DEPARTMENT OF BIOTECHNOLOGY				*CLASS: II B.Sc. Biotechnology*				
Sem	**Course Type**	**Course Code**	**Course Title**	**Credits**	**Contact Hours/week**	**CIA**	**Ext**	**Total**
IV	SBE-II	20U4LSM2	Food Processing and Preservation	2	2	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented	✓		Entrepreneurship oriented	

Course Objectives

1.	To make students aware of food spoilage, food related hazards/risks and diseases.
2.	To introduce the students tofood processing, preservation and packaging methods.
3.	To insist knowledge on the national/international food safety organisations, food standards and governmental regulations on food safety.

Unit	**Description**	**Hours**	**K level**	**CLOs**
I	**Food composition and Food quality** Foodindustry - A historical perspective. Food composition and nutritive values: food as energy source, carbohydrate, protein and fats, nutraceuticals, Vitamins, Minerals. Food quality and consumer preference. Quality Factors in food: appearance, textural, flavour. Food quality assurance agencies- National and International Organisation – FDA, FSSAI.	6	Up to K-2	**1**
II	**Food spoilage and preservation** Food deterioration & Food spoilage: Shelf life of food, Factors governing food spoilage – Abiotic, biotic, enzymatic and chemical changes in the food. Food preservation strategies - Heat,Cold, Radiation, chemical techniques.	6	Up to K-3	**2**
III	**Food processing** Types of consumable foods – perishable, non-perishable, processed preserved, formulated and derived foods. Handling and management of raw materials of food: Harvesting, transportation from field, sorting and grading. Processing of cereals & grains, milk & milk products, vegetables and fruits, fat/oil related products, microbes in food industry - fermentation & benefits of fermented foods.	6	Up to K-4	**3**
IV	**Food additives and packaging** Food additive – functions, additives used in food processing. Food packaging: requirements for effective packaging, types of containers-primary, secondary & tertiary. Types of packaging materials, food packaging methods – nutritive effects and need for food packing.	6	Up to K-3	**4**

V	**Food hazards/risks, food safety and Government regulations** Risk assessment & management – Biological hazards –Control of microorganisms - HACCP – seven principles, nutrient related illness, physical hazards, chemical hazards, impact of trace chemicals and additives.Government regulations of food safety – Laws, acts and guidelines for food safety - GRAS, food additives, pesticide residues, testing for safety, Food labelling, nutritional labelling.International food standards and codex alimentarius.	6	Up to K-4	**5**

Books for study

1. Potter & Hotchkiss. 1998. Food Science. 5th edition. Springer.
2. Vaclavik& Christian. 2008. Essentials of Food Science. 3rd edition. Springer.

Books for reference

1. Adams & Moss. 2008. Food Microbiology.3rd edition. RSC publishing.
2. Varzakas&Tzia. 2016. Handbook of food processing, food safety, quality, and manufacturing processes. CRC Press.

Weblinks

http://www.old.fssai.gov.in/Portals/0/Training_Manual/Volume%20I-%20Intoduction%20to%20Food%20%20and%20Food%20Processing.pdf

http://www.ignouhelp.in/ignou-mfn-08-study-material/

https://foodprocessingindia.gov.in/

Rationale for nature of the course

The enormous growth of food industry in the past 50-100years had led to large scale food production worldwide and transport across the countries.This had seen rapid evolution of modern food processing and preservation technologies andnational/international regulatory bodies for food safety. This course is designed to provide basic knowledge on foodtypes, nutritive value of food, insight into various food processing & preservationtechnologies, awareness on food spoilage, food borne hazards, government food safetyregulatory bodies and regulations.

Activities having direct bearing on Skill development / Employability /Entrepreneurship

- Seminar
- Poster preparation
- Scientific discussion
- Critical thinking and analysis on theoretical concepts

Pedagogy

The teaching methods may include Chalk and talk, PowerPoint, assignments, group discussions and quiz.

Course content designers

Dr.N. Arul MuthuKumaran
Dr. N. Krithiga

Course Learning Outcomes

On completion of this course the students would be able to

#	CLOs	K - Level
CLO-1	Incur basic knowledge on food composition, nutrition and quality	Up to K-2
CLO-2	identify food spoilage agents and select ideal preservation strategies	Up to K-3
CLO-3	Explain the methods of handling and processing of different food materials and their applications.	Up to K-4
CLO-4	analyse the merits & demerits of food additives and explain the materials & methods of food packaging	Up to K-3
CLO-5	identify the food related hazards/risks and appreciate the importance government organisations/regulations on food safety	Up to K-4

Mapping of Course outcomes with Program Outcomes

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	3	2	2	2	1
CLO-2	3	2	2	2	1
CLO-3	3	2	2	2	1
CLO-4	3	2	2	2	1
CLO-5	3	2	2	3	1

Advance application-3; Intermediate level-2 & Basic level-1

Mapping of Course outcomes with Program specific Outcomes

CLO/PSO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CLO-1	--	--	--	--	--
CLO-2	2	2	2	3	2
CLO-3	2	1	1	2	1
CLO-4	2	1	2	2	2
CLO-5	2	2	1	1	1

Advance application-3; Intermediate level-2 & Basic level-1

LESSON PLAN

Unit	Description	Hours	Mode
UNIT - I	Foodindustry - A historical perspective. Food composition and nutritive values: food as energy source, carbohydrate, protein and fats, nutraceuticals, Vitamins, Minerals. Food quality and consumer preference.	3	Chalk & Talk
	Quality Factors in food: appearance, textural, flavour. Food quality assurance agencies-National and International Organisation – FDA, FSSAI.	3	Chalk & TalkDiscussion
UNIT - II	Food deterioration & Food spoilage: Shelf life of food, Factors governing food spoilage – Abiotic, biotic, enzymatic and chemical changes in the food.	3	Discussion & PPT
	Food preservation strategies - Heat, Cold, Radiation, chemicals techniques.	3	Chalk & Talk
UNIT - III	Types of consumable foods – perishable, non-perishable, processed preserved, formulated and derived foods. Handling and management of raw materials of food: Harvesting, transportation from field, sorting and grading.	3	Chalk & talk, PPT
	Processing of cereals & grains, milk & milk products, vegetables and fruits, fat/oil related products, microbes in food industry - fermentation & benefits of fermented foods.	3	Discussion & PPT
UNIT-IV	Food additive – functions, additives used in food processing. Food packaging: requirements for effective packaging, types of containers-primary, secondary & tertiary.	3	Chalk & Talk Discussion
	Types of packaging materials, food packaging methods – nutritive effects and need for food packing.	3	Chalk & talk, PPT
UNIT - V	Risk assessment & management – Biological hazards –Control of microorganisms - HACCP – seven principles, nutrient related illness, physical hazards, chemical hazards, impact of trace chemicals and additives.	3	Chalk and talk. PPT
	Government regulations of food safety – Laws, acts and guidelines for food safety - GRAS, food additives, pesticide residues, test for safety, Food labelling, nutritional labelling. International food standards and codex alimentarius.	3	Chalk and talk. PPT

Learning Outcome Based Education & Assessment (LOBE)
Blue Print – Food Processing and Preservation
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

BLUE PRINT FOR INTERNAL ASSESSMENT – I

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 1	Up to K 2	2	K1 & K2	1	K1	2 (K1&K1)	1(K2)
2.	CLO 2	Up to K 3	2	K1 & K2	1	K1	2 (K3&K3)	1(K3)
No. of Questions to be asked			4		3		4	3
No. of Questions to be answered			4		3		2	2
Marks for each Question			1		2		5	10
Total Marks for each Section			4		6		10	30

BLUE PRINT FOR INTERNAL ASSESSMENT – II

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 3	Up to K 4	2	K1 & K2	1	K2	2 (K3&K3)	1(K4)
2.	CLO 4	Up to K 3	2	K1 & K2	1	K2	2 (K2&K2)	1(K3)
No. of Questions to be asked			4		3		4	3
No. of Questions to be answered			4		3		2	2
Marks for each Question			1		2		5	10
Total Marks for each Section			4		6		10	30

Learning Outcome Based Education & Assessment (LOBE)
Blue Print – Food Processing and Preservation
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 1	Up to K 2	2	K1 & K2	1	K1	2 (K1&K1)	1(K2)
2.	CLO 2	Up to K 3	2	K1 & K2	1	K1	2 (K3&K3)	1(K3)
3.	CLO 3	Up to K 4	2	K1 & K2	1	K2	2 (K3&K3)	1(K4)
4.	CLO 4	Up to K 3	2	K1 & K2	1	K2	2 (K2&K2)	1(K3)
5.	CLO 5	Up to K 4	2	K1 & K2	1	K2	2 (K4&K4)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	**19**	15.83	**42%**
K2	5	6	10	10	**31**	25.83	
K3	-	-	20	30	**50**	41.67	**42%**
K4	-	-	10	10	**20**	16.67	**16%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

Distribution of Unit-wise questions with K Levels

Section A	Section B	Section C	Section D
2 Questions for each Unit (K1 & K2 Level)	1 Question from each Unit (K1 & K2 Level)	2 Questions from Unit-I (K1 Level)	1Question from Unit-I (K2 Level)
		2 Questions fromUnit-II (K3 Level)	1Question from Unit-II (K3 Level)
		2 Questions from Unit-III (K3 Level)	1Question from Unit-III (K4 Level)
		2 Questions from Unit-IV (K2 Level)	1Question from Unit-IV (K3 Level)
		2 Questions from Unit-V (K4 Level)	1Question from Unit-V (K3 Level)

K1 –Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving Problems
K4 – Examining, analysing, presentation and make interferences with evidences