Syllabus of 4 + 1 Year Integrated UG and PG Programme

w. e. f 2024-25 Academic Year

GRADUATE SCHOOL

Mahatma Gandhi University

P. D. Hills P O

Kottayam, Kerala

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Schools offering Majors

SL.No	School/Centre
1	School of Bio Sciences
2	School of Chemical Sciences
3	School of Computer Sciences
4	School of Environmental Sciences
5	School of Gandhian Thought and Development Studies
6	School of International Relations and Politics
7	School of Pure and Applied Physics
8	School of Social Sciences

Sl. No.	Major	Intake
SCIENCE		
1	Bio Sciences	6**
2	Chemistry	6
3	Computer Science	6
4	Environmental Science	6
5	Physics	6
SOCIAL SCIENCES		
1	Development Studies	5
2	Gandhian Studies	5
3	History	10
4	International Relations and Politics	10

Majors offered and Intake *1 seat shall be sanctioned over and above the intake in each major in the 3rd semester for students who opt for a change of major after two semesters.

**Progression to PG Shall be based on the specialization selected by students as Biochemistry (2 seats) Biotechnology (2 seats) and Microbiology (2 seats) based on merit.

Schools offering Minors/MDCs/AECs/VACs/SECs

SL.No	School/Centre
1	School of Artificial Intelligence And Robotics
2	School of Behavioural Sciences
3	School of Biosciences
4	School of Chemical Sciences
5	School of Computer Sciences
6	School of Data Analytics
7	School of Energy Materials
8	School of Environmental Sciences
9	School of Food Science And Technology
10	School of Gandhian Thought And Development Studies
11	School of Gender Studies
12	School of Indian Legal Thought
13	School of International Relations And Politics
14	School of Letters
15	School of Mathematics And Statistics
16	School of Nanoscience And Nano Technology
17	School of Pedagogical Sciences
18	School of Polymer Science And Technology
19	School of Pure And Applied Physics
20	School of Social Sciences
21	School of Tourism Studies
22	International and Inter University Centre for Nanoscience and Nanotechnology
23	K N Raj School of Economics

Scheme for 4 + 1 Integrated UG and PG Programme
Graduate School
Mahatma Gandhi University
School of Food Science & Technology

Course Code	Title	Credits	Hours per Week		Level	Type
			Theory	Practicals		
SEMESTER I						
MG1DSCUFT121	Principles of food chemistry	4	4	0	Foundation (100-199)	Minor A
MG1DSCUFT141	Fundamentals of food & nutrition	4	4	0	"	Minor B
MG1MDCUFT101	Basic principles of food technology	3	3	0	"	MDC
SEMESTER II						
MG2DSCUFT121	Principles of food preservation technology	4	4	0	"	Minor A
MG2DSCUFT141	Dairy Microbiology	4	4	0	"	Minor B
MG2MDCUFT101	Post-harvest technology of fruits & vegetables	3	3	0	"	MDC
SEMESTER III						
MG3DSCUFT221	Food Anthropology	4	4	0	Intermediate (200-299)	Minor A
MG3MDCUFT20	Food safety &	3	3	0	"	MDC

1	quality assurance					
MG3VACUFT201	Novel approach to food packaging	3	3	0	“	VAC
SEMESTER IV						
MG4DSCUFT241	Instrumental techniques in food industry	4	4	0	“	Minor B
MG4SECUFT201	Food product development & Sensory evaluation	3	3	0	“	SEC
MG4VACUFT201	Waste management in food processing `	3	3	0	“	VAC
SEMESTER V						
MG5SECUFT301	Fssai guide for Food entrepreneurs	3	3	0	Higher (300-399)	SEC
MG5VACUFT301	HACCP in food industry	3	3	0	“	VAC
SEMESTER VI						
MG6SECUFT301	Chocolate & Confectionary technology	3	3	0	“	SEC

SEMESTER VII						
MG7DSCUFT421	Novel techniques in food processing	4	4	0	Advanced (400-499)	Minor A

*Only for 4-Years Honours Students

**Only for students who opt for theory courses instead of Research Project

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Level	Foundation (100-199	Intermediate (200-299)	Higher (300-399)	Advanced (400-499)	PG Level (500-599)

Type	Major	Minor	MDC	SEC	VAC	AEC

	MAHATMA GANDHI UNIVERSITY **Graduate School**
	4 + 1 Integrated UG and PG Programme

School	School of Food Science and Technology		
Programme	4 + 1 Integrated UG and PG Program		
Course Title	**Principles of Food Chemistry**		
Course Type	Minor		
Course Level	100-199		
Course Code	MG1DSCUFT121		
Course Overview	The course is framed to get a basic idea on the chemistry of food. It explores the basic constituents of food and their role in various chemical reactions during food processing and spoilage in a basic level. This course developed as a strong foundation in the field of food technology		
Semester	1	**Credit**	4
Total Student Learning Time	**Instructional hours for theory**	**Instructional hours for practical/lab work/field work**	
	60	0	
Pre-requisite	11^{th} & 12^{th} level physics, chemistry and biology		

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains	PSO No.
	Upon completion of this course, students will be able to;		
1	Understand the chemistry and properties of water, ice	U	
2	To identify the different types of biomolecules such as carbohydrates, proteins, lipids, vitamins and minerals in various kind of food.	U/An	
3	To learn the structures of biomolecules (such as carbohydrates, proteins etc) and the way in which they contribute various reactions in foods during processing	A	
4	To create a basic knowledge about enzymes and their importance in foods	U/R	

*(Learning Domains: Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E) , Create (C), Skill (S))

COURSE CONTENT

Module 1	Hours	CO No
Water Water as a nutrient, function, sources, requirement, structure, effect of deficiency. Introduction to chemistry of water and ice. Moisture in food: Hydrogen bonding, Bound water, Free water, Water activity and Food stability.	12	1
Module 2	**Hours**	
Carbohydrates & Lipids	15	2, 3, 5

Carbohydrates- composition, classification, sources, functions, structure, physical & chemical properties, browning reactions Lipids – composition, nomenclature, saturated, unsaturated fatty acids, classification, sources & functions of fats. Role of lipids in food flavor		
Module 3	**Hours**	
Proteins & Enzymes Enzymes-Nomenclature, specificity, kinetics factors influencing enzyme activity. Enzymes added to food during processing. Amino acids & Proteins- Basics of amino acids, sources, classification, functions and denaturation of proteins	15	2, 3, 4, 5
Module 4	**Hours**	
Vitamins & Minerals Vitamins & Minerals- Classification, sources and functions	10	2

Mode of Transaction	**Classroom activities:** Direct instruction: Brain storming lecture, Explicit teaching, E-learning. Interactive instruction: Active co-operative learning, Seminars, Single/Group assignments Authentic learning: Library work and Group discussion, Presentations by individual student/Group representative

Mode of Assessment	**A. Continuous Internal Assessment (CIA)** **Internal test (20 marks)** **Assignment: Every student needs to write an assignment on a given topic based on the available published literature- 10 marks** **Seminar Presentation: A topic needs to be presented and discussed with the class- 10 marks** **B. Semester end examination- 60 Marks**

Learning Resources

1 Beltz, H.D. 2005. Food Chemistry. Springer Verl

2 Fennema, O.R, 2006, Food Chemistry, Academic Press.

3 Manay, N.S, 2004, Shadaksharaswamy, M., Foods- Facts and Principles, New Age Intemational Publishers, New Delhi.

Relevance of Learning the Course/ Employability of the Course
Understanding Food Chemistry is one of the major basic requirements to build a career in Food Technology as an academician, researcher, industrial expert or any other since it gives an idea about the basic chemistry of the constituents of foods.

	MAHATMA GANDHI UNIVERSITY **Graduate School**
	4 + 1 Integrated UG and PG Programme

School	Food Science and Technology		
Programme	**4+1 Integrated UG and PG Programme**		
Course Title	**Fundamentals of Food &Nutrition**		
Course Type	Minor		
Course Level	100-199		
Course Code	MG1DSCUFT141		
Course Overview	This course provides an introduction to the fundamental principles of food and nutrition. It covers the essential nutrients, their roles in the body, dietary requirements, food sources, and the relationship between diet, health, and disease. To enable students to obtain in-depth knowledge of both macro and micronutrients. Then, understand the role of each nutrient in various stages of life and diseases due to their deficiencies and excessive intake.		
Semester	1	**Credit**	4
Total Student Learning Time	**Instructional hours for theory**	**Instructional hours for practical/lab work/fieldwork**	
	60 (h)		
Pre-requisite	Basics of Human Nutrition		

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains	PSO No.
	Upon completion of this course, students will be able to;		
1	Understand the basic concepts of nutrition and the role of nutrients in the body.	U	2
2	Identify the sources and functions of major nutrients.	U	4
3	Assess dietary needs and develop balanced meal plans	A/E	1
4	Understand the relationship between nutrition and health	U	1

*(Learning Domains: Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S))

COURSE CONTENT

Module 1	Hours	CO No
Introduction to Food &Nutrition Definition and Importance of Food, Different Food Groups. Definition and Importance of Nutrition, Overview of Nutrients: Macronutrients and Micronutrients, RDA, EAR, Factors affecting RDA, Indian reference man and women Definition of Energy, Energy content of Food, Energy measurement, Basal Metabolism,	**16**	**1**
Module 2	**Hours**	
Macronutrients Nutritional importance of macro nutrients Carbohydrates, Protein, Fats, sources, significances.	**12**	**2**
Module 3	**Hours**	
Micronutrients , Water & Dietary Fiber Vitamins –Classification of vitamins Water-Soluble/ Fat-Soluble Vitamins: Functions and Sources of Key Vitamins (A, C, D, E, K, B-complex,C) Major Minerals and Trace Elements: Functions and Sources of Essential Minerals (Calcium, Iron, Potassium, Magnesium, Zinc) Water - Functions, Distribution, Factors affecting water	**18**	**2**

distribution, Regulation of water balance in the human body. Dietary Fiber – Types of Dietary fibre, physiological and metabolic effects of dietary fibre and potential health benefits.		
Module 4	**Hours**	
NUTRITION THROUGH LIFE CYCLE Nutritional Needs During Different Life Stages (Infancy, Childhood, Adolescence, Adulthood, Elderly) Special Nutritional Considerations During Pregnancy and Lactation. Nutritive calculation using Ready Reckoner Introduction to Therapeutic Nutrition, Nutrition for the prevention of lifestyle Diseases	**14**	**3,4**

Mode of Transaction	Classroom activities: Plan a balanced diet for individuals (through the life cycle) using Ready Reckoner/ Field activities: Visit nearest Anganwadi
Mode of Assessment	1. Internal Tests of Maximum 20 Marks 2. Seminar Presentation –a theme is to be discussed and identified to prepare a paper and present in the seminar Maximum marks 10 3. Write a detailed report on a given topic based on research findings Semester End examination-60 marks

Learning Resources

1. Dr. Swaminathan. (2018). *Handbook of Food and Nutrition*. The Bangalore Printing and Publishing Co., Ltd., No. 88, Mysore Road, Bangalore 560018.
2. Indian Council of Medical Research. (2020). *Recommended Dietary Allowances and Nutrient Requirements for Indians*. Retrieved from https://www.nin.res.in/RDAshortreport2020.html
3. Joshi, S. A. (2015). *Nutrition and Dietetics*. McGraw Hill Education (India) Private Limited.
4. Christian Medical College, Vellore, Department of Endocrinology, Diabetes & Metabolism. *Ready Reckoner*.

Relevance of Learning the Course/ Employability of the Course
• This course provides essential knowledge for careers in nutrition, dietetics, public health, food science, and wellness industries. Understanding the fundamentals of food and nutrition is crucial for roles in healthcare, research, education, and the food industry.

	MAHATMA GANDHI UNIVERSITY **Graduate School**
	4 + 1 Integrated UG and PG Programme

School	School of Food Science and Technology		
Programme	4+1 integrated UG and PG programme		
Course Title	**Basic Principles of Food Technology**		
Course Type	MDC		
Course Level	100-199		
Course Code	MG1MDCUFT101		
Course Overview	This course explores the fundamental principles of food technology, covering essential concepts in food science, processing, preservation, and safety. This course provides students insights into the intricacies of food production and its impact on nutrition, health, and sustainability.		
Semester	1	**Credit**	3
Total Student Learning Time	**Instructional hours for theory**	**Instructional hours for practical/lab work/field work**	
	45	0	
Pre-requisite	11th and 12th level physics, chemistry and biology		

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains	PSO No.
	Upon completion of this course, students will be able to;		
1	To create an insight to food processing sector in India	An/ E	
2	To understand various physical and functional properties of food and effect of processing on these properties	U/R/ An	
3	To create insights to the principles regarding preservation by various thermal, non-thermal and chemical techniques and novel techniques in food processing	U/R	
4	Create an insight to concept of food quality, food safety, food quality assurance and food quality management, national agencies in the field of food safety	U/ An	

*(Learning Domains: Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E) , Create (C), Skill (S))

COURSE CONTENT

Module 1 Introduction to Food Technology	**Hours**	**CO No**
Definition and scope of food technology, Food processing industries/institutions/food scientists of importance in India, Status of the Indian food industry, Socioeconomic implications of food technology, Ethical considerations in food production Food attributes viz. colour, texture, flavour, rheology, nutritive value and consumer preferences, Functional properties of food- gelatinisation, dextrinization, foaming capacity, water absorption capacity, oil absorption capacity, bulk density, swelling capacity, emulsion capacity, solubility, gelation, aeration	**15**	**1, 2**
Module 2 Food Preservation Methods	**Hours**	
Classification of food on the basis of spoilage, Causes of food spoilage, sources of microbial contamination of foods, Principles and methods of food preservation- preservation by salt and sugar, preservation by drying and dehydration, blanching, pasteurization, canning, freezing, freeze drying, fermentation, microwave, irradiation and chemical additives, Importance of packaging in food preservation Novel processing techniques- high pressure processing, pulsed electric field, ultrasound, cold plasma, ohmic heating, ozone treatment, Functional foods, Probiotics and prebiotics, Robotics in food processing	**20**	**2, 3**
Module 3 Principles of Food Safety and Quality Management	**Hours**	
Introduction to Food Safety, Food Safety System, Food quality assurance and food quality management, National standards- FSSAI, BIS, AGMARK, Food Labelling	**10**	**4**

Mode of Transaction	**Classroom activities:** Direct Instruction: Brain storming lecture, Explicit Teaching, E-learning, interactive Instruction: Active co-operative learning, Seminar, Group Assignments Authentic learning: Library work and Group discussion, Presentation by individual student/ Group representative
Mode of Assessment	A. Continuous Internal Assessment (CIA) Internal Test -20 marks Assignment/Seminar – Every student needs to write an assignment on a given topic based on the available published literature – 20 marks B. Semester End examination – 60 marks

Learning Resources

1. Frederick, J.F, 2000, Encyclopedia of Food Science and Technology. Second edition vol l-4, awidely inter science publication.
2. Food science :Norman.N.Potter,Joseph. H. Hotchkis
3. Manany S, N S. Swamy Food Facts and Principles. New Age International Publishers
4. Sivasankar B. (2002): Food Processing And Preservation, Prentice Hall of India Pvt Ltd., New delhi
5. Rao M.A. and Rizvi S.S. and Datta A. K. (2005) .Engineering properties of foods: CRC Press

Relevance of Learning the Course/ Employability of the Course
Studying food technology offers a gateway to a dynamic and growing industry, presenting diverse career paths across sectors such as food processing, research, regulatory compliance, and product development.

	MAHATMA GANDHI UNIVERSITY **Graduate School**
	4 + 1 Integrated UG and PG Programme

School	School of Food Science & Technology		
Programme	**4 +1 integrated UG and PG programme**		
Course Title	**Principles of Food Preservation technology**		
Course Type	Minor		
Course Level	100-199		
Course Code	MG2DSCUFT121		
Course Overview	• This course is designed to impart a fundamental grasp on food preservation. • The course material aims to provide students with a basic understanding on various techniques used in the preservation of food.		
Semester	2	**Credit**	4
Total Student Learning Time	**Instructional hours for theory**	**Instructional hours for practical/lab work/field work**	
	60	0	
Pre-requisite	Basics of food science		

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains	PSO No.
	Upon completion of this course, students will be able to;		
1	Understand various type of food spoilage & principles of food preservation	U/R	
2	Create a deep insight to different types of high & low temperature method for preserving food.	U/R	
3	Understanding the principles regarding preservation by irradiation of food	U/R	
4	Understand the role of temperature & moisture in food preservation	U/An	

*(Learning Domains: Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E) , Create (C), Skill (S))

COURSE CONTENT

Module 1	**Hours**	**CO No**
Food spoilage & Introduction to preservation: Definition, types of spoilage - physical, enzymatic, chemical, biological & miscellaneous. Factors affecting food spoilage. Classification of food based on perishability. Scope & significance of food preservation. Principles of food preservation. Historical developments in food preservation. Traditional preservation techniques.	**15 Hours**	1
Module 2	**Hours**	
Preservation by use of High Temperature: Role of temperature in food preservation. Basic principle and equipments: Cooking, Canning, blanching, pasteurization, sterilization. Spoilage of canned foods. **Chemical preservation**: Class I & Class II preservatives, House hold preservation methods	**15 Hours**	2,4,5
Module 3	**Hours**	
Preservation by low temperature: Basic principle and equipments: Chilling, cold storage, freezing (Advantages & disadvantages). Slow & quick freezing, common spoilages occurring during freezing, freezing curve.	**15 Hours**	2,5
Module 4	**Hours**	
Preservation by Removal of Moisture: Water activity: Role of water activity in food preservation. Dehydration: drying,	**15 Hours**	

dehydration and concentration. Factors affecting drying. **Preservation by Irradiation:** Food Irradiation: history and mechanism. Principles of using electromagnetic radiations in food preservation, Advantages & disadvantages.		3,4

Mode of Transaction	**Classroom activities:** Direct Instruction: Brain storming lecture, Explicit Teaching, E-learning, interactive Instruction: Active co-operative learning, Seminar, Group Assignments Authentic learning: Library work and Group discussion, Presentation by individual student/ Group representative **Field activities:** **Lab based activities:**
Mode of Assessment	**Continuous Internal Assessment (CIA)** **1. Internal** Tests of maximum 20 marks 2. Seminar Presentation – a theme is to be discussed and identified to prepare a paper and present in the seminar Maximum marks 10 3. Write a detailed report on a given topic based on research findings **Semester End examination – 60 marks**

Learning Resources

1. Sivasankar B. (2002): Food Processing And Preservation, Prentice Hall of India Pvt Ltd., New delhi.
2. Srilakshmi, B. Food Science. New Age International Publishers, New Delhi, 2003.
3. Desrosier N W & James N. (2007). Technology of food preservation. AVI. Publishers

Relevance of Learning the Course/ Employability of the Course
The course will help the students comprehend how food spoils and different methods of preserving it to enhance its shelf life.

	MAHATMA GANDHI UNIVERSITY **Graduate School**
	4 + 1 Integrated UG and PG Programme

School	School of Food Science and Technology		
Programme	4+1 integr ated UG and PG programme		
Course Title	**Dairy Microbiology**		
Course Type	Minor		
Course Level	100-199		
Course Code	MG2DSCUFT141		
Course Overview	This course helps to explore the basics of dairy microbiology and covers important topics in microbiology of production and preservation of dairy products. Course also prov des a detailed outline on microbial spoilage of dairy products. This course provides students detailed outline of microbial aspects of dairy products.		
Semester	2	**Credit**	4
Total Student Learning Time	**Instructional hours for theory**	**Instructional hours for practical/lab work/field work**	
	60	0	
Pre-requisite	11th and 12th level chemistry and biology		

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains	PSO No.
	Upon completion of this course, students will be able to;		
1	To create an insight to microbiology of milk	U	
2	To create an insight to various microbial species associated with dairy products	An/ An	
3	To understand the sources of contaminations, methods of preservation and microbial spoilage of milk and milk products	U/R	
4	To understand the methods of analysis of milk and milk products	U/S	

*(Learning Domains: Remember (R), Understand (U), Apply (A), Analyse (An),Evaluate (E), Create (C), Skill (S))

COURSE CONTENT

Module 1:Introduction to Dairy Microbiology	**Hours**	**CO No**
Introduction and significance of dairy microbiology, Scope and application of microbiology in field of dairy technology. Normal flora of milk, Factors affecting growth of microorganisms in milk- intrinsic and extrinsic factors, Hygienic milk production. Milk borne food infection, intoxication, Milk borne diseases	**15**	**1**
Module 2:Microorganisms associated with milk	**Hours**	
Common microbial species associated with milk and their significance, Role of psychrotrophs in milk, Effect of processing on microorganisms in milk	**15**	**2**
Module 3:Microbiological methods of milk testing	**Hours**	
Qualitative and quantitative methods of milk testing Microscopic methods, Dye reduction assay, Standard plate count (SPC), Coliform counts in Milk, Methods of Enumeration of other groups of bacteria, fungi and yeast in Milk	**15**	**4**

Module 4:Microbiology of milk and milk products	Hours	
Sources of contamination, preservation techniques and microbial spoilage of milk, cream, butter, cheese, and yoghurt. Milk fermentation, Abnormal milk fermentations.	**15**	**3**

Mode of Transaction	**Classroom activities:** Direct Instruction: Brain storming lecture, Explicit Teaching, E-learning, interactive Instruction: Active co-operative learning, Seminar, Group Assignments Authentic learning: Library work and Group discussion, Presentation by individual student/ Group representative
Mode of Assessment	A. Continuous Internal Assessment (CIA) Internal Test -20 marks Assignment and seminar- 10 marks Industrial Visit/field visit and report submission –10 marks B. Semester End examination – 60 marks

Learning Resources

1. Britz, T.J. and Robinson, R.K. 2008. Advanced Dairy Science and Technology. 1st ed. Blackwell Publ. Ltd., UK.
2. Fernandes, R. 2009. Microbiology Handbook: Dairy Products. Royal Society of Chemistry, Revised ed., London.
3. Marth, E.H. and Steele, J. 2001. Applied Dairy Microbiology. 2nd ed. CRC Press, Boca Raton, USA.
4. Robinson, R.K. 2002. Dairy Microbiology Handbook - The Microbiology of Milk and Milk Products. 3rd ed. Wiley-Interscience, New York.

5. Walstra, P., Wouters, J.T.M. and Geurts, T.J. 2006. Dairy Science and Technology. CRC Press, New York.

Relevance of Learning the Course/ Employability of the Course
Studying food technology offers a detailed outline of microbiology of milk and milk products. This will provide a clear idea of spoilage and microbial diseases of dairy products which will help to improve eating habits of everyone.

	MAHATMA GANDHI UNIVERSITY **Graduate School**
	4 + 1 Integrated UG and PG Programme

School	School of Food Science and Technology		
Programme	4+1 integrated UG and PG programme		
Course Title	**Post Harvest Technology of Fruits and Vegetables**		
Course Type	MDC		
Course Level	100-199		
Course Code	MG2MDCUFT101		
Course Overview	This course explores the principles and practices of post-harvest handling, processing, and preservation of fruits and vegetables to ensure quality, safety, and marketability. Topics include harvesting methods, storage techniques, packaging, processing technologies, and quality control measures.		
Semester	2	**Credit**	3
Total Student Learning Time	**Instructional hours for theory**	**Instructional hours for practical/lab work/field work**	
	45	0	
Pre-requisite	11th and 12th level chemistry and biology		

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains	PSO No.
	Upon completion of this course, students will be able to;		
1	Understand the physiological changes occurring in fruits and vegetables after harvest	U/R	
2	Understand various post-harvest handling techniques to minimize losses and maintain quality and to create insight to various storage techniques of fruits and vegetables	U/An/A	
3	Understand processing technologies for value addition and extending shelf life	U/S/C	
4	To create insight to quality control measures and food safety regulations in post-harvest operations	U/An	

*(Learning Domains: Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E) , Create (C), Skill (S))

COURSE CONTENT

Module 1 Introduction to post harvest system	**Hours**	**CO No**
Importance of post harvest technology, Post harvest handling (harvesting, precooling, sorting, grading and packaging) of perishables, Ripening and senescence, Maturity indices, ripening process – factors affecting ripening- chemicals used for hastening and delaying ripening, Respiration	**10**	**1,2**
Module 2 Storage systems and operations	**Hours**	

Introduction, Principles of storage, Objectives of storage, storage considerations- temperature, relative humidity and atmospheric composition, Concept of cool chain, Precooling, Pre Storage Treatments, Low Temperature Storage, Controlled Atmosphere Storage, Modified Atmosphere Storage Hypobaric Storage, Irradiation And Low Cost Storage Structures, ZECC	**15**	**2**
Module 3 Value addition of fruits and vegetables	**Hours**	
Processing of fruit pulp/puree, Processing of sauce, Processing of ketchup, Processing of sauce, Processing of pickles, Processing of chutneys, Processing of fruit juices, Fermented and non-fermented beverages, Intermediate moisture food- concept of water activity, Jam, jelly, marmalade, preserve, candy, honey, FSSAI regulation and standards in maintaining food safety and quality, packaging, labelling, registration and licensing, GMP, GHP, GLP, HACCP	**20**	**3, 4**

Mode of Transaction	**Classroom activities:** Direct Instruction: Brain storming lecture, Explicit Teaching, E-learning, interactive Instruction: Active co-operative learning, Seminar, Group Assignments Authentic learning: Library work and Group discussion, Presentation by individual student/ Group representative

Mode of Assessment	B. Continuous Internal Assessment (CIA) Internal Test -20 marks Assignment/Seminar – Every student needs to write an assignment on a given topic based on the available published literature – 20 marks B. Semester End examination – 60 marks

Learning Resources

1 Hui, Y.H. (2008). Handbook of fruit and vegetable processing. Wiley India Pvt. Ltd., New Delhi

2 E-Course of ICAR, New Delhi

3 Sharma, S.K. (2010). Postharvest management and processing of fruits and vegetables. New India Publishing Agency, New Delhi

Relevance of Learning the Course/ Employability of the Course
Studying food technology offers a gateway to a dynamic and growing industry, presenting diverse career paths across sectors such as food processing, research, regulatory compliance, and product development.