and the monitoring agencies involved in food safety and labelling of fruits and vegetables. 5. Understand the methods of packaging, shelf life and related factors in the processing of fruits and vegetables.

Prerequisites: Food Science

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	2	1	2	2	2	1	2
CO-2	2	2	1	1	1	1	1
CO-3	2	2	2	1	1	1	1
CO-4	2	1	1	1	1	2	1
CO-5	1	1	3	2	1	1	2

1: Weakly related, 2: Moderately related and 3: Strongly related	
MODULE:1 INTRODUCTION (9 L+3T=12)	
Current status of production and processing of fruits and vegetables. Scope of fruits and vegetables preservation in India: Postharvest losses and management, marketing facility, Logistics and supply chain management.	**CO-1 BTL-2**
MODULE 2:JUICE EXTRACTION (9 L+3T=12)	
Types of juices, process flow diagram for fruit juice production, juice extraction process- fruit selection, sorting, washing, juice extraction, deaeration, straining/filtration, clarification, adding of sugars, fortification, bottling, sealing and storage; methods of juice preservation, causes of juice spoilage.	**CO-2 BTL-2**
MODULE 3: CANNING (9 L+3T=12)	
Introduction, can manufacture, canning process - selection of fruits and vegetables, grading, washing, peeling, cutting, blanching, cooling, filling, exhausting, sealing, retort processing and storage; types of canning- pressure canning and water bath canning, common causes of spoilage in canning of foods.	**CO-3 BTL-3**
MODULE 4: DRYING (9 L+3T=12)	
Drying: principles, merits and demerits of drying, working principles of various dryers – drum, cabinet, tunnel, freeze, spray, etc., preparation of fruit powders and dried slices, intermediate moisture foods, osmotic dehydration.	**CO-4 BTL-3**
MODULE 5: MINIMAL PROCESSING (9 L+3T=12)	
Physico chemical aspects affecting the postharvest life, technologies used in preservation – chemicals and non-chemical, methods to extend the shelf life, food packaging -Modified atmosphere packaging (MAP), Controlled atmospheric packaging, Intelligent packaging, Temperature control, humidity control and gas control, advantages and disadvantages. Hurdle technology – basic aspects, commonly used hurdle combinations, future trends.	**CO-5 BTL-3**
BOOKS	
1.	R. P. Srivastava & Sanjeev Kumar. Fruit and Vegetable Preservation: Principles & Practices International book distributing Co. Lucknow (2019 4th print). ISBN 10: 812392437
1	Rosenthal, A., Deliza, R., Welti-Chanes, J., & Barbosa-Cánovas, G. V. (Eds.). Fruit Preservation: Novel and Conventional Technologies. Springer. 2018. ISBN 978-1-4939-3311- 2
E BOOKS	
1.	https://www.agrivi.com/processing-of-fruits-and-vegetables/
MOOC	
1.	https://onlinecourses.nptel.ac.in/noc22_ag13/postharvest operation

COURSE TITLE	ADVANCED RESEARCH METHODOLOGY			CREDITS	4
COURSE CODE	AFT12004	COURSE CATEGORY	PC	L-T-P-S	3-1-0-1
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENTSCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test/ Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	Scientific research methodology describes about the statistical techniques that are used in data collection, coding and analyzing.
Course Objective	Enable students 1. To understand the basics concepts and methodologies in research and statistics. 2. To identify appropriate experimental designs and techniques for research in food industry. 3. To prepare systematic literature review, data collection tools and computer assisted data presentation. 4. To compare the use of various statistical methods and their appropriateness in different research designs. 5. To formulate a research proposal and develop skills in scientific writing and publishing
Course Outcome	Upon completion of the course students will be able to 1. Analyze the systematic research process and statistical methods and tools in food and consumer research. 2. Exposed to modules like experimental designs, scale of measurements used in sensory evaluation, sampling methods, data analysis and presentation. 3. Interpretationofdeliverinformationondatacollectionusingvarioustools and databases in science and technology. 4. Provision of hands-on experience on computing basic statistics by using spreadsheets. 5. Preparation of the students to carry out independent research; understand the methodology of writing a thesis and publishing a research article.

Prerequisites: Basics of statistics and computer skill

CO,PO ANDPSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	-	-	-	-	-	-	-
CO-2	-	-	-	-	-	-	-

CO-3	-	-	-	-	-	-	-
CO-4	**2**	-	-	-	-	-	-
CO-5	-	-	**3**	-	-	-	-
1:Weaklyrelated,2: Moderatelyrelatedand3:Stronglyrelated							

MODULE 1 : INTRODUCTION TO SCIENTIFIC RESEARCH METHODOLOGY (9L+3T=12)	
Introduction to scientific research methodology Research and Research Methodology: Meaning of research; objectives of research; Types of research-qualitative and quantitative research and its application in food processing; selection of a research problem. Research Design: Basic concepts concerning testing of hypothesis; and principles relating to experimental design. Features of translational research and their application in Food Technology.	**CO-1 BTL-2**
MODULE 2: SAMPLING METHODS (9L+3T=12)	
Random sampling methods and non-random sampling methods; size of sample; sampling and non-sampling errors. Collection of data: Tools for collecting primary data; guidelines for constructing primary data; sources of secondary data and tertiary data. Use of secondary and exploratory data to answer the research question. Use of Measurement Scales-Nominal, ordinal, ratio and interval scales, sensory scales. Experimental errors; tests of validity; reliability and practicality.	**CO-2 BTL-2**
MODULE 3: DATA ANALYSIS DESCRIPTIVE STATISTICS (9 L+3T=12)	
Measures of Central tendency, Measures of dispersion. Inferential Statistics – Hypothesis testing, Associations, test of significance– T-test, ANOVA, Correlation analysis	**CO-3 BTL-3**
MODULE 4: APPLICATION OF COMPUTER IN FOODTECHNOLOGY (9L+3T=12)	
Application of computer in food technology Data preparation using spreadsheets Editing, coding, classification, tabulations and graphical representation. Use SPSS Package and MS Excel for data analysis. Risk prone analysis number. Data bases and indexes in food research.	**CO-4 BTL-2**
MODULE5: SCIENTIFICREPORTWRITING(9L+3T=12)	
Research proposal, thesis, and journal articles. Requirement of technical communications. Bibliography – Reference manager software-Endnote, Mendeley, Zotero. Presenting Insights and findings using written reports and oral presentation. Ethics in research: Plagiarism, and Their Prevention. Softwares– PlagiarismX, Urkund, Plagscan, DupliChecker, Paperater.	**CO-5 BTL-2**

TEXTBOOKS

1.	Gupta;S.P.(2022) Statistical methods; Sultan Chand and Sons; 31st Revised Edition 2. ISBN: 978-8180549892.
2.	Kothari C.R (2019) Research Methodology-Methods and Techniques; New Age International; New Delhi. ISBN: 9789386649225.

MOOC

1.	https://nptel.ac.in/noc/courses/noc22/SEM1/noc22-ge15
2.	https://onlinecourses.swayam2.ac.in/nou22_cm06/preview

COURSE TITLE	BAKERY CONFECTIONARY AND PASTRY LAB			CREDITS	2
COURSE CODE	AFT12402	COURSE CATEGORY	PC	L-T-P-S	0-0-4-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	Through this course, students will be learning various baking and confectionary techniques using various emerging technologies.
Course Objective	Enable students 1.To introduce the students to the basic concepts and principles of baking and confectionery products. 2. To practice the methods, techniques and applications of candy making and baking in a laboratory set up. 3. To sensitize the students to the sources and properties of raw materials related to the manufacturing of baked and confectionery products. 4. To compare traditional and modern baking and confectionery techniques, preparation methods and storage practices to produce high quality products. 5. To enable the students to appreciate and evolve new formulations with novel ingredients in baking and confectionery sectors.
Course Outcome	Upon completion of the course students will be able to 1. Gain exposure to products having a wide range of innovative products appealing to consumers. 2. Learn the significance of the ingredients, processing techniques and value addition in both baking and confectionery products. 3. Widen the horizon in understanding the role of the traditional and non-traditional ingredients in the preparation of baked and confectionery goods. 4. The course focuses on the processing techniques and marketability of the finished products through workshops and industrial visit to baking and confectionery units. 5. The course offers practical demonstrations for basic confectionery and bakery preparations with innovations in the food industry.

Prerequisites: Food Science

CO, PO AND PSO MAPPING							
CO	**PO -1**	**PO-2**	**PO-3**	**PO-4**	**PSO-1**	**PSO-2**	**PSO-3**
CO-1	**1**	**2**	**1**	**2**	**1**	**2**	**2**
CO-2	**1**	**2**	**1**	**2**	**1**	**2**	**2**
CO-3	**1**	**2**	**1**	**2**	**1**	**2**	**2**
CO-4	**1**	**2**	**1**	**1**	**1**	**2**	**1**
CO-5	**1**	**1**	**1**	**1**	**1**	**2**	**1**
1: Weakly related, 2: Moderately related and 3: Strongly related							

EXPERIMENTS	
1. Preparation of different types of bread using various methods, quality evaluation and shelf-life studies. Preparation of gluten-free baked products.	**CO-1 BTL-3**
2. Preparation of different types of cakes and pastries using different methods, quality evaluation of cakes and evaluation of different types of toppings	**CO-2 BTL-3**
3. Preparation of other bakery products and indigenous baked goods: rusks, crackers, buns, muffins, pizza and kulcha. Experiment on leavening action of baking powder, sodium- bicarbonate and ammonium-bi-carbonate	**CO-3 BTL-3**
4. Different stages of sugar cookery and preparation of indigenous products based on the stages. Preparation of sugar solutions and evaluation using Refractometry and Brix	**CO-4 BTL-4**
5. Preparation and quality evaluation of non-crystalline candies - Non-Crystalline candies	**CO-5 BTL-4**
6. Hard candies (Tablets, lollipop), caramels, toffees and nougats. Preparation and quality evaluation of Crystalline candies: Fondant, fudge and Marshmallow	**CO-5 BTL-4**
Participation in a baking workshop on fundamental techniques and processing principles. Visit to bakeries and confectionary units	

TEXT BOOK	
1.	Dubey SC (2020) Basic Baking. The Society of Indian Bakers, New Delhi
REFERENCE BOOK	
1	Manley D (2020) Technology of Biscuits, Crackers & Cookies, 2nd Ed.CRC Press.
E BOOK	
1.	https//:guidesbakery.edu
MOOC	
1	https//:joyofbaking.com

COURSE TITLE	PROCESSING OF FRUITS AND VEGETABLE LAB			CREDITS	2
COURSE CODE	AFT12403	COURSE CATEGORY	PC	L-T-P-S	0-0-4-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	Vegetable and fruit processing lab teaches the various methods of processing that is specifically applicable to each and every fruit and vegetable based on its physiochemical properties.
Course Objective	Enable students 1. To understand the scientific basis for the formulation of fruit and vegetable products. 2. To develop novel products by integrating theoretical principles and practical skills. 3. To evaluate and understand the influence of physiochemical parameters on the shelf life of fruits and vegetables. 4. To explore industrial practices adopted to minimize losses during processing. 5. To integrate different processing principles in identifying defects in processed products and recommend suitable solutions.
Course Outcome	Upon completion of the course students will be able to 1. Aims to understand the various marketable processed fruits and vegetable products. 2. Analysis of fruits and vegetable products to better understand their quality parameters. 3. The course covers the fundamental scientific principles underpinning the methodology of thermal processing in fruit and vegetable industry. 4. Explores the changes in chemical and physical constituents of fruit and vegetable processing in fresh, dehydrated, frozen, and canned fruit and vegetable products. 5. This course is structured to evolve cost-effective methods of processed fruit and vegetable formulations suitable for food industry applications

Prerequisites: Food Science

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	2	1	1	2	2	1	1
CO-2	1	2	1	1	2	3	2

CO-3	**1**	**2**	**1**	**1**	**2**	**1**	**2**
CO-4	**2**	**2**	**1**	**1**	**2**	**2**	**2**
CO-5	**3**	**2**	**3**	**1**	**1**	**1**	**1**
1: Weakly related, 2: Moderately related and 3: Strongly related							

EXPERIMENTS	
1. Preparation of Jams, Jellies and Marmalades - Estimation of Total soluble solids, acidity and percentage Brix in the prepared fruit products.	**CO-1 BTL-3**
2. Determination of percentage Brine, percentage Brix, Vacuum, drained weight of thermally processed fruits and vegetable products (Canned/Bottled/Flexibly packaged).	
3. Preparation of fruit juice and determination of acidity.	**CO-2 BTL-3**
4. Practices in judging the maturity of fruits and vegetables. Influence of pH, thermal processing and freezing on the pigments in fruits and vegetables.	
5. Cost effective method to determine the effect of ethylene gas on fruits ripening.	**CO-3 BTL-3**
6. Preparation of sauces and ketchup, examination of physical parameters and viscosity.	
7. Preparation of indigenous fermented product and its microbial analysis.	**CO-4 BTL-3**
8. Traditional and Osmotic dehydration of fruits and vegetables with salt and sugar.	
9. Determine the presence of peroxidase, sulphur dioxide in dehydrated fruits and vegetables.	**CO-5 BTL-3**
10. Determination of rehydration ratio in dehydrated fruits and vegetables.	

TEXT BOOK	
1.	Rathore, Post-Harvest Management and Processing of Fruits and Vegetables (2021)
REFERENCE BOOK	
1	https://egyankosh.ac.in/bitstream/123456789/12397/.pdf
E BOOK	
1.	http://ecoursesonline.iasri.res.in/mod/page/view.php?id=807
MOOC	
1	https://onlinecourses.nptel.ac.in/noc22_ag03/Novelproccessing technology

<table>
<tr><td>COURSE TITLE</td><td colspan="3">PRESENTATION SKILLS</td><td>CREDITS</td><td>1</td></tr>
<tr><td>COURSE CODE</td><td>GLS52400</td><td>COURSE CATEGORY</td><td>AE</td><td>L-T-P-S</td><td>0-0-2-1</td></tr>
<tr><td>Version</td><td>1.0</td><td>Approval Details</td><td></td><td>LEARNING LEVEL</td><td>BTL-3</td></tr>
<tr><td colspan="6">ASSESSMENT SCHEME</td></tr>
<tr><td>First Periodical Assessment</td><td>Second Periodical Assessment</td><td>Seminar/ Assignments/ Project</td><td>Surprise Test / Quiz</td><td>Attendance</td><td>ESE</td></tr>
<tr><td>15%</td><td>15%</td><td>10%</td><td>5%</td><td>5%</td><td>50%</td></tr>
<tr><td>Course Description</td><td colspan="5">This practical course is designed to provide students with hands-on experience in conducting research, writing research papers, and delivering presentations tailored to real world contexts. Through a combination of theoretical instruction, practical exercises, experience and entail learning opportunities, students will develop the essential skills and competencies needed to excel in academic and professional settings.</td></tr>
<tr><td>Course Objective</td><td colspan="5">Enable the students
1. To effectively conduct research, critically evaluate sources, and synthesize information to produce well-structured and persuasive written documents.
2. To develop the skills necessary to delivering aging and professional presentations, including effective public speaking techniques, slide design principles, and audience engagement strategies.
3. To provide hands-on exercises, collaborative projects, and constructive feedback, cultivate the ability to communicate complex ideas clearly and confidently in both written and oral formats, preparing them for success in academic, professional, and Personal contexts.
4. To develop technical documents and presentations through the creation, editing, and application of visual aids.
5. To organize a diverse portfolio of technical writing and presentations.</td></tr>
<tr><td>Course Outcome</td><td colspan="5">Upon completion of the course students can able to
1. Discuss on research ideas and findings in clear and well-structured written research documents that communicate effectively.
2. Develop project proposal structures by analyzing successful examples and engaging in peer reviews.
3. Apply techniques for structuring technical presentations, integrating visuals, demonstrating delivery skills, and evaluating peers' work.
4. Develop technical documents and presentations through the creation, editing, and application of visual aids.
5. Organize a diverse portfolio of technical writing and presentations.</td></tr>
<tr><td colspan="6">Prerequisites: NIL</td></tr>
</table>

CO, PO AND PSO MAPPING											
CO	**PO -1**	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**PSO-1**	**PSO-2**	**PSO-3**
CO-1	-	-	2	2	3	-	-	3	-	-	3
CO-2	-	-	2	2	3	-	-	3	-	-	3
CO-3	-	-	3	2	3	-	-	3	-	-	3
CO-4	-	-	2	2	3	-	-	3	-	-	3
CO-5	-	-	2	2	3	-	-	3	-	-	3
1: Weakly related, 2: Moderately related and 3: Strongly related											

MODULE 1: Writing for Presentation (6 hrs)	
Introduction to Ms power point-Structuring technical presentations: introduction, main content, conclusion-Crafting clear and engaging presentation content-Types of presentation: informative, persuasive and demonstrative- Using images, animations and videos to enhance the quality of presentation- Customizing the presentation according to audience. **Lab Exercises:** • Making PowerPoint presentation. • Adding animations and videos.	**CO-1** **BTL-2**
MODULE 2: EFFECTIVE OFFLINE PRESENTATION (6 hrs)	
Searching and organising the content- Checking for feasibility of presentation aids- preparatory checks before presentation: voice, mike, system, lights, speaker, etc, handling fear and nervousness during the presentation. – importance of non-verbal communication: body language, gesture and eye contact. Handling mishap- stage management and bonding with the audience during presentation. **Lab Exercises:** • Micro presentation practice. • Practice for Handling mishap.	**CO-2** **BTL-2**
MODULE 3: EFFECTIVE ONLINE PRESENTATION (6 hrs)	
Customizing the presentation for online- introduction to online presentation tools: Zoom, Ms-Teams, Google meet, etc- handling camera, lights, mike and audience during online presentation. Using visuals and multimedia effectively in presentations handling mishap in online presentation- Time management during presentation. **Lab Exercises:** • Practice for micro-online presentation • Handling mishap during online presentations.	**CO-3** **BTL-2**
MODULE 4: CONCLUDING THE PRESENTATION (6 hrs)	
Summarising the presentation- handling the question-and-answer section- inspiring the audience for action- closing anecdote or quote. Paying complements and gratitude exercises and feedbacks- Presenting vote of thanks. **Lab Exercises:** • Practice for handling question and answer section. • Practice for presenting vote of thanks.	**CO-4** **BTL-2**
MODULE 5: DRESSING ATTRIBUTES FOR PRESENTATION (6 hrs)	
Importance of dressing for men and women- Use of proper dress code to meet the occasion- Importance of tie knots, shoes, belt, makeup, hairstyle, etc- Dressing for online presen-	**CO-5** **BTL-2**

tation-Do and Don't in dressing- self assessment and reflection. **Lab Exercises:** • Practice for dressing for the different occasions. • Practice for tying the knot.	
TEXT BOOKS	
1.	Technical Writing, Presentation Skills, and Online Communication: Professional Tools and Insights by Raymond Greenlaw
REFERENCE BOOKS	
1.	The Elements of Style by William Strunk Jr. and E.B. WhiteSlideology: The Art and Science of Creating Great Presentations by Nancy Duarte
E BOOKS	
1.	https://www.site.uottawa.ca/~rhabash/ELG2911TechnicalWritingandPresentation.pdf

SEMESTER – III

COURSE TITLE	TECHNOLOGY OF MEAT, FISH, AND POULTRY PROCESSING			CREDITS	4
COURSE CODE	AFT12005	COURSE CATEGORY	PC	L-T-P-S	3-1-0-1
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course deals with the processing of fish, meat and poultry, and as well as quality and hygienic aspects of handling various meat, fish and poultry products during processing.
Course Objective	Enable students 1. To understand the composition and nutritive value of meat, poultry, and fish. 2. To acquire knowledge about the various physical and chemical reactions that occurs after slaughter. 3. To know about processing technology of meat, poultry and fish. 4. To learn about the various types of spoilages that occurs in meat. 5. To understand the HACCP and GMP of meat plant.
Course Outcome	Upon completion of the course students can able to 1. Understand the slaughtering, carcass processing methods and equipment used for processing meat. 2. Apply technological ideas in the preparation of various types of meat products and designs of equipment used for processing meat. 3. To understand the HACCP and GMP of meat processing 4. Evaluate the processing of poultry meat, meat products and egg products. 5. Predict the role of microorganisms in spoilage, biochemistry, preservation, and fishery products

Prerequisites: Food Science

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	1	2	1	2	1	2	2
CO-2	1	2	2	2	1	2	1

CO-3	**1**	**2**	**1**	**1**	**1**	**2**	**1**
CO-4	**1**	**2**	**1**	**1**	**1**	**2**	**1**
CO-5	**1**	**1**	**3**	**1**	**2**	**2**	**1**

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: CHEMISTRY AND MICROBIOLOGY OF MEAT (9L+3T=12)	
Definition and composition of Meat, sources of meat; Explanation of muscle structure and compositions and its modifiers, White and Red Meat, Description of animal fat and its modifiers, description of bone and its modifiers; Post mortem muscle chemistry, Meat colour, flavors of meat products, meat microbiology and safety.	**CO-1 BTL-2**
MODULE 2:SLAUGHTERING AND CARCASS PROCESSING (9 L+3T=12)	
Modern abattoirs and features, Ante mortem handling and welfare of animals, design of handling facilities, Hoisting rail and traveling pulley system, slaughtering equipment, Washing, Sticking, bleeding, dressing, Beef/Sheep and Pig Dressing operations, Offal handling and inspection. Carcass processing equipment, Operational factors affecting meat quality, meat tenderization; electrical gadgets and manual gadgets; Typical layouts.	**CO-2 BTL-2**
MODULE 3: MEAT PRODUCTS (9 L+3T=12)	
Canned meat, Frozen meat, refrigerated meat, Cooked meat, Dried meat and Cured meat. Production methods for Intermediate moisture and dried meat products, Different kinds of sausages – Equipment used for all the process operations; Meat plant hygiene, Good manufacturing practice and HACCP.	**CO-3 BTL-2**
MODULE 4: PROCESSING OF POULTRY PRODUCTS: (9L+3T=12)	
Poultry industry in India, characteristics of poultry products, measurement: yields and quality of poultry product. Microbiology of poultry meat, spoilage factors; Poultry meat processing plant sanitation, operations and equipment used – Defeathering, bleeding, Scalding etc.; Packaging of poultry products, refrigeration and storage of poultry meat, by products – eggs, egg products, Whole egg powder, Egg yolk products. Poultry product packaging and storage.	**CO-4 BTL-2**
MODULE 5:FISH AND MARINE PRODUCT PROCESSING (9 L+3T=12)	
Commercial marine products in India, Basic biochemistry, spoilage factors of fish, field refrigeration and icing practice, merits and demerits, Use of dry ice and liquid nitrogen as preservation elements, use of Refrigerated Sea Water (RSW) for preservation, Changes during storage in RSW and CSW; Freeze preservation; freezing of prawn and shrimp. Canning operations, Salting and drying of fish, pickling and preparation of fish protein concentrate and fish oil.	**CO-5 BTL-2**

TEXT BOOKS	
1.	Srinivasan Damodaran, Kirk L. Parkin. “Fennema’s Food Chemistry”. 5th Edition, Taylor & Francis group, (2017). ISBN- 9781315372914
REFERENCE BOOKS	
1.	John M.deMan, John W. Finley, W.Jeffrey Hurst and Chang Yong Lee . “Principles of Food Chemistry”, 4th edition, Springer International Publishing (2018). ISBN 978-3-319-63607-8
E BOOKS	
1.	https://www.pdfdrive.com/food-processing-technology-principles-and-practice-

	woodhead-publishing-in-food-science-and-technology-e184887837.html
MOOC	
1.	https://www.pdfdrive.com/food-science-and-technology-d41395460.html

COURSE TITLE	NUTRIGENOMICS, MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE FOR FOOD TECHNOLOGY APPLICATIONS			CREDITS	4
COURSE CODE	AF12006	COURSE CATEGORY	PC	L-T-P-S	3-0-0-1
Version	1.0	Approval Details		LEARNING LEVEL	BTL-2

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	The course deals about the history of fundamentals of nutrigenomics and fundamentals of genetics and epigenetic regulations. Personalized nutrition and complex diseases and ethical issues. Fundamental learning of artificial intelligences and its relevant algorithm. Various machine learning algorithm and data processing codes.
Course Objective	Enable the students 1. To understand fundamentals of nutrigenomics and nutrition 2. To learn genetic markers and epigenetic function for gene regulation. 3. To study relationship between food and disease and ethical approach. 4. To discuss about the machine learning, artificial intelligent and it application in food technology. 5. To learn AI algorithms and data processing algorithm.
Course Outcome	Upon completion of this course, the students will be able to 1. Able to understand Basic knowledge on Nutrigenomics 2. Elaborate Genetics and epigenetics. 3. Discuss about the personalized medicine and disease. 4. Understand basics of Machine learning and Artificial intelligence. 5. Learned various machine learning algorithms.

Prerequisites:

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3
CO-1	1	1	2	2	1	1	1	1
CO-2	1	1	1	1	2	1	1	1
CO-3	1	1	1	2	1	2	1	1
CO-4	2	1	1	2	1	2	1	1

CO-5	**2**	**1**	**2**	**1**	**1**	**1**	**1**	**2**

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: FUNDAMENTALS OF NUTRIGENOMICS (9L+3P=12)	
Introduction to nutrigenomics, definition, and scope. Relationship between nutrients, diet, and gene expression. Modern techniques in genomics and genetic makeup**.** Use of molecular genomics in Nutrition.	**CO-1** **BTL-2**
MODULE 2: FUNDAMENTALS OF GENETICS (9L+3P=12)	
Genetic variability and nutrition. Nutrigenomics and Nutrigenetics. Need for personalized nutrition. Introduction to Epigenomics- Epigenomics and Nutrition. Epigenomics and disease.	**CO-2** **BTL-2**
MODULE 3: PERSONALIZED NUTRITION APPROACHES (9L+3P=12)	
Taste as a determining of eating behavior. Introduction to eating disorders (ED). Nutrigenomics and development of functional foods. Relationships between nutrigenomics and complex diseases. Personalized Nutrition Approaches and Ethical Considerations.	**CO-3** **BTL-2**
MODULE 4: ARTIFICIAL INTELLIGENCE (AI) AND MACHINE LEARNING (ML) IN FOOD INDUSTRY (9L+3P=12)	
Introduction to Artificial Intelligence (AI) and Machine Learning (ML). Integration of AI with sensory analysis: E-nose and E-tongue. Shelf life determination with real time monitoring. Food packaging, Food safety compliance.	**CO-4** **BTL-2**
MODULE 5: AI AND ML APPLICATIONS IN FOOD INDUSTRY (9L+3P=12)	
Role of AI in food process sectors: fruit and vegetables, dairy, bakery, beverages, fish and meat, poultry.	**CO-5** **BTL-2**

TEXT BOOKS

1.	Aboul E H, Mona S (Editors) (2023). Artificial Intelligence: A real opportunity in the food industry. Springer. ISBN: 978-3-031-13702-0.
2.	Insha Z, Sajad AW, Tariq A (2025). Artificial Intelligence in the food Industry ensuring quality and safety. CRC Press. ISBN 9781032613147.

REFERENCE BOOK

1.	Daniel H, Charles O, A (Editors) (2023). Sensing Artificial Intelligence solutions for food manufacturing. 1st edition. CRC Press. https://doi.org/10.1201/9781003207955. ISBN: 9781003207955.

E BOOK

1.	Artificial Intelligence for Biology, Soha Hassoun, Felicia Jefferson, Xinghua Shi, Brian Stucky, Jin Wang, Epaminondas Rosa, Jr. Integrative and Comparative Biology, Volume 61, Issue 6, December 2021, Pages 2267–2275, https://doi.org/10.1093/icb/icab188

COURSE TITLE	FOOD PRODUCT DEVELOPMENT			CREDITS	4
COURSE CODE	AFT12007	COURSE CATEGORY	PC	L-T-P-S	3-0-2-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	The course deals about the nutrition required during various stages of life in order to facilitate optimum growth. The nutrition requirements for reference man and women are dealt with.
Course Objectives	Enable the students 1. To understand the various steps involved in food product development. 2. Develop products that meet consumer requirements and demands. 3. Formulate products that are nutritionally and commercially viable 4. Development of packaging materials from different substances.
Course Outcome	Upon completion of this course, the students will be able to 1. Apply a product development process to generate ideas, design, develop and evaluate new products and their markets 2. Demonstrate skill in the application of standard methods for the measurement and evaluation of sensory differences 3. Evaluate and analyze the different food packaging material 4. Review the appropriate labelling to adhere to standards 5. Gain knowledge on pricing and marketing of food product

Prerequisites: Food science

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	2	2	1	2	2	1	1
CO-2	1	1	2	1	2	2	2
CO-3	1	1	1	2	2	2	2
CO-4	2	2	1	2	1	1	1
CO-5	1	1	1	2	2	1	1

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1 - INTRODUCTION TO NEW FOOD PRODUCT DEVELOPMENT (9 L+3P=12)	
Definition, significance of product development, food needs and consumer preferences, market survey and designing a questionnaire to find consumer needs for a product. Steps involved in product development, formulation of nutritious food products and standardization, Factors that influence new product development success, Intellectual Property Rights and patenting of foods. **Practicum** – Development of new product	**CO-1** **BTL-1**
MODULE 2: SENSORY EVALUATION OF THE PRODUCT (9 L+3P=12)	
Assessing the sensory characteristics of food - colour, texture, odor and taste. Sensory evaluation of foods – Laboratory set up, equipment, panel selection and training, judging quality. Subjective evaluation techniques – Difference tests: paired comparison test, duo-trio test, triangle test. Rating tests – Ranking single sample, two samples and multiple samples. **Practicum – Sensory evaluation techniques**	**CO-2** **BTL-2**
MODULE 3: ESSENTIALS OF FOOD PACKAGING (9 L+3P=12)	
Importance, definition, principles design requirement and basic FSSAI laws governing food packaging. Selection criteria and types of packaging material – metal, glass, paper, plastic, edible, wooden. Packages with special features – Boil-in-bag package, plastic-shrink package, cryovac film, microwave oven packaging, aseptic packaging and distribution packaging. **Practicum – Sensory evaluation techniques**	**CO-3** **BTL-2**
MODULE 4: PRODUCT LABELLING AND REGULATIONS (9 L+3P=12)	
Definition, purpose, importance, Function, Nutritional information and laws governing product labelling. Types of labelling – smart labels, barcode labels, radioactive labels, antimicrobial labels, security labels and other specialized food labels. Standards and regulations for nutrition harming and Nutrition claims in food labels. **Practicum – Development of Labels**	**CO-4** **BTL-3**
MODULE 5: QUALITY CONTROL, PRICING AND MARKETING (9 L+3P=12)	
Analyzing the product stability, evaluation of shelf life, determining the changes in sensory attributes due to environmental conditions. Pricing a product, Methods of pricing-cost plus pricing, Demand pricing, Competitive pricing, mark up pricing, Principles of pricing, determining the selling price and profit margin, price bundling, promotional pricing and quantity discounts. Advertising and marketing strategies- Basic techniques, Food advertising regulations, Marketing mix “four P’s” **Practicum** – Promotion of a product – Depict through video or poster.	**CO-5** **BTL-3**
TEXT BOOK	
1.	Subbu Lakshmi G and Udipi A Shobha (2017). Food processing and preservation. 1st edition, New Age Publisher.
REFERENCE BOOK	
1	Reddy S M. (2018). Basic food science and Technology. 3 rd edition, New age publisher.
E BOOKS	
1.	https://run.edu.ng/directory/oermedia/11934434415399.pdf

DEPARTMENTAL ELECTIVES

COURSE TITLE	TECHNOLOGY OF CEREALS, PULSES, AND OIL SEEDS			CREDITS	3
COURSE CODE	AFT12501	COURSE CATEGORY	DE	L-T-P-S	3-0-0-1
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	The course will provide theoretical knowledge about the processing of cereals, pulses and oil seeds. The technology concerned has a vital role in these products as they are of daily requirements in food with greater bifurcation of ingredient mixture uses.
Course Objective	Enable the students 1. To gain in-depth knowledge about cereals, pulses and oil seeds. 2. To equip the students with basic concepts of various unit operations in the processing of food materials. 3. To provide basic knowledge of various processing equipment. 4. To impart skills in product and by-product development. 5. To gain knowledge on converting waste in to wealth
Course Outcome	Upon completion of this course, the students will be able to 1. recall the basic concept on cereals, pulses and oil seeds processing 2. understand the various unit operations involved milling 3. analyze and select suitable equipment for milling 4. apply the knowledge to process grains into value added products 5. create new products from pulses and legumes

Prerequisites: Food Science

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	2	1	1	1	2	2	1
CO-2	2	1	2	2	2	2	1
CO-3	1	1	1	1	1	1	2
CO-4	2	1	1	2	1	1	2
CO-5	1	1	1	2	2	2	2

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION (9L+3T=12)	
General introduction and production and utilization trends; Structure and composition of common cereals, pulses and oilseeds.	**CO-1 BTL-2**
MODULE 2: WHEAT MILLING (9L+3T=12)	
Types and physicochemical characteristics; wheat milling -products and byproducts; factors affecting quality parameters; physical, chemical and rheological tests on wheat flour; additives used in bakery products; flour improvers and bleaching agents; manufacture of bakery products, pasta products and various processed cereal-based foods; manufacture of whole wheat atta, blended flour and fortified flour.	**CO-2 BTL-2**
MODULE 3: PADDY MILLING (9L+3T=12)	
Classification, physicochemical characteristics; Paddy parboiling – methods - quality changes - cooking quality - rice milling technology; by- products of rice milling and their utilization; Rice bran stabilization, oil extraction and refining – Quick cooking rice – fermented products – puffed, expanded rice.	**CO-3 BTL-2**
MODULE 4: MAIZE/ CORN MILLING(9L+3T=12)	
Types and nutritive value; dry and wet milling, processing of corn in breakfast cereals, snacks, tortilla etc., production of glucose syrups, dextrose, high fructose corn syrups, and modified starches.	**CO-4 BTL-2**
MODULE 5: PULSE AND OIL SEEDS MILLING (9L+3T=12)	
Pulse milling – traditional and commercial milling - processing for production of flour, protein concentrates and isolates - development of low cost protein foods**.** Types of oil seeds - Pre-conditioning of oilseeds - Oil expression and extraction – Traditional ghani - Mechanical expression, screw press, hydraulic press - solvent extraction methods - refining of oil - Byproducts utilization.	**CO-5 BTL-2**

TEXT BOOKS	
1.	Sahay, K.M. and K.K. Singh, 2016 Unit operations of Agricultural processing. Vikas publishing House Pvt. Ltd. Noida, New Delhi. ISBN: 9788125911425
REFERENCE BOOKS	
1.	Hoseney, R.S. (1994). Principles of Cereal Science and Technology. 2nd Ed.AACC. ISBN: 978-1-891127-63-2
E BOOKS	
1.	https://ccsuniversity.ac.in/bridge-library/pdf/FST-Paper-II%20Technology.pdf
MOOC	
1.	foodscienceuniverse.com/cereal-technology-and-milling-of-cereals/
2.	https://mooc.steps-project.eu/courses/course-v1:UNSA+B2-3.2+2022-2023/about

COURSE TITLE	FOOD PACKAGING TECHNOLOGY			CREDITS	3
COURSE CODE	AFT12502	COURSE CATEGORY	DE	L-T-P-S	3-0-0-1
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENTSCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	The course details the technology required for preparing foods for transport, storage, or sales elsewhere from the point of production and ensures safe delivery of products to the consumer in sound condition at minimal cost.
Course Objective	Enable students 1. To study about the functions of packaging 2. To gain knowledge about the influence of various factors on food quality. 3. To know about the different packaging materials and their application in food packaging. 4. To study about the various advance methods of food packaging. 5. To learn about defects in packaging.
Course Outcome	Upon completion of this course, the students will be able to 1. Understand the need and functions of packaging to protect and store food. 2. Gain knowledge on shelflife of food and accelerated shelflife testing. 3. Know the different packaging materials based on their properties and their application. 4. Learn about the filling and sealing techniques used for different food materials. 5. Understand labeling methods and legislature. 6. Know about the advanced food packaging techniques.

Prerequisites: Food Science

CO,PO ANDPSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	-	-	-	-	-	-	-
CO-2	-	-	-	-	-	-	-
CO-3	-	-	-	-	-	-	-
CO-4	2	-	-	-	-	-	-
CO-5	-	-	3	-	-	-	-

1:Weaklyrelated,2: Moderatelyrelatedand3:Stronglyrelated

MODULE 1: INTRODUCTION TO FOOD PACKAGING(9 L+3T=12)	
History of Packaging. Functions of Packaging. Levels of Packaging in food distribution. Effect of environmental factors and biological factors on quality of food products. Shelf life of food products and accelerated shelf life testing.	**CO-1 BTL-2**
MODULE 2: PACKAGINGMATERIALS (9 L+3T=12)	
Types–Metals, Glass, Papers and Polymers. Properties-Requirements-Packaging strategy for different foods - Total product concept.	**CO-2 BTL-2**
MODULE 3: METALS AND GLASS (9 L+3T=12)	
Metal Cans- Types of metals, Types of food and beverage cans. Open top sanitary cans and two-piece cans. Can manufacturing operations. Lacquers. Aerosol Cans. Glass Packaging– Properties, composition, types of glass. Glass Manufacturing. Bottle sterilization.	**CO-3 BTL-3**
MODULE 4:POLYMERS AND PAPER(9 L+3T=12)	
Types and applications. Flexible and rigid polymers. Manufacturing of films and containers. Co-extruded films, Laminates and Plastic Containers. Paper and paperboard – Types of Paper and Paper board. Test for packaging materials.	**CO-4 BTL-2**
MODULE 5: FILLING AND SEALING (9 L+3T=12)	
Types of fillers, seals and sealing equipment. Types of Pouches and Form Fill Seal machines. Labelling - Types of Labels - Nutrition Label - Printing Techniques.	**CO-5 BTL-2**
TEXTBOOKS	
1.	RichardColes, Derek McDowell & MarkJ.Kirwan, Food Packaging Technology, Blackwell Publishing Ltd, 2019, ISBN:978-1-405-14771-2.
REFERENCEBOOKS	
1.	GordonL.Robertson,Food Packaging Principlesand Practice,3rdEdition,CRCPress,2018, ISBN:978-1439862414.
EBOOKS	
1.	https://www.academia.edu/19121118/Food_Packaging_Principles_and_Practice_2012
MOOC	
1.	https://www.openlearning.com/courses/introduction-to-food-packaging/?cl=1

COURSE TITLE	ADVANCED FOOD PROCESSING AND PRESERVATION METHODS			CREDITS	3
COURSE CODE	AFT12503	COURSE CATEGORY	DE	L-T-P-S	3-0-0-1
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	The course deals with the preservation and processing steps in various food products, which includes canning, pickling, drying, irradiation pulse electric field, sonication, high pressure processing and also the significance of consuming preserved foods
Course Objective	Enable the students 1. To impart knowledge on basic aspects of food preservation. 2. To provide technical aspects of food processing. 3. To give orientation towards the process and products developed using different techniques. 4. To create new processes for product development create new processes for product development
Course Outcome	Upon completion of this course, the students will be able to 1. Recall the basic principles involved in food preservation. 2. Understand the various processing methods. 3. Comprehend suitable techniques for preservation of various foods. 4. Apply the modern technologies o food preservation in industry. 5. Evaluate and suggest proper preservation methods and equipment.

Prerequisites: Food Science

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	1	1	2	2	1	1	2
CO-2	1	1	1	2	1	1	1
CO-3	2	2	1	2	2	1	1
CO-4	2	1	1	1	2	1	2
CO-5	2	1	2	1	2	1	2

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: PRINCIPLES OF FRESH FOOD STORAGE AND PRESERVATION (9 L+3T=12)	
Definition and scope of Food Science and Technology- Nature of harvested crop, plant, animal; product storage; effect of cold storage and quality – storage of grains, historical development of food processing and preservation, general principles of food preservation	**CO-1 BTL-2**
MODULE 2: PRESERVATION BY HEAT(9 L+3T=12)	
Blanching, pasteurization, sterilization and UHT processing, canning, extrusion cooking, dielectric heating, microwave heating, baking, roasting and frying. Retort processing of Ready to eat (RTE) products. Newer methods of thermal processing – batch and continuous.	**CO-2 BTL-2**
MODULE 3: PRESERVATION BY LOW TEMPERATURE (9 L+3T=12)	
Chilling: Considerations relating to storage of foods at chilling temperature, applications and procedures, controlled and modified atmosphere storage of foods. Freezing temperature: Freezing process, slow and fast freezing of foods and its consequences, other occurrences associated with freezing of foods. Technological aspects of pre-freezing, Actual freezing, frozen storage and thawing of foods.	**CO-3 BTL-3**
MODULE 4: PRESERVATION BY DRYING (9 L+3T=12)	
Drying – water activity. Dehydration of fruits, vegetables, milk, animal products. Various methods employed in production of dehydrated commercial products advantages and disadvantages of different methods, sundrying, tray or tunnel drying, spray drying, drum drying, freeze drying, fluidized bed drying. Physical and chemical changes during drying, control of chemical changes, desirable and undesirable changes.	**CO-4 BTL-2**
MODULE 5: PRESERVATION BY NON-THERMAL METHODS (9 L+3T=12)	
High pressure, pulsed electric field, ultrasound technology, cold plasma technology, UV and pulsed light technology, hurdle technology. Permissible limits for chemical preservatives. Use and application of enzymes in processing and preservation of foods.	**CO-5 BTL-2**
TEXT BOOKS	
1.	Sivasankar,B, “Food processing and preservation”, Prentice Hall., 2018. ISBN-13: 978-8120320864
REFERENCE BOOKS	
1.	Rao, Chandra Gopala, “Essentials of food process engineering”. B.S. Publications, 2019. ISBN 9781439803103.
E BOOKS	
1.	https://www.rroij.com/open-access/food-preservation-methods-and-advanced-techniques.pdf
MOOC	
1.	https://openedx.moocshub.com/courses/course-v1:GWPGC+FN101+2022_04/about

COURSE TITLE	FOOD ADDITIVES AND FOOD TOXICOLOGY			CREDITS	3
COURSE CODE	AFT12504	COURSE CATEGORY	DE	L-T-P-S	3-0-0-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	The course will provide the importance of food additives in food acting as a compliment in order to improvise its quality presumption. The formula addition and the desired additive will be based on the food content and nutritive value. The course completely relates to the preservation and additive components pertaining to the food substance.
Course Objective	To enable the students 1 To elucidate the role of additives in food 2 To analyze the nutrient specializations in accordance with the food additive. 3 To discuss the correlation of food and its additive 4 To implement the formulation skills in industrial oriented mechanisms. 5 To inculcate the ideology in research oriented fashion.
Course Outcome	Upon completion of this course, the students will be able to 1 Understand about the main additive classification in varieties of food. 2 Gain knowledge about micronutrient analysis involved in food classifications. 3 Learn about protein formation and their role with amino acid essentials 4 Detect the analytical energy based roles of macro and micro-nutrients in food 5 Develop study on the mechanism of action of the food metabolism of nutrients.

Prerequisites: Principles of Food Science

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	2	2	3	1	2	1	1
CO-2	2	2	1	2	2	1	1
CO-3	1	1	2	2	2	2	2
CO-4	1	3	1	1	3	1	1
CO-5	1	2	1	1	2	1	2

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION (9L+3T=12)	
Food additives- definitions, classification and functions, need for food additives, food preservatives, classifications, antimicrobial agents. safety concerns, regulatory issues in India, international legal issues Nutrient supplements & thickeners, polysaccharides, bulking agents, antifoaming agents, synergists, antagonists.	**CO-1** **BTL-2**
MODULE 2: ANTIOXIDANTS (9L+3=12T)	
Antioxidants (synthetic and natural, mechanism of oxidation inhibition), chelating agents: types, uses and mode of action.	**CO-2** **BTL-2**
MODULE 3: COLOURING AGENTS (9L+3T=12)	
Color retention agents, applications and levels of use, natural colorants, sources of natural color (plant, microbial, animal and insects), misbranded colors, color extraction techniques, color stabilization.	**CO-3** **BTL-3**
MODULE 4: FLAVOURING AGENTS (9L+3T=12)	
Flavoring agents: flavors, flavor enhancers, flavor stabilization, flavor encapsulation Flour improvers: leavening agents, humectants and sequesterants, hydrocolloids, acidulants, pH control agents buffering salts, anticaking agents, etc.	**CO-4** **BTL-2**
MODULE 5: SWEETENERS (9L+3T=12)	
Sweeteners: natural and artificial sweeteners, nutritive and non-nutritive sweeteners, properties and uses of saccharin, acesulfame-K, aspartame, corn sweeteners, invert sugar sucrose and sugar alcohols (polyols) as sweeteners in food products. Emulsifiers: Types, selection of emulsifiers, emulsion stability, functions and mechanism of action. Additives, food uses and functions in formulations; permitted dosage	**CO-5** **BTL-2**
TEXT BOOK	
1.	Seyed Mohammed Nobavi. (2020). Food Additives and Human Health
REFERENCE BOOK	
1.	Morton ID & Macleod AJ .(2017). Food Flavours. Part A, B & C. Elsevier.
MOOC	
1.	https://efsa.onlinelibrary.wiley.com/doi/full/10.2903/j.efsa.2020.e181110

COURSE TITLE	ADVANCED FOOD BIOTECHNOLOGY			CREDITS	3
COURSE CODE	AFT12505	COURSE CATEGORY	DE	L-T-P-S	3-0-0-1
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	Food biotechnology deals with the use of technology to modify the genes of our food sources. With food biotechnology, new species of animals and plants are created and the new species have desired nutritional, production, and marketing properties
Course Objective	To enable the students 1.To impart basic knowledge about components of different process equipment and unit operation associated with them 2. The student will gain basic knowledge of technology and methods for the development of various food products. 3. To understand genetically modified microorganisms and their applications in foods 4. To understand the methodologies to improve production and modify the qualities of food.
Course Outcome	Upon completion of this course, the students will be able to 1. Explore the origins of biotechnology, the legislation, and social issues related to biotechnology in food. 2. Gives knowledge on the genetic manipulation of microorganisms for food production. 3. The student will gain basic knowledge of GMOs/GMCs. 4. Role of microorganisms in food biotechnology and their various applications in the food sector. 5. To gain knowledge on the molecular methodologies of identification of food pathogens.

Prerequisites: Biotechnology

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	1	1	2	1	1	1	1
CO-2	1	1	2	1	1	2	2
CO-3	1	2	1	1	2	2	1
CO-4	2	1	1	2	2	2	1

CO-5	1	2	3	1	3	2	1

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: FERMENTATION IN FOOD BIOTECHNOLOGY (9 L+3T=12)	
Types of Fermentation - Submerged Fermentation, Solid-State Fermentation, Submerged Fermentor Systems - Stirred Tank Bioreactor, Air Lift Bioreactor, Fluidized Bed Bioreactor, Microcarrier Bioreactor, Membrane Bioreactor, Photobioreactor. Solid-State Fermentor Systems - Laboratory Scale SSF bioreactor, Industrial Scale SSF Bioreactor. Stages in a Fermentation Process - Upstream Processing, Fermentation Medium, Components of Industrial Fermentation Medium, Sterilization, Inoculation. Fermentation Process - Modes of Operation, Agitation, Aeration, Process Monitoring and Control. Scale up and scale down	**CO-1 BTL-2**
MODULE 2: DOWNSTREAM PROCESSING & PRODUCT RECOVERY (9 L+3T=12)	
Separation of insoluble products - filtration, centrifugation, sedimentation, flocculation; Cell disruption. Separation of soluble products: liquid, liquid extraction, precipitation, chromatographic techniques, reverse osmosis, ultra and microfiltration, electrophoresis Final purification: drying; crystallization; storage and packaging	**CO-2 BTL-2**
MODULE 3: BIOTRANSFORMATION IN FOOD INDUSTRIES (9 L+3T=12)	
Potential of Microbial and plant cells to carry out biotransformation. Reactions involved in biotransformation. Design of biotransformation process – Selection of microorganisms, methods. Improvement of Biotransformation process - Optimization of environmental conditions, strain improvement, eliminations of side chain. Product Isolation. Production of Vanilla by biotransformation	**CO-3 BTL-3**
MODULE 4: GENETICALLY MODIFIED FOOD (9 L+3T=12)	
Genetically engineered proteins: Bovine Somatotropin in Milk , Genetically engineered bacteria: Chymosin Lite beer, Tryptophan , Transgenic plants: Flavr Savr tomato, nutritionally improved crops, Edible vaccines: Cholera vaccine in potatoes , Transgenic Fish: Atlantic salmon	**CO-4 BTL-2**
MODULE 5: MOLECULAR TECHNIQUES TO IDENTIFY FOOD PATHOGENS (9 L+3T=12)	
Nucleic acid assay methods - Molecular subtyping - RFLP, RAPD, hybridization methods - FISH, Amplification Methods - PCR. Rapid Methods - Quantum Dots, Nano chemicals, Cantilevers, phage-based assay, pyrosequencing, microarrays. Biosensor	**CO-5 BTL-2**

TEXT BOOKS

1.	Anthony Pometto, Kalidas Shetty, Gopinadhan Paliyath, Robert E. Levin, 2018. Food Biotechnology. CRC Press, New York
1.	Aly Farag, Robert Levin and Jianping Xu,2018. Molecular techniques in Food biology.Wiley & Sons,USA

E BOOKS

1.	https://publication/311576459_Food_Biotechnology_Principles_and_Practices

MOOC

1.	https://imoox.at/mooc/local/landingpage/course.php?shortname=foodbiotech&lang=en

COURSE TITLE	FOOD ADULTERATION FOOD SAFETY AND QUALITY CONTROL			CREDITS	3
COURSE CODE	AFT12506	COURSE CATEGORY	DE	L-T-P-S	3-0-0-1
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	To facilitate the students to learn and understand food adulteration, food safety principles, Production Methods, Quality control practices, and sanitizing procedures to be followed in the food industries.
Course Objective	1. To get understand the food adulterants and food adulteration. 2. To get more exposure and awareness of food safety systems. 3. To Implement GMP (Good Manufacturing Practices) and quality assurance scheme. 4. To implement the HACCP program in any food industry 5. To build fundamental knowledge of food quality management 6. To develop procedures and approaches to identify food safety hazards in food process.
Course Outcome	Upon completion of this course, the students will be able to 1. Determine the food adulterants and adulterated foods. 2. Differentiate Quality control, Quality Assurance and their functions to maintain safe food. 3. To outline the practices and procedures to produce safe, high-quality cereal-based products; development of good hygienic practices (GHP) and good manufacturing practices (GMP) programmers and Hazard Analysis and Critical Control Point (HACCP) system. 4. Develop procedures and approaches to identify food safety hazards in the food process. 5. They can easily identify the sources for food standards, regulations and specifications prescribed by different certificate bodies. 6. Become an advisor to the manufacturing industries, and process industries that are involved in the food business.

Prerequisites: Fundamentals of Food processing and preservation techniques

CO, PO AND PSO MAPPING

CO	PO - 1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3	PO -1
CO-1	1	2	1	1	1	1	1	1

CO-2	**1**	**2**	**1**	**1**	**1**	**1**	**1**	**1**
CO-3	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**1**
CO-4	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**1**
CO-5	**1**	**1**	**3**	**1**	**1**	**1**	**1**	**1**

1: Weakly related, 2: Moderately related, and 3: Strongly related

MODULE 1 INTRODUCTION TO FOOD ADULTERATION AND FOOD SAFETY (9L+3T=12)	
Introduction to concepts of food adulterants, adulteration – intentional / unintentional. Test for food adulteration detection. Health consequences of food adulteration. Food safety - Definition and terms Safety in food procurement, handling, preparation storage and distribution, Current challenges to food safety.	**CO-1 BTL-2**
MODULE 2: PRE-REQUISITE PROGRAM (9L+3T=12)	
Good Manufacturing Practices - Personal hygiene – occupational health and safety specification, Food Plant Sanitation Management - Plant facilities construction and maintenance - the exterior of the building- the interior of the building- equipment. Storage, transportation, traceability, recalling procedures, training.	**CO-2 BTL-2**
MODULE 3: SAFETY DURING PROCESSING (9L+3T=12)	
Conduct a hazard analysis, and CCP identification, establish critical limits for each CCP, establish CCP monitoring procedures, establish corrective action procedures, establish procedures for HACCP verification and validation, and document the HACCP Program. HACCP; Desirable safety features of some food processing equipment; Personal protective equipment's.	**CO-3 BTL-3**
MODULE 4: FOOD QUALITY AND FOOD SAFETY (9L+3T=12)	
Quality of raw materials, quality checks on flours, building inspection and routine cleaning programs, process control- microbial and fungal contaminants. Ingredients, equipment's, ingredient inspection, process control, assessing products for quality -National and international standards.	**CO-4 BTL-2**
MODULE 5: PERSONAL HYGIENE (9L+3T=12)	
Introduction - Procedure of cleaning in place process - Centralized CIP system - Operation techniques - Sanitization in CIP process - Cleaning and sanitization - Cleaning Methods and consideration - Sanitization methods, Factors, and applications - Assessment of the effectiveness of cleaning and sanitizations. Hygiene and sanitation requirements in food processing industries; Cleaning, sanitizing & pest control in food processing; storage and service area, Contigency plan.	**CO-5 BTL-2**

TBOOKS	
1.	Food Safety Management, A Practical Guide for the Food Industry, Editors: Yasmine Motarjemi Huub Lelieveld, eBook ISBN: 9780123815057, Hardcover ISBN: 9780123815040, Academic Press.
2.	Andres Vasconcellos J. 2005. Quality Assurance for the Food industry - A practical approach. CRC press. 2. Inteaz Alli. 2004. Food quality assurance - Principles & practices. CRC Press.

3.	Inteaz Alli. 2004. Food quality assurance - Principles & practices. CRC Press. New York
4.	Roday, S. 1998. Food Hygiene and Sanitation, Tata McGraw-Hill Education.
REFERENCE BOOKS	
1.	Food Hygiene, Microbiology & HACCP. S J Forsythe, P R Hayes. Springer, 2012
2.	Food Safety Handbook, Author(s): Ronald H. Schmidt, Gary E. Rodrick, Published 2003 John Wiley & Sons, Inc., Print ISBN: 978047121064
E BOOKS	
1.	Food Safety Handbook, DOI: 10.1002/047172159X
2.	Neal D. Fortin. 2009. Food regulation, Wiley Publishers
3.	Naomi Rees. David Watson. 2000. International standards for food safety, An Aspen Publications
4.	O'Rourke. 2005. European Food law, 3rd Edition, Thomson, Sweet and Maxwell
MOOC	
1.	http://www.who.int/foodsafety/publications/micro/march1995/en/ index.html
2.	https://www.mofpi.gov.in
3.	https://fostac.fssai.gov.in
4.	https://elearning.fao.org
5.	www.theknowledgeacademy.com/*food-safety*

COURSE TITLE	FOOD LAWS, AUDITING AND REGULATION			CREDITS	3
COURSE CODE	AFT12507	COURSE CATEGORY	DE	L-T-P-S	3-0-0-1
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENTSCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	The course deals with the food laws, auditing and regulations that are applicable nationally and internationally, so that the food products produced are in par regarding quality.
Course Objective	Enable the students 1. To gain an understanding on the food laws aspects for food industries. 2. To apply the principles of food laws and regulation sto control food risks/ hazards and assure the quality of food products. 3. To develop procedures and approaches to identify food contamination and implement HACCP and FSMS plans. 4. To evaluate the required standards, laws and regulations to effectively handle food business operations. 5. To be aware and updated on current topics of importance to food auditing and legal requirements.
Course Outcome	Upon completion of this course students can able to 1. Provide fundamental theoretical concepts on food laws as affected the food sector. 2. Enable students to identify international and national laws and regulations and their prevention procedures to eliminate food related hazards. 3. Discuss the principles and concepts for developing food audit procedures and plans. 4. Focus on the history and purpose of food law/standards and its importance in trade and commerce. 5. Emphasize the legal requirements for an effective processing environment to produce safe food for human consumption.

Prerequisites: Food Science

CO,PO ANDPSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	-	-	-	-	-	-	-
CO-2	-	-	-	-	-	-	-
CO-3	-	-	-	-	-	-	-
CO-4	2	-	-	-	-	-	-

CO-5	-	-	**3**	-	-	-	-
1:Weaklyrelated,2: Moderatelyrelatedand3:Stronglyrelated							

MODULE:1 HISTORICAL PERSPECTIVES OF FOOD LAWS AND REGULATIONS (9L+3T=12)	
Historical Perspectives of food laws and regulations- Purpose of laws to enforce safety and purity of food products. The current food law on standardization: fundamentals, areas, benefits and aims of national and international institutions relating to food standardization	**CO-1 BTL-2**
MODULE 2: INTERNATIONAL FOOD LEGISLATION & STANDARDS (9 L+3T=12)	
Concepts and trends in food legislation. Harmonized Food Standards for international trade, WTO International regulatory bodies dealing with food standardization: Codex Alimentarius Commission, ISO, FAO/WHO standards, standard setting and advisory mechanism. Country specific standards EU, EPA, USFDA, FSMA. Retailer Standards: overview -BRC, SQF, IFS –relations with national laws. Current trends in Food Standardization.	**CO-2 BTL-2**
MODULE 3:FOOD LAWS AND FOOD SAFETYMANAGEMENT SYSTEM (9 L+3T=12)	
Prerequisite programmes, Codex Alimentarius, logic sequence for the application of HACCP - 12 steps - CCP, HACCP plan, monitoring and corrective action, calibration of monitoring devices, Food inspection and product recall, withdrawal, documentation and record keeping validation of controls, verification, traceability and recall.	**CO-3 BTL-3**
MODULE 4: NATIONAL FOOD LAWS (9L+3T=12)	
Government Regulatory System for Food Legal compliances specific to Food industry in relation to food quality / safety in India. Mandatory and voluntary food laws. FSSAI and Food Regulation in India. Food Safety & Standards Act 2006, Food safety and standard rules 2011 (as amended from time to time). FSSAI-Implementing Agencies, Governing bodies-penalties.	**CO-4 BTL-2**
MODULE5: FOOD AUDITING AND CERTIFICATION (9L+3T=12)	
Food audit: aims and benefits. Types of audits, Audit criteria and audit participants. Ethical, Legal, and Professional Issues in audit**.** Audit Preparation and Planning. Audit Performance. Audit Reporting**.** Audit Follow-up and Closure**.** Auditor Competencies**.** Certification/ Certifying bodies, Accreditation and Auditing.	**CO-5 BTL-2**

TEXTBOOKS	
1.	Andres Vasconcellos J. 2005. Quality Assurance for the Food industry - A practical approach. CRC press. ISBN: 9780429210006.
2.	FSSAI Basic Food safety hand book / Manual for Foodmanufacturers, Processors and packers 2017
3.	Neal D. Fortin. 2009. Food regulation, Wiley Publishers.
4.	Naomi Rees. David Watson. 2000. International standards for food safety, An Aspen Publications
EBOOKS	
1.	https://www.ihmnotes.in/Sem-3&4/FOOD%20SAFETY%20&%20QUALITY/1.pdf
MOOC	
1.	https://www.cdc.gov/foodsafety/cdc-and-food-safety.html
2..	https://www.fao.org/food-safety/en/

COURSE TITLE	ADVANCED FERMENTED FOODS			CREDITS	3
COURSE CODE	AFT12508	COURSE CATEGORY	DE	L-T-P-S	3-0-0-1
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	The course deals about the history of fermented foods and beverages and the impact of fermentation on flavour, aroma, and taste and from chemistry to microbiology of fermented foods, the role of different types of microbes in production, preservation, and enhancement of diverse foods.
Course Objective	To enable the students 1. To understand various principles and procedures involved in the fermentation of foods. 2. To examine the different biochemical and microbial systems involved. 3. To study common biochemical pathways involved in different fermentation systems. 4. To discuss on the methods for starter culture preparation, protection and use. 5. To learn about the impact of fermentation on nutritive value, flavour, aroma
Course Outcome	Upon completion of this course, the students will be able to 1. Elaborate the principles of food fermentation technology 2. Evaluate the types of starters used in Food Industry 3. Discuss about the production of various fermented foods, alcoholic and non-alcoholic beverages. 4. Apply the benefits of traditional foods and its existence at present to explore.

Prerequisites: Food science

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3
CO-1	1	1	2	2	1	1	1	1
CO-2	1	1	1	1	2	1	1	1
CO-3	1	1	1	2	1	2	1	1
CO-4	2	1	1	2	1	2	1	1
CO-5	2	1	3	1	1	1	1	2

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: SPECIALISED FERMENTATION (9L+3P=12)	
Fermentation - Principles, Types of fermentation. Specialized fermentations including alcoholic, lactic fermentations. Advantages of fermentation. Organisms used for production of fermented food products; Environmental parameters for fermentation process; safety criteria of fermented foods. Fermented foods – starter cultures, genetics and biochemical aspects	**CO-1 BTL-2**
MODULE 2: CEREAL BASED FERMENTATION (9L+3P=12)	
Cereal and legume based fermented products like Bread, Soya Sauce, Koji, Tempeh, Miso, Natto, Tofu, Angkkak; Indian products like Idly, Dosa, Bori. Alcoholic beverages and vinegar.	**CO-2 BTL-2**
MODULE 3: VEGETABLES, FISH AND MEAT BASED FERMENTED PRODUCTS (9L+3P=12)	
Different types of pickles like olive cucumber, salt stock and dill pickles, Fish sauce, sausages and Surimi. Processing techniques and quality assessment	**CO-3 BTL-3**
MODULE 4: DAIRY BASED FERMENTED PRODUCTS (9L+3P=12)	
Cheese, Butter, Yoghurt, Kefir, Koumiss, Srikhand, Cultured butter milk; Whey based fermented products. Processing methods and quality determination. The role of fermented dairy ptoducts in human nutrition	**CO-4 BTL-2**
MODULE 5: WINE AND BEER PRODUCTION (9L+3P=12)	
Selection and desirable characteristics of raw materials used for wine and beer production. Detailed analysis of unit operations applicable to the production of beer, wine, etc. The roles played by microorganisms during fermentation for different types of beer, and wines. Post fermentation treatments processing and packaging. Biochemistry of malting and mashing.	**CO-5 BTL-2**
TEXT BOOKS	
1.	A. Sankara Narayanan, N. Amaresan, D. Dhanasekaran. (2020) Fermented Food Products. 1st Edition. CRC Press. ISBN 9780367224226.
REFERENCE BOOKS	
1.	SandorEllix Katz and Michael Pollan. (2012) The Art of Fermentation: An In-Depth Exploration of Essential Concepts and Processes
E BOOKS	
1.	https://www.med.umich.edu/pfans/_pdf/hetm-2017/0717-fermentedfoods.pdf

COURSE TITLE	ENTREPRENEURSHIP DEVELOPMENT IN FOOD TECHNOLOGY			CREDITS	3
COURSE CODE	AFT12509	COURSE CATEGORY	DE	L-T-P-S	3-0-0-1
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	Entrepreneurs require a foundation in several key areas in order to be successful. This course will focus on multiple topics including: opportunities and challenges for new ventures, benefits/drawbacks of entrepreneurship, strategic management and forms of business ownership, marketing strategies, venture finance and human resource management.
Course Objective	To enable the students 1. To systematically apply an entrepreneurial way of thinking that will allow them to identify and create business opportunities that may be commercialized successfully. 2. To acquire necessary knowledge and skills required for organizing and carrying out entrepreneurial activities 3. To develop the ability of analyzing and understanding business situations in which entrepreneurs act 4. To master the knowledge necessary to plan entrepreneurial activities. 5. To advance the ability of analyzing various aspects of entrepreneurship activities
Course Outcome	Upon completion of this course, the students will be able to 1. Acquire the ability to discern distinct entrepreneurial traits 2. Know the parameters to assess opportunities and constraints for new business ideas 3. Understand the systematic process to select and screen a business idea 4. Design strategies for successful implementation of ideas 5. Write a business plan

Prerequisites: BASICS OF ENTREPRENEURSHIP DEVELOPMENT

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	1	2	2	2	2	2	1
CO-2	2	1	1	1	1	1	1
CO-3	1	1	1	2	2	2	1
CO-4	1	1	2	1	2	1	2

CO-5	**1**	**2**	**2**	**1**	**1**	**1**	**2**

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION (9 L+3T=12)	
Entrepreneur & entrepreneurial flair; Classification of small, medium and large scale manufacturing industries; Opportunities of food processing industries in West Bengal.	**CO-1 BTL-2**
MODULE 2: SCOPE OF ENTREPRENEURSHIP (9 L+3T=12)	
Nature, scope and importance of entrepreneurship; business ideas, source of business ideas, feasibility studies, problem solving and decision making. Agricultural sector and food processing industry problems and opportunities; self-employment need and entrepreneurship in foods sector, project sizing, fund management and enterprise management issues in food entrepreneurship, entrepreneurship development policies of government in food business	**CO-2 BTL-2**
MODULE 3: LICENSING PROCEDURES (9 L+3T=12)	
Trade license and registration marks; Sources of finance; Selection of land and factory sheds.	**CO-3 BTL-3**
MODULE 4 : EQUIPMENT MANAGEMENT (9L+0T=9)	
Agencies for promotion of food processing industries; Source of machine and equipment.	**CO-4 BTL-2**
MODULE 5: WRITING PROJECT PROPOSAL (9L+0T=9)	
Preparation of project report; Market feasibility reports; Techno-economic feasibility report on fruits and vegetable processing, bakery and confectionary, mushroom manufacture and soybean processing.	**CO-5 BTL-2**

TEXT BOOK	
1.	Kanka. (2014) Entrepreneurial Development, Himalaya Publishing House.
REFERENCE BOOK	
2.	Poornima. (2013.)Entrepreneurial Development, S Chand & Co

COURSE TITLE	UNIT OPERATIONS IN FOOD PROCESSING			CREDITS	3
COURSE CODE	AFT12510	COURSE CATEGORY	DE	L-T-P-S	3-0-0-1
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	The processes used by the food industry can be divided into common operations, called unit operations. Unit operations common to many food products include cleaning, controlling, disintegrating, drying, evaporating, fermentation, heating/ cooling(heat exchange), materials handling, mixing, packaging, pumping, separating, and others.
Course Objective	Enable the students 1. To gain Knowledge on the principles of food process engineering and its significance in food industry. 2. To understand the units, dimensions and formulas related to food processing 3. To familiarize about the existing various food processing unit operations 4. To provide knowledge on emerging novel, various unit operations involved in food industry.
Course Outcome	Upon completion of this course, the students will be able to 1. List and explain the principles of different types of evaporators and their application. 2. Analyze the different mechanical separation techniques 3. Appraise the significance of size reduction and energy requirements in food processing 4. Illustrate the mechanism of crystallization and distillation 5. Employ different processing techniques to transform the raw materials to quality food products

Prerequisites: Food science

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	2	1	2	2	2	2	2
CO-2	2	2	2	1	2	2	2
CO-3	2	1	2	2	1	2	2
CO-4	1	2	2	2	2	2	2
CO-5	2	2	2	2	2	2	2

1: Weakly related, 2: Moderately related and 3: Strongly related	
MODULE 1: INTRODUCTION TO UNIT OPERATIONS (9L+0T)	
Introduction to unit operations in food processing, Units and Dimensions; Basic Principles; Heat balance, total mass balance and energy balance.	**CO-1 BTL-1**
MODULE 2: SIZE REDUCTION PROCESSES (9L+0T)	
Size reduction: Principles and Theory, size reduction methods - compression, impact, shearing and cutting, standard sieves, cereal grinding, degree of grinding, size reduction machinery- crusher, grinder, attrition mills, hammer mill, ball mills, rietzmill and oil expression and extractions-hydraulic press, screw press.	**CO-2 BTL-2**
MODULE 3: SEPARATION PROCESSES (9L+0T)	
Definition and introduction to separation; types of separator –disk, indented cylinder, spiral, specific gravity, de-stoners, inclined draper, pneumatic and aspirator, Mechanical separation, sedimentation, principle, equipment and applications. Centrifugation: principle, centrifugation equipment and applications in food industries. Filtration: Theory, equipment, types of filters and their applications	**CO-3 BTL-2**
MODULE 4: EVAPORATION (9L+0T)	
Basic principle, need for evaporation, thermodynamics of evaporation; boiling point elevation ,heat transfer during evaporation, heat transfer coefficients, design of evaporation system; retention time; single effect evaporator, multiple effect evaporator, thermo compression system	**CO-4 BTL-3**
MODULE 5: DISTILLATION (9L+0T)	
Theory and principles, liquid vapor equilibrium, distillation of binary mixtures, simple distillation, steam distillation, vacuum distillation, and fractional distillation. Crystallization: Principle, nuclei formation - equipment and applications in food industries.	**CO-5 BTL-3**
TEXT BOOK	
1.	Sahay, K. M. and K.K.Singh (2017). Unit operation of Agricultural Processing Vikas Publishing House Pvt. Ltd., New Delhi
REFERENCE BOOK	
1.	Rao D.G. (2020) Fundamentals of food engineering. PHI learning private limited
E BOOK	
1.	http://www.uprtou.ac.in/other_pdf/dvapfv_block_4.pdf

COURSE TITLE	VALUE ADDITION TO FOOD INDUSTRY REFUSE AND MANAGEMENT			CREDITS	3
COURSE CODE	AFT12511	COURSE CATEGORY	DE	L-T-P-S	3-0-0-1
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course deals with the classification of food industry refuse - handling, transportation and storage of industrial refuse – contamination of industrial refuse – effect of contamination and prevention methods
Course Objective	1. To enter a career in the food industry as food scientists ensuring the production and marketing of safe and quality foods. 2. To Provide a broadly based scientific education whose graduates can work in scientific sectors. 3. To allow individuals to develop capacity to undertake research into the science of foods. 4. To provide undergraduates with opportunities to develop their inter-personal and communication skills. 5. To create a knowledge-based skill towards research-oriented aspiration.
Course Outcome	Upon completion of this course, the students will be able to 1. Have Knowledge on Production of pectin. 2. Examine on Marketable products like chitin, chitosan, fertilizer, nutritional enhancer animal feed from shells. 3. Elucidate the Utilization of tea waste as feed for livestock & poultry. 4. Have Knowledge on texturised fish protein concentrate. 5. Have Knowledge on extraction of prolamin.

Prerequisites:

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	2	1	1	2	1	1	2
CO-2	1	2	2	1	2	2	2
CO-3	2	1	2	1	1	2	1
CO-4	2	2	1	1	1	2	2

CO-5	**1**	**1**	**1**	**2**	**1**	**2**	**1**

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION	**(9 L+3T=12)**
Types of food industries, classification of food industry refuse - handling, transportation and storage of industrial refuse – contamination of industrial refuse – effect of contamination and prevention methods – processing methods and processing equipments – their applications.	**CO-1 BTL-2**
MODULE 2: FRUITS & VEGETABLES (9 L+3T=12)	
Production of pectin, ethanol, natural gas, citric acid, activated charcoal, fibre extract from apple pomace, vitamins - Production of citrus oil from peels of citrus fruits; Manufacture of candied peel and pectin from albedo of citrus fruits. Production of single cell protein	**CO-2 BTL-2**
MODULE 3: FISH, MEAT, POULTRY (9 L+3T=12)	
Production of fish meal; Fish protein concentrate; Animal feed; Shell product; Glue from seafood processing waste. Texturised fish protein concentrate (marine beef);Production of human food from animal blood and blood protein; Marketable products like chitin, chitosan, fertilizer, nutritional enhancer animal feed from shells	**CO-3 BTL-3**
MODULE 4: CEREALS	**(9 L+3T=12)**
Feed for livestock from wheat and corn bran and germ. Extraction of oil & wax from rice bran, Puffed cereals from broken rice; Starch, modified starch and industrial alcohol from non-usable cereals; Silica from rice husk; Extraction of prolamin (Zein & katirin); Protein from sorghum; Beer spent graining.	**CO-4 BTL-2**
MODULE 5: DAIRY INDUSTRY AND BEVERAGES (9 L+3T=12)	
Fermentation products from whey. Condensed & dried products from whey; Production of lactose and protein from whey; Utilization of tea waste as feed for livestock & poultry.	**CO-5 BTL-2**

TEXT BOOK

1.	Anil Kumar (2018)Food Processing By-Products and their Utilization, Wiley-Blackwell.

REFERENCE BOOK

1.	Lawrence K. (2016) Waste Treatment in the Food Processing Industry., CRC Press.

COURSE TITLE	TECHNOLOGY OF SPICE TECHNOLOGY			CREDITS	3
COURSE CODE	AFT12512	COURSE CATEGORY	PE	L-T-P-S	3-0-0-1
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	Course provides students with a knowledge base of Herbs and Spices. The course will also cover the new processing technologies of herbs and spices, with a focus on plants containing bioactive components and the utilization of novel processing technologies in the development of functional products.
Course Objective	To enable the students 1. To learn about the chemistry of spices and herbs 2. To understand the quality parameters of spices and herbs 3. To create awareness on phytochemicals of spices and herbs 4. To examine the processing of herbs 5. To explore the handling methods of spices and herbs
Course Outcome	Upon completion of this course, the students able to 1. Describe the role, classification, properties, quality, specifications and processing. 2. Illustrate the importance, working and problem associated with processing. 3. Operate and maintain various processing machines used for value addition. 4. Judge the effects of spices and herbs on food products and human health. 5. Develop improved procedures for processing knowing the current and future prospects.

Prerequisites:

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3
CO-1	1	2	1	1	1	2	2	1
CO-2	1	2	1	1	2	1	2	2
CO-3	1	2	2	1	2	1	1	1
CO-4	2	1	1	1	2	1	1	1
CO-5	1	1	3	1	1	1	1	1

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: HERBS AND SPICES (9L+3T=12)	
Definition of herbs and spices. Classes and types of herbs and spices. Roles of herbs and spices on food quality. Effects of processing on herbs and spices.	**CO-1** **BTL-2**
MODULE 2: CHEMISTRY OF HERBS AND SPICES (9L+3T=12)	
Major active ingredients in herbs and spices. Chemistry of herbs and spices. Functions of phytochemicals and bioactive materials in herbs and spices. The roles of herbs and spices in human nutrition and health	**CO-2** **BTL-2**
MODULE 3: PROCESSING OF HERBS AND SPICES(9L+3T=12)	
Developments in the processing of herbs and spices. Nature of herbs and spices and their bioactive substances. Effects of processing methods on quality and bioavailability of bioactive components in herbs and spices.	**CO-3** **BTL-3**
MODULE 4: QUALITY OF HERBS AND SPICES PRODUCTS (9L+3T=12)	
Quality aspects of the final products. Types of herb and spices products. Quality parameters of herb and spice products.	**CO-4** **BTL-2**
MODULE 5: HANDLING OF SPICES AND HERB (9L+3T=12)	
Medicinal values of herbs; essential and encapsulated oils, salad dressings and seasonings, oleoresins, uses in processed foods, spice processing machineries; Packaging of spices and herbs: handling, packaging machineries, uses and limitations.	**CO-5** **BTL-2**
TEXT BOOKS	
1.	K V Peter (2018) Handbook of Herbs and Spices, Editor: 1st Edition
REFERENCE BOOKS	
1.	Padma Lakshmi, 2016.The Encyclopedia of Spices and Herbs: An Essential Guide to the Flavors of the World.
E BOOKS	
1.	https://www.fao.org/3/ad420e/ad420e.pdf

COURSE TITLE	FOOD MACHINES			CREDITS	3
COURSE CODE	AFT12513	COURSE CATEGORY	DE	L-T-P-S	3-0-0-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	The course entails machines and equipment used by the food industry for processing raw materials or produce into finished food products. These machines and equipment can be divided into pressure vessels, storage tanks- Horizontal and vertical silos, and process vats, design of pulper and crushers. Heat exchangers –LMTD, plate heat exchanger, shell and tube heat exchangers - design of finned type heat exchanger, single effect and multiple effect evaporators, dryers- tray dryer- PHTC dryer- LSU dryer, Food extruders – single and twin screw extruders, freezers – types of freezers, cold storage – factors to be considered – estimation of cooling load – operation- maintenance of cold storage.
Course Objective	Enable the students 1. To gain knowledge on food machines and equipment. 2. To understand the nature and principles of food equipment and machines. 3. To familiarize about design and maintenance of food machines and equipment. 4. To provide knowledge on material handling, cleaning and storage devices 5. To gain knowledge about emerging novel food processing machines and equipment used in food industry.
Course Outcome	Upon completion of this course, the students will be able to 1. Explain the principles of different types of food machines and equipment. 2. Analyze the different food equipment and machines and their principles 3. Appraise the significance of food machines and equipment in food processing 4. Illustrate the design and maintenance of food machines and equipment. 5. Explain and employ the use of different food equipment and machines to transform the raw materials to quality food products

Prerequisites: Unit Operations in Food Processing

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	2	2	2	2	2	1	2
CO-2	2	2	2	1	2	2	1

CO-3	**2**	**2**	**3**	**2**	**1**	**2**	**2**
CO-4	**1**	**2**	**1**	**1**	**2**	**3**	**2**
CO-5	**2**	**3**	**2**	**2**	**3**	**2**	**2**

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: BASIC CONSIDERATIONS IN FOOD MACHINES (9L+0T)	
Nature of food equipment and machines, food equipment classification. Properties of materials -Types of stresses and strains - Poisson's ratio- Hooke's Law – stress strain diagram- factor of safety. Corrosion - theories of failure- economic considerations; safety measures in food equipment and machines. Materials and sanitary features of the food equipment.	**CO-1 BTL-1**
MODULE 2: PULPER AND STORAGE STRUCTURES (9L+0T)	
Pressure vessels, storage tanks- Horizontal and vertical silos, and process vats, design of pulper and crushers.	**CO-2 BTL-2**
MODULE 3: HEAT EXCHANGERS, EVAPORATORS AND DRYERS (9L+0T)	
Heat exchangers –LMTD, plate heat exchanger, shell and tube heat exchangers - design of finned type heat exchanger, single effect and multiple effect evaporators, dryers- tray dryer- PHTC dryer- LSU dryer.	**CO-3 BTL-2**
MODULE 4: EXTRUDERS, FREEZERS AND COLD STORAGE (9L+0T)	
Food extruders – single and twin screw extruders, freezers – types of freezers, cold storage – factors to be considered – estimation of cooling load –operation- maintenance of cold storage.	**CO-4 BTL-3**
MODULE 5: MATERIAL HANDLING, CLEANING AND SEPARATION DEVICES (9L+0T)	
Material Handling devices- belt conveyor, bucket elevator, screw conveyor, chain conveyor, and pneumatic conveyor. Cleaning and grading-screens- effectiveness of screen-Air screen cleaners, Disc separator-Spiral Separator-Specific gravity Separator, Pneumatic Separator-Inclined draper-Velvet roll Separator, Cyclone separator-Magnetic Separator - Colour Separator	**CO-5 BTL-3**

TEXT BOOK

1.	George D. Saravacos, Athanasios E. Kostaropoulos, Handbook of Food Processing Equipment, Springer, 2012, 1461352126, 9781461352129
2.	Amalendu Chakraverty, R. Paul Singh Postharvest Technology and Food Process Engineering, CRC Press, 2016, ISBN: 1466553219, 9781466553217

REFERENCE BOOK

1.	Y.V.C. Rao, Chemical Engineering Thermodynamics, Universities Press
2.	Smith J.M., Chemical Engineering Kinetics, McGraw Hill.

E BOOKS

1.	http://www.uprtou.ac.in/other_pdf/dvapfv_block_4.pdf

COURSE TITLE	TECHNOLOGY OF BEVERAGE PROCESSING			CREDITS	3
COURSE CODE	AFT12514	COURSE CATEGORY	DE	L-T-P-S	3-0-0-1
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	Beverages are liquids consumed either for thirst, nourishment or as a stimulant. In this course the different types of beverages and the processing methods will be dealt.
Course Objective	Enable the students to 1. Learn about the definition and functions of beverages 2. Gain knowledge about the classification of beverages 3. Know about the functions of beverages 4. Understand the processing methods of beverages
Course Outcome	Upon completion of this course, the students will be able to 1. Differentiate the variations in the composition of beverages 2. Enhance knowledge about the composition of beverages 3. Take into account the raw materials used for different types of beverages. 4. Employ the methods learnt for the preparation of various beverages 5. Preparation of carbonated beverages and fermented beverages.

Prerequisites:

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	2	2	1	2	1	2	2
CO-2	3	2	2	2	2	2	2
CO-3	3	3	3	1	3	1	2
CO-4	2	3	1	1	1	1	2
CO-5	2	1	3	2	3	2	2

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION TO BEVERAGES	(9 L+ 3 T)
Definition of beverages, functions, types of beverages	CO-1 BTL-2

MODULE 2: BEVERAGES FOR STIMULATION	(9 L+ 3 T)
Tea , coffee, types, processing of tea and coffee powder	CO-2 BTL-2

MODULE 3: BEVERAGES FOR NOURISHMENT	**(9L+ 3 T)**
Milk, malted beverages, fresh juices, functions, types and processing	**CO-3** **BTL-3**
MODULE 4: CARBONATED BEVERAGES	**(9 L+ 3 T)**
Composition of carbonated beverages, functions, classification	**CO-4** **BTL-2**
MODULE 5: FERMENTED BEVERAGES	**(9 L+ 3 T)**
Functions, common fermented beverages, making of beer and wine	**CO-5** **BTL-2**
TEXT BOOK	
1.	Sharada Manay (2019). Principles of Food Science. New Age Publisher.
REFERENCE BOOK	
1.	Sri Lakshmi (2020). New Age Food Science. 8th edition. New Age Publisher.
E BOOK	
1.	https://www.pdfdrive.com/food-science-and-technology-d41395460.html

COURSE TITLE	ADVANCED FUNCTIONAL FOODS AND NUTRACEUTICALS			CREDITS	3
COURSE CODE	AFT12515	COURSE CATEGORY	DE	L-T-P-S	3-0-0-1
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	The course deals with health promoting nutritional factors and bioactive constituents, their potential health implications and mechanisms of action. Also focus on potential health implications and mechanism of functional foods and discuss the applications of functional foods in the industry.
Course Objective	Enable the students 1. To understand with an overview of the field of functional foods, nutraceuticals and natural health products. 2. To understand the functional food concept as related to ingredient efficacy and safety. 3. To familiarize students with: examples of bioactive ingredient-disease relation-ships and the importance of clinical study support 4. To introduce the regulatory aspects of functional foods; and requirements for standards of evidence of efficacy for health claims; and market determinants of the functional food industry
Course Outcome	Upon completion of this course, the students will be able to 1.Understand History of functional foods 2. Know the Phytochemicals, phytosterols and other bioactive compounds 3. Have sufficient knowledge of Safety, and consumer acceptance 4.Understand the significance of functional food in health aspects 5. Realize the legal aspects associated with marketing strategies

Prerequisites:

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	2	2	1	2	2	1	2
CO-2	1	2	2	2	2	2	2
CO-3	1	1	1	1	1	1	1
CO-4	2	1	1	1	3	1	1
CO-5	2	1	1	2	1	2	2

1: Weakly related, 2: Moderately related and 3: Strongly related	
MODULE 1: DEFINITION OF FUNCTIONAL FOODS (9 L+3T=12)	
History of functional foods, status of nutraceuticals and functional food market, definitions, difference between nutraceuticals and functional foods, types of nutraceutical compounds and their health benefits, Relevant terminologies – Enrichment, value addition, fortification, supplementation.	**CO-1 BTL-2**
MODULE 2: FUNCTIONAL FOODS FROM PLANT SOURCES (9 L+3T=12)	
Functional foods from Plant sources – garlic, turmeric, cruciferous vegetables – Nutrients, bioactive compounds, historical perspectives, active components, their function and mode of consumption.	**CO-2 BTL-2**
MODULE 3: FUNCTIONAL FOODS FROM ANIMAL SOURCES (9 L+3T=12)	
Functional foods from animal sources – Milk ,fish, meat – Nutrients, bioactive compounds, historical perspectives, active components, their function and mode of consumption.	**CO-3 BTL-3**
MODULE 4: FUNCTIONAL FOODS FROM MICROBIAL SOURCES (9 L+3T=12)	
Functional foods from microbial sources – probiotics,prebiotics,synbiotics, spirulina, red yeast rice, – Nutrients, bioactive compounds, historical perspectives, active components, their function and mode of consumption.	**CO-4 BTL-3**
MODULE 5: DOSAGE AND TOXICITY LEVEL (9 L+3T=12)	
Stability of nutraceuticals. Dosage levels; Adverse effects and toxicity of nutraceuticals Safety, Consumer acceptance and assessment of health claims, labeling, marketing and regulatory issues related to nutraceuticals and functional foods.	**CO-5 BTL-3**
TEXT BOOK	
1.	Subhadra M, 2020 Functional foods and nutrition. Daya publishing house
REFERENCE BOOK	
1.	Danik M.2021 Functional foods and viral diseases.New age publishers
E BOOK	
1.	https://www.pdfdrive.com/food-science-and-technology-d41395460.html

COURSE TITLE	TECHNOLOGY DAIRY PROCESSING			CREDITS	3
COURSE CODE	AFT12516	COURSE CATEGORY	DE	L-T-P-S	3-0-0-1
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	The course will cover the essentials of dairy food processing and preservation technologies required in any dairy and food processing industries. The basic knowledge is intermingled with most of the unit operations at some or other stage of processing.
Course Objective	Enable the students 1. To recognize the details pertaining to the properties of milk, milk products and beverages. 2. To understand the milk production practices in India and across the globe. 3. To familiarize with the processing techniques of milk, milk products and beverages. 4. To classify and categorize different indigenous and conventional milk products. 5. To formulate and evolve novel products in the dairy and beverage industry.
Course Outcome	Upon completion of this course, the students will be able to 1. Delivers the basic information on the nutritional, physical and chemical properties of milk 2. Understand the features, the fundamental concepts on the source, composition and consumption of alcoholic and non-alcoholic beverages. 3. Explain about the processing significance of beverages and the utilization of novel ingredients in the manufacturing process of beverages. 4. Educates about nuances involved in setting up a dairy plant and features the versatility of milk and its products from the farm to the consumer.

Prerequisites: Food Science

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	1	2	2	2	2	1	1
CO-2	1	2	1	1	1	1	1
CO-3	1	2	1	1	1	1	3
CO-4	1	1	1	2	1	1	1
CO-5	1	1	1	2	1	1	1

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE:1 MILK AND MILK PRODUCTION (9 L+3T=12)	
Nutritive value of milk ICMR recommendation of nutrients. Introduction to dairy production, processing and consumption- -Physio chemical properties of milk; color, taste, pH and buffering capacity, viscosity, surface tension, freezing, boiling point, thermal and optical properties, redox potential, electrical conductivity. Dairy scenario in India - Composition, factors affecting composition and yield of milk and Dairy Cooperatives – NDRI, NDDB, TCMPF - Operation Flood.	**CO-1 BTL-2**
MODULE 2: MARKET MILK INDUSTRY: (9 L+3T=12)	
Systems of collection of milk Reception, quality evaluation Platform tests -Various stages of processing, Filtration, Clarification, Homogenization, Pasteurization-LTST, HTST,UHT, sterilization - Packaging, storage, transportation and distribution, Standardized milk, toned milk, double toned milk, recombined milk, sterilized milk, filled milk, flavoured milk, and cream.	**CO-2 BTL-2**
MODULE 3: PROCESSING OF MILK PRODUCTS (9 L+3T=12)	
Flow diagram and processing of condensed milk, dehydrated milk, evaporated milk, ice cream. Newer concepts in dairy products: cream powder, sterilized cream, butter spread, butter powder, cheese spread, whey protein concentrates, Lactose. Classification of traditional dairy products	**CO-3 BTL-3**
MODULE 4: FERMENTED MILK PRODUCTS (9 L+3T=12)	
Fermented milk products – butter, cheese, yogurt, kefir, acidophilus milk and sour cream Non-fermented milk products – Ghee, Ice cream and milk powder Indigenous milk products - Present status, method of manufacture of traditional Indian fermented and non-fermented dairy products.	**CO-4 BTL-3**
MODULE 5: MILK GRADATION (9 L+3T=12)	
Grading of milk and criterion of grading, milk adulteration problem, synthetic milk Dairy plant sanitation: hygiene in dairy Industry, different types of cleansing and sanitizing agents, their applications, cleaning systems	**CO-5 BTL-3**
T BOOKS	
1.	De Sukumar, (2017) Outlines of Dairy Technology, Oxford University Press.
1.	Walstra P, J.T.M. Wouters and T.J. Geurts, (2006) Dairy Science Technology, 2nd ed., CRC
E BOOKS	
1.	Dairyprocessinghandbook.com
MOOC	
1.	https://onlinecourses.nptel.ac.in/noc21_ag02/dairy and food process