FOOD AND DAIRY TECHNOLOGY

Syllabus

Program Code: UFD

2021-2022 onwards

MANNAR THIRUMALAI NAICKER COLLEGE

(AUTONOMOUS)

Re-accredited with "A" Grade by NAAC

PASUMALAI, MADURAI – 625 004

Eligibility for Admission

Candidate should have passed the Higher Secondary Examination conducted by the Board of Higher Secondary Education, Government of Tamil Nadu, CBSE Board with Science as one of the subjects in Higher Secondary Education.

Subjects of Study

Part I : Tamil / Company Secretarial Practice and Modern Office Management

Part II : English

Part III :

1. Core Subjects
2. Allied Subjects
3. Electives

Part IV :

1. Non Major Electives (II Year)
2. Skill Based Subjects
3. Environmental Studies - Mandatory Subject
4. Value Education - Mandatory Subject

Part V :

Extension Activities

Pattern of the question paper for the Continuous Internal Assessment

Note: Duration – 1 hour

(For Part I, Part II & Part III)

The components for continuous internal assessment are:

Part –A

Four multiple choice questions (answer all) 4 x01= 04 Marks

Part –B

Three short answers questions (answer all) 3 x02= 06 Marks

Part –C

Two questions (‘either …. or ‘type) 2 x 05=10 Marks

Part –D

Two questions out of three 1 x 10 =10 Marks

Total 30 Marks

The scheme of Examination for Part-I, II & III

The components for continuous internal assessment are:

(60 Marks of two continuous internal assessments will be converted to 15 marks)

Two tests and their average	--15 marks
Seminar /Group discussion	--5 marks
Assignment	--5 marks

Total	25 Marks

Pattern of the question paper for the Summative Examinations:

Note: Duration- 3 hours

Part –A

Ten multiple choice questions 10 x01 = 10 Marks

No Unit shall be omitted: not more than two questions from each unit.)

Part –B

Short answer questions (one question from each unit) 5 x02 = 10 Marks

Part –C

Five Paragraph questions (‘either …. or ‘type) 5 x 05 = 25 Marks

(One question from each Unit)

Part –D

Three Essay questions out of five 3 x 10 =30 Marks

(One question from each Unit)

Total	75 Marks

Part-IV- Skill Based Papers / NME:

The Scheme of Examination for Skill Based Papers: (Except Practical Lab Subjects)

Pattern of the questions paper for the continuous Internal Assessment

45 MCQs will be asked for each internal assessment tests (45 x 1=45 Marks**) and converted for 15 marks**

The components for continuous internal assessment are:

Two tests and their average	--15 marks
Seminar /Group discussion	--5 marks
Assignment	--5 marks

Total	25 Marks

Summative Examination Pattern

Pattern of the Question Paper for Skill Based Papers (External)

75 Multiple choice questions will be asked from five units (75 x 1=75 Marks**)**

(15MCQ's from each unit)

Part-IV- Environmental Studies and Value Education

The Scheme of Examination (Environmental Studies and Value Education)

Two tests and their average	--15 marks
Project Report	--10 marks*****
Total	--25 marks

***** The students as Individual or Group must visit a local area to document environmental assets – river / forest / grassland / hill / mountain – visit a local polluted site – urban / rural / industrial / agricultural – study of common plants, insects, birds – study of simple ecosystem – pond, river, hill slopes, etc.

Question Paper Pattern

(Internal Assessment)

Pattern of the Question Paper for Environmental Studies & Value Education only) (Internal)

45 MCQs will be asked for each internal assessment tests (45 x 1=45 Marks**) and converted for 15 marks**

Two tests and their average	--	15 marks
Project	--	10 marks

Total		25 Marks

Summative Examination Pattern

Pattern of the Question Paper for Environmental Studies & Value Education only) (External)

75 Multiple choice questions will be asked from five units (75 x 1=75 Marks**)**

(15MCQ's from each unit)

Part V Extension Activities: (Maximum Marks: 100)

1. NCC
2. NSS
3. Physical Education
4. YRC
5. RRC
6. Health & Fitness Club
7. Eco Club
8. Human Rights Club

Pattern of the Question Paper for (Internal Examination & Summative Examination)

Internal Examinations	- - 40 Marks
Summative Examinations	- - 60 Marks
	100

Minimum Marks for a Pass
40% of the aggregate (Internal +Summative Examinations).
No separate pass minimum for the Internal Examinations.
27 marks out of 75 is the pass minimum for the Summative Examinations.

VISION

To develop technically qualified, skilled, and competent human resource through excellence teaching knowledge to cater the needs of food and dairy industries.

MISSION

- To provide quality environment that facilitate to develop knowledge on industrial realities in food and dairy field.
- To inculcate in-depth knowledge of Food Technology with an ability to analyse, evaluate, design, discriminate, interpret, create and integrate existing and new knowledge.
- To Provide high quality education and training for careers in food industry, Government and capable to start their own business.
- To acquaint and equip students with professional and intellectual integrity, ethics of research and scholarship and responsibilities to contribute positively in the sustainable development of society.
- To provide facilities for academic excellence, training in soft and professional skills and placement.

The 12 Graduate Attributes*:

1. (KB) A knowledge base for engineering: Demonstrated competence in university level mathematics, natural sciences, engineering fundamentals, and specialized engineering knowledge appropriate to the program.
2. (PA) Problem analysis: An ability to use appropriate knowledge and skills to identify, formulate, analyze, and solve complex engineering problems in order to reach substantiated conclusions
3. (Inv.) Investigation: An ability to conduct investigations of complex problems by methods that include appropriate experiments, analysis and interpretation of data and synthesis of information in order to reach valid conclusions.
4. (Des.) Design: An ability to design solutions for complex, open-ended engineering problems and to design systems, components or processes that meet specified needs with appropriate attention to health and safety risks, applicable standards, and economic, environmental, cultural and societal considerations.
5. (Tools) Use of engineering tools: An ability to create, select, apply, adapt, and extend appropriate techniques, resources, and modern engineering tools to a range of engineering activities, from simple to complex, with an understanding of the associated limitations.
6. (Team) Individual and teamwork: An ability to work effectively as a member and leader in teams, preferably in a multi-disciplinary setting.
7. (Comm.) Communication skills: An ability to communicate complex engineering concepts within the profession and with society at large. Such ability includes reading, writing, speaking and listening, and the ability to comprehend and write effective reports and design documentation, and to give and effectively respond to clear instructions.

8. (Prof.) Professionalism: An understanding of the roles and responsibilities of the professional engineer in society, especially the primary role of protection of the public and the public interest.
9. (Impacts) Impact of engineering on society and the environment: An ability to analyze social and environmental aspects of engineering activities. Such ability includes an understanding of the interactions that engineering has with the economic, social, health, safety, legal, and cultural aspects of society, the uncertainties in the prediction of such interactions; and the concepts of sustainable design and development and environmental stewardship.
10. (Ethics) Ethics and equity: An ability to apply professional ethics, accountability, and equity.
11. (Econ.) Economics and project management: An ability to appropriately incorporate economics and business practices including project, risk, and change management into the practice of engineering and to understand their limitations.
12. (LL) Life-long learning: An ability to identify and to address their own educational needs in a changing world in ways sufficient to maintain their competence and to allow them to contribute to the advancement of knowledge

WA	Graduate Attributes	Caption as
WA1	A knowledge base for engineering: Demonstrated competence in university level mathematics, natural sciences, engineering fundamentals, and specialized engineering knowledge appropriate to the program.	**Disciplinary Knowledge**
WA10	An ability to apply professional ethics, accountability, and equity.	**Communication Skills**
WA12	An ability to identify and to address their own educational needs in a changing world in ways sufficient to maintain their competence and to allow them to contribute to the advancement of knowledge	**Digital Literacy & Life-long Learning**
WA4	An ability to design solutions for complex, open-ended engineering problems and to design systems, components or processes that meet specified needs with appropriate attention to health and safety risks, applicable standards, and economic, environmental, cultural and societal considerations.	**Analytical Reasoning & Critical Thinking**
WA7	An ability to communicate complex engineering concepts within the profession and with society at large. Such ability includes reading, writing, speaking and listening, and the ability to comprehend and write effective reports and design documentation, and to give and effectively respond to clear instructions.	**Problem Solving**
WA9	An ability to analyze social and environmental aspects of	**Teamwork and**

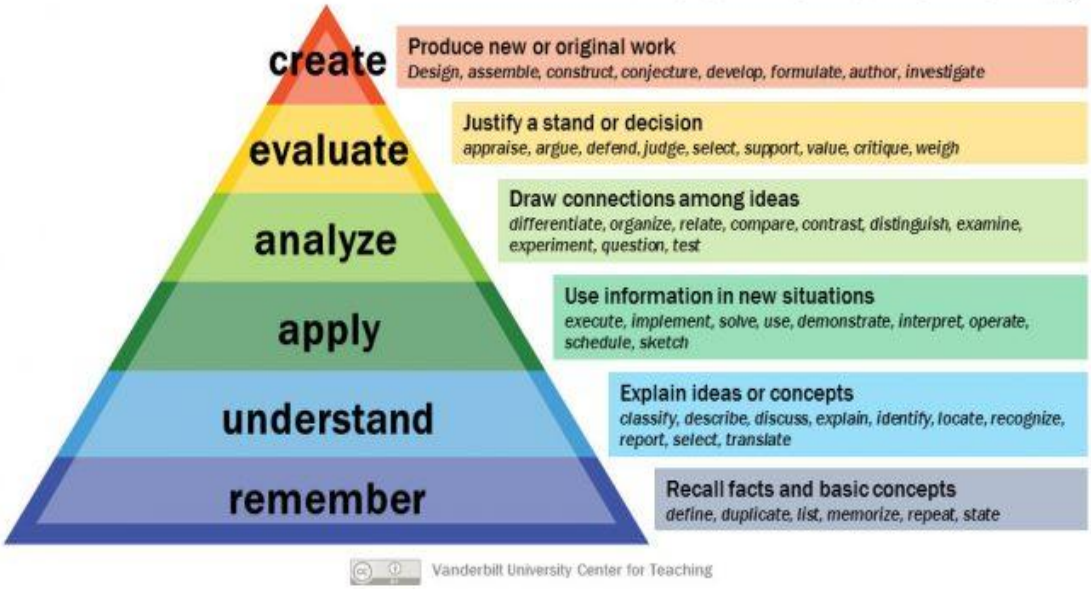
	engineering activities. Such ability includes an understanding of the interactions that engineering has with the economic, social, health, safety, legal, and cultural aspects of society, the uncertainties in the prediction of such interactions, and the concepts of sustainable design and development and environmental stewardship.	**Moral/Ethic al Awareness**
WA7	An ability to communicate complex engineering concepts within the profession and with society at large. Such ability includes reading, writing, speaking and listening, and the ability to comprehend and write effective reports and design documentation, and to give and effectively respond to clear instructions.	**Disciplinary Knowledge**

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)	
PEO1:	To enhance the entrepreneurial abilities through the product development and learn to Learn schemes.
PEO2:	As part of curriculum our student will go to In-Plant Training for 30days where they acquire adequate knowledge on processing and quality methods.
PEO3:	Equip the knowledge of students through project. Hence students can learn the research activities**.**
PEO4:	To learn the science behind the processing of food and its impacts on nutritive value of food stuffs.
PEO5:	To provide knowledge and creates awareness for a safe and healthy food supply.
PEO6:	To provide the strong foundation in the areas of Food and Dairy Technology.

PO NO	PROGRAMME OUTCOMES (POs)	
At the end of the programme, the students will be able to		
PO – 1	Demonstrate the knowledge and understanding of Science concepts and its relevant fields.	**Disciplinary Knowledge**
PO – 2	Identify, formulate, analyse complex problems and reach valid conclusions using the methodologies of Science.	**Problem Solving**
PO – 3	Employ critical and analytical thinking in understanding the concepts and apply them in various problems appearing in different branches of Science.	**Analytical Reasoning & Critical Thinking**
PO - 4	Communicate the known concepts effectively within the profession and with any forum	**Communication Skills**
PO - 5	Function successfully as a member/leader in any team and to apply ethics, accountability and equity in their life.	**Team Work and Moral/Ethical Awareness**
PO - 6	Use ICT tools in various learning situations, related information sources, suitable software to analyze data and furthermore participating in learning activities throughout life to meet the demands of work place through knowledge /up-skilling / re-skilling	**Digital Literacy & Life-long Learning**

PROGRAM SPECIFIC OUTCOME (PSOs)	
PSO1:	To enlighten the student's knowledge about the functioning of milk procurement organizations.
PSO2:	To enable students to acquire skill in processing of various food and dairy products.
PSO3:	To understand the science behind the processing of food and its impacts on nutritive value of food stuffs.
PSO4:	To apply Food and Dairy technology in the field of selection, preservation, packing, distributing, and using safe and nutritious food.
PSO5:	The ability to apply standard practices and regulation in developing the food and allied products
PSO6:	To upgrade the scientific knowledge in the area of food science, food processing and safety for the development of food products through quality research

Bloom's Taxonomy



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS), MADURAI

B.Sc., FOOD AND DAIRY TECHNOLOGY. CURRICULUM

(For the student admitted during the academic year 2021-2022 onwards)

Course Code	Title of the Course	Hrs	Credits	Maximum Marks		
				Int	Ext	Total
FIRST SEMESTER						
Part – I	**Tamil / Alternative Course**					
21UTAG11	இக்கால கவிதையும் நாடகமும்	6	3	25	75	100
Part – II	**English**					
21UENG11	Communicative English – I	6	3	25	75	100
Part - III	**Core Courses**					
21UFDC11	Principles of Food Science	3	3	25	75	100
21UFDCP1	Principles of Food Science-Practical	2	1	40	60	100
21UFDC12	Fundamentals of Food Technology	4	4	25	75	100
Part III	**Allied Course**					
21UFDA11	Principles of Food Production	5	5	25	75	100
Part IV	**Skill Based Course**					
21UFDS11	Dairy Farming and Rural Development	2	2	25	75	100
Part IV	**Mandatory Course**					
21UEVG11	Environmental Studies	2	2	25	75	100
	Total	**30**	**23**	**215**	**585**	**800**
SECOND SEMESTER						
Part – I	**Tamil / Alternative Course**					
21UTAG21	இடைக்கால இலக்கியமும் சிறுகதையும்	6	3	25	75	100
Part – II	**English**					
21UENG21	Communicative English - II	6	3	25	75	100
Part – III	**Core Courses**					
21UFDC21	Food Processing Technology	5	5	25	75	100
21UFDC22	Technology of Food Preservation	2	2	25	75	100
21UFDCP2	Technology of Food Preservation - Practical	2	1	40	60	100
Part III	**Allied Course**					
21UFDA21	Fast Foods and Catering Service	5	5	25	75	100
Part IV	**Skill Based Course**					
21UFDS21	Market Milk	2	2	25	75	100
	Value Education					
21UVLG21	Value Education	2	2	25	75	100
	Total	**30**	**23**	**215**	**585**	**800**

Course Code	Title of the Course	Hrs	Credits	Maximum Marks		
				Int	Ext	Total
THIRD SEMESTER						
Part – I	**Tamil / Alternative Course**					
21UTAG31	காப்பிய இலக்கியமும் உரைநடையும்	6	3	25	75	100
Part – II	**English**					
21UENG31	Communicative English – III	6	3	25	75	100
Part - III	**Core Courses**					
21UFDC31	Introduction to Biochemistry	5	5	25	75	100
21UFDC32	Technology of Fruits and Vegetables	2	2	25	75	100
21UFDCP3	Technology of Fruits and Vegetables - Practical	2	2	40	60	100
Part III	**Allied Course**					
21UFDA31	Food Product Development and Marketing	5	4	25	75	100
Part IV	**Skill Based Course**					
21UFDSP1	Traditional Indian Dairy Products - Practical	2	2	40	60	100
Part IV	**Non-Major Elective Course**					
21UFDN31	Nutrition for Health and Fitness	2	2	25	75	100
	Total	**30**	**23**	**230**	**570**	**800**
FOURTH SEMESTER						
Part – I	**Tamil / Alternative Course**					
21UTAG41	பண்டைய இலக்கியமும் புதினமும்	6	3	25	75	100
Part – II	**English**					
21UENG41	Communicative English - IV	6	3	25	75	100
Part - III	**Core Courses**					
21UFDC41	Technology of Cereals, Pulses and Oilseeds	5	4	25	75	100
21UFDC42	Food and Industrial Microbiology	2	2	25	75	100
21UFDCP4	Food and Industrial Microbiology – Practical	2	2	40	60	100
Part III	**Allied Course**					
21UFDAP1	Bakery and Confectionary- Practical	5	4	40	60	100
Part IV	**Skill Based Course**					
21UFDSP2	Fermented Dairy Products - Practical	2	2	40	60	100
Part IV	**Non-Major Elective Course**					
21UFDN41	Dairy Business Management	2	2	25	75	100
Part V	**Extension Activities**					
21UEAG40 - 21UEAG49	NSS, NCC, YRC	0	1	40	60	100
	Total	**30**	**23**	**285**	**615**	**900**

FIFTH SEMESTER						
Part - III	**Core Courses**					
21UFDC51	Food Engineering	6	4	25	75	100
21UFDC52	Food Chemistry	4	2	25	75	100
21UFDCP5	Food Chemistry – Practical	2	2	40	60	100
21UFDC53	Technology of Dairy Products	4	2	25	75	100
21UFDCP6	Technology of Dairy Products - Practical	2	2	40	60	100
Part III	**Core Elective - I**					
21UFDE51	Food Biotechnology	5	5	25	75	100
21UFDE52	Food Toxicology					
21UFDE53	Dairy By Product Technology					
Part III	**Core Elective - II**					
21UFDE54	Dairy Extension Education	5	5	25	75	100
21UFDE55	Physio-Chemical Aspects of Milk					
21UFDE56	Human Nutrition					
Part IV	**Skill Based Course**					
21UFDSP3	Technology of Ice Cream and Frozen Desserts - Practical	2	2	40	60	100
	Total	**30**	**24**	**245**	**555**	**800**
SIXTH SEMESTER						
Part - III	**Core Courses**					
21UFDC61	Food Quality and Sensory Evaluation	6	4	25	75	100
21UFDIP1	In plant Training	6	4	40	60	100
21UFDPR1	Project and Viva Voce	6	4	40	60	100
Part III	**Core Elective - I**					
21UFDE61	Functional foods and Nutraceuticals	5	5	25	75	100
21UFDE62	Technology of Poultry and Meat Processing					
21UFDE63	Effluent Treatment and Environmental Safety					
Part III	**Core Elective - II**					
21UFDE64	Value Added Dairy Products	5	5	25	75	100
21UFDE65	Technology of Sea Foods					
21UFDE66	Food Packaging Technology					
Part IV	**Skill Based Course**					
21UFDS61	Entrepreneurship Development and Industrial Consultancy	2	2	25	75	100
	Total	**30**	**24**	**180**	**420**	**600**
	Grand Total	**180**	**140**	**1370**	**3330**	**4700**


FIRST SEMESTER

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**PRINCIPLES OF FOOD SCIENCE**			
Course Code	**21UFDC11**	**L**	**P**	**C**
Category	**Core**	**3**	**-**	**3**

Nature of course:	**EMPLOYABILITY**	✓	**SKILLORIENTED**	✓	ENTREPRENEURSHIP	

Course Objectives:

- To Study the science behind the food products.
- To Analyze various methods of cooking.
- To highlight the importance of the role of difference foods in cookery.
- To provide knowledge on food groups.
- To Gain ideas related to different types of food

Unit: I	**Introduction to Food Science**	**15**

Food Science definition, scope of studying food science; Classification of Foods -Basic five food groups; Food Pyramid and Balanced diet. Cooking - Definition, objectives of cooking; Cooking Methods-Moist heat & Dry heat methods, advantages and disadvantages.

Unit: II	**Cereals, Pulses and Millets**	**15**

Composition and nutritive value of cereals; Structure of wheat and Rice, Fermented and unfermented products. Millets, Role of cereals in cookery. Composition and nutritive value of pulses, Classification, Pulse products, role of pulses in cookery;

Unit: III	**Nuts - Oil seeds and Spices**	**15**

Nuts and Oil seeds. Types of fats and oils, Hydrogenation, role of fat in cookery, effect of heating, factors affecting absorption of fats, smoking point Rancidity-Types, Prevention. Spices: Functions, role of spices in cookery, Types, Nutritive value, Uses and abuses. Nuts & Oilseeds: Types, Composition Nutritive value, role of nuts and oil seeds in cookery.

Unit: IV	**Vegetables and Fruits**	**15**

Classifications of fruits and vegetables, Concept of maturity, ripening, changes during ripening, post-harvest changes in fruits, vegetables - maturation, changes in maturation, pigments in fruits & vegetables, Role of fruits and vegetables in cookery.

Unit: V	**Meat, Fish and Egg**	**15**

Structure of egg, uses of egg in cookery, structure of meat, types of meat, post - mortem changes in meat, methods of cooking meat, classification of poultry, processing of poultry, selection of fish, methods of preservation of fish.

	Total Lecture Hours	**75 Hrs**

Books for Study:

1. Srilakshmi, B, **Food Science,** New Age International Private Limited Publishers, New Delhi, 2008.

Books for References:

1. Mudambi, R.S. and Rajagopal, M.Y. **Fundamentals of Food and Nutrition**, Wiley Eastern Limited: New Delhi(1991).
2. Swaminathan, M., **Food Science and Experimental Foods**, Ganesh and Company, Madras(1988).
3. Mudambi, R.S. and Rao. S, **Food Science**, Wiley Eastern Limited, New Delhi(1987).
4. Potter, N.M. and Birch, G.G., **Food Science**, AVI, West Port: Conn(1986).
5. Bennion, et.al., **Introductory Foods**, Macmillan, New York(1985).

Web Resources:		
http://lib.rudn.ru/file/Food_Science_Nutrition_Catalogue_ebook.pdf		
Course Outcomes		**K Level**
On Successful Completion of Course the Student will able to,		
CO1:	Identify the science behind the food products.	**K1**
CO2:	Explain various foods and their composition.	**K2**
CO3:	Apply various methods of cooking.	**K3**
CO4:	Analyze the role of difference foods in cookery.	**K4**
CO5:	Discover various new food products.	**K3**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**3**	**2**	**3**	**2**	**2**	**2**
CO 2	**3**	**2**	**2**	**2**	**2**	**2**
CO 3	**3**	**3**	**2**	**2**	**2**	**1**
CO 4	**3**	**2**	**2**	**2**	**2**	**1**
CO 5	**3**	**3**	**2**	**3**	**2**	**1**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	**Introduction to Food Science:** Food Science definition, scope of studying food science; Basic five food groups; Food Pyramid and Balanced diet; Cooking–Definition, objectives of cooking; Cooking methods - Moist heat & Dry heat methods, advantages, and disadvantages.	15	PPT, Chalk & Talk
II	**Cereals and Millets:** Composition and nutritive value of cereals; Structure of wheat and Rice, Fermented and unfermented products. Millets, Role of cereals in cookery. Composition and nutritive value of pulses, Classification, Pulse products, role of pulses in cookery;	15	Chalk & Talk, PPT
III	**Nuts - Oil seeds and Spices:** Types of fats and oils, Hydrogenation, role of fat in cookery, effect of heating, factors affecting absorption of fats, smoking point Rancidity-Types, Prevention. Spices: Functions, role of spices in cookery, Types, Nutritive value, Uses and abuses. Nuts & Oilseeds: Types, Composition Nutritive value, role of nuts and oil seeds in cookery.	15	Chalk & Talk, PPT, Assignment
IV	**Vegetables and Fruits:** Classifications of fruits and vegetables, Concept of maturity, ripening, changes during ripening, post-harvest changes in fruits, vegetables - maturation, changes in maturation, pigments in fruits & vegetables, Role of fruits and vegetables in cookery.	15	Chalk & Talk
V	**Meat, Fish and Egg:** Structure of egg, uses of egg in cookery, structure of meat, types of meat, pos- mortem changes in meat, methods of cooking meat, classification of poultry, processing of poultry, selection of fish, methods of preservation of fish.	15	Chalk & Talk, PPT

Course Designed by: **Ms. M. RAGADEEPA & Ms. G. BHARATHI**

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	K Level	Section A MCQs		Section B Short Answers		Section C Either or Choice	Section D Open Choice
			No. of. Questions	K - Level	No. of. Questions	K - Level		
CI AI	CO1	K1	1	K1	1	K1	2(K1&K1)	1(K1)
	CO2	K2	1	K2	2	K2	2(K2&K2)	2(K2&K2)
CI AII	CO3	K3	1	K3	1	K3	2(K3&K3)	1(K3)
	CO4	K4	1	K4	2	K4	2(K4&K4)	2(K4&K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	20

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	1	1	-	-	2	3.33	41.66
	K2	1	2	10	10	23	38.33	
	K3	1	1	10	10	22	36.67	36.67
	K4	1	2	-	10	13	21.67	21.67
	Marks	4	6	20	30	60	100	100
CIA II	K1	1	1	-	-	2	3.33	41.66
	K2	1	2	10	10	23	38.33	
	K3	1	1	10	10	22	36.37	36.37
	K4	1	2	-	10	13	21.67	21.67
	Marks	4	6	20	30	60	100	100

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, analyzing, presentation and make inferences with evidences
CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MOQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	**K1**	**2**	**K1&K2**	**1**	**K1**	**2(K1&K1)**	**1(K1)**
2	CO2	**K2**	**2**	**K1&K2**	**1**	**K1**	**2(K2&K2)**	**1(K2)**
3	CO3	**K3**	**2**	**K1&K2**	**1**	**K2**	**2(K3&K3)**	**1(K3)**
4	CO4	**K4**	**2**	**K1&K2**	**1**	**K2**	**2(K3&K3)**	**1(K4)**
5	CO5	**K4**	**2**	**K1&K2**	**1**	**K2**	**2(K4&K4)**	**1(K4)**
No. of Questions to be Asked			**10**		**5**		**10**	**5**
No.of Questions to be answered			**10**		**5**		**5**	**3**
Marks for each question			**2**		**2**		**5**	**10**
Total Marks for each section			**10**		**10**		**25**	**30**
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4	10	-	19	15.84	41.67
K2	5	6	10	10	31	25.83	
K3	-	-	20	20	40	33.33	33.33
K4	-	-	10	20	30	25	25
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q.No	**CO**	**K Level**	**Questions**
16) a	CO1	K1	
16) b	CO1	K1	
17) a	CO2	K2	
17) b	CO2	K2	
18) a	CO3	K2	
18) b	CO3	K2	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K4	
20) b	CO5	K4	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q.No	**CO**	**K Level**	**Questions**
21	CO1	K1	
22	CO2	K2	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**PRINCIPLES OF FOOD SCIENCE - PRACTICAL**						
Course Code	**21UFDCP1**				**L**	**P**	**C**
Category	**Core - Practical**				**-**	**2**	**1**
NATURE OF COURSE:	EMPLOYBILITY	**SKILLORIENTED**	✓	**ENTREPRENEURSHIP**	✓		

Course objectives:

- To Remember the processing and preparation of food products.
- To Apply different methods of cooling.
- To Analyze skills in handling appliances in laboratories
- To give training on different types of cooking methods.
- To create new recipes in different methods.

Course Content:

1. Use of standard measuring cups and spoons.
2. Cooking of different recipes from Millets, Cereals, Pulses, Vegetables, Fruits, Egg & Fish.
3. Cooking of foods by using water or steam as medium – Boiling & pressure cooking.
4. Cooking of foods by using microwave.
5. Effect of cooking on cereal cookery and pulses cookery.
6. Preparation of sprouted legumes and malt powder.
7. Preparation of nuts based dishes.
8. Effect of cooking on vegetables – steam , acid , alkali.
9. Evaluation of meat quality.
10. Evaluation of egg quality.

Books for Study:

1. Srilakshmi, B, **Food Science,** New Age International Private Limited Publishers, New Delhi, 2018.
2. Jamesen SK, Food Science Laboratory manual. Purdue University, 1998.

Books for Reference:

1. Mudambi, R.S. and Rajagopal, M.Y. **Fundamentals of Food and Nutrition**, Wiley Eastern Limited: New Delhi, 1991.

Web Resources:

http://154.68.126.6/library/Food%20Science%20books/batch1/The%20Food%20Chemistry%20Laboratory.pdf

Course Outcomes		**K Level**
On Successful Completion of Course the Student will able to,		
CO1:	Remember the processing and preparation of food products.	**K1**
CO2:	Understand the science behind various cooking methods.	**K2**
CO3:	Apply different methods of cooling.	**K3**
CO4:	Analyze skills in handling appliances in laboratories.	**K4**
CO5:	Examine different pigments, acids, alkali in foods.	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	2	3	2	2	2	1
CO 2	2	3	2	2	1	1
CO 3	3	2	2	2	2	1
CO 4	2	2	2	2	2	1
CO5	1	2	1	1	1	1

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

UNIT	SUBJECT NAME	Hrs	Mode
1.	Display of basic five food groups.	3	Lab
2.	Cooking of foods by using gas as medium - Roasting &baking	3	Lab
3.	Cooking of foods by using water or steam as medium – Boiling & pressure cooking.	3	Lab
4.	Cooking of foods by using microwave.	3	Lab
5.	Effect of cooking on cereal starches and proteins.	3	Lab
6.	Preparation of sprouted legumes and malt powder.	3	Lab
7.	Preparation of nuts-based dishes.	3	Lab
8.	Effect of cooking, acid & alkali on pigments.	3	Lab
9.	Evaluation of meat quality.	3	Lab
10.	Evaluation of egg quality.	3	Lab

Course Designed by: **Ms. M. RAGADEEPA & Ms. BHARATHI**

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**FUNDAMENTALS OF FOOD TECHNOLOGY**				
Course Code	**21UFDC12**		**L**	**P**	**C**
Category	**CORE**		**4**	**-**	**4**
Nature of course:	**EMPLOYABILITY**	✓ SKILL ORIENTED	ENTREPRENEURSHIP		

Course Objectives:

- To understand the history and evolution of food processing.
- To study the structure, composition, nutritional quality and post-harvest changes of various plant foods
- To analyze different technology involved in foods.
- To know the importance of changes in foods.
- To create various new food products.

Unit: I	**Historical development of food science and technology**	15

Evolution of Food Processing from prehistoric times till date. Introduction to various branches of Food Science and Technology.

Unit: II	**Technological aspects of foods**	15

Technological aspects of foods uses and by-products of cereals and coarse cereals wheat grain and malting. Wheat milling and by-products. Gelatinization and dextrinization of starch. Rice- Composition of rice obtained by different dehusking and polishing methods, parboiling of rice- advantages and disadvantages. By-products. Millets - Uses of maize, sorghum, barley, oats, pearl millet and finger millet.

Unit: III	**Fats and Oils - Types of fatty acids**	15

Saturated fatty acids, unsaturated fatty acids, essential fatty acids, trans fatty acids. Refining of oils, types- steam refining, alkali refining, bleaching, steam deodorization, hydrogenation. Winterization. Rancidity - hydrolytic and oxidative rancidity and its prevention. Definition - margarine, butter, hydrogenated vegetable oil, lard.

Unit: IV	**Post-harvest changes in fruits and vegetables,**	**15**

Climacteric rise horticultural maturity, physiological maturity, physiological changes, physical changes, chemical changes during the storage of fruits and vegetables.

Unit: V	**Meat**	15

Definition of carcass, concept of red meat and white meat, composition
of meat, marbling, post-mortem changes in meat- rigor mortis, tenderization of meat, ageing of meat.
Fish - Classification of fish (fresh water and marine), composition of fish, characteristics of fresh fish, spoilage of fish- microbiological, physiological, biochemical.
Poultry - composition and nutritive value, egg proteins, characteristics of fresh egg, deterioration of egg quality, difference between broiler and layers.

	Total Lecture Hours	**75**

Books for Study:

B. Srilakshmi, Food science, New Age Publishers,2002

Books for References:		
1. Manay, S. & Shadaksharaswami, M., Foods: Facts and Principles, New Age Publishers, 2004 2. Meyer, Food Chemistry, New Age,2004 3. Kenneth F. et.al., Ed. Vol-1, 2, The Cambridge World History of Food, Cambridge Univ.Press, 2000. 4. Martin Eastwood, Second edition, Principles of Human Nutrition, Blackwell publishing, 2003.		
Web Resources:		
https://swayam.gov.in/nd 1_noc19_ag06/preview		
Course Outcomes		**K Level**
On successful completion of the course, the students will be able to		
CO1:	Understand the history and evolution of food processing.	**K1**
CO2:	Identify the structure, composition, nutritional quality and post harvest changes of various plant foods.	**K2**
CO3:	Analyze different technology involved in foods.	**K2**
CO4:	Apply the importance of changes in foods.	**K3**
CO5:	Create various new food products.	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**3**	**2**	**1**	**2**	**2**	**1**
CO 2	**2**	**2**	**1**	**2**	**2**	**2**
CO 3	**3**	**1**	**2**	**3**	**2**	**1**
CO 4	**3**	**2**	**2**	**3**	**3**	**1**
CO 5	**2**	**2**	**1**	**2**	**3**	**1**

***3 –**Advanced Application; **2 –** Intermediate Development; **1 –** Introductory Level

LESSON PLAN

UNIT	COURSE NAME	Hrs	Mode
I	**Historical development of food science and technology**. Evolution of Food Processing from prehistoric times till date. Introduction to various branches of Food Science and Technology.	15	Chalk &Talk
II	**Technological aspects of foods** - uses and by-products of cereals and coarse cereals wheat grain and malting. Wheat milling and by-products. Gelatinization and dextrinisation of starch. Rice- Composition of rice obtained by different dehusking and polishing methods, parboiling of rice- advantages and disadvantages. By-products. Millets - Uses of maize, sorghum, barley, oats, pearl millet and finger millet.	15	PPT Slide share
III	**Fats and Oils - Types of fatty acids** - saturated fatty acids, unsaturated fatty acids, essential fatty acids, trans fatty acids. Refining of oils, types- steam refining, alkali refining, bleaching, steam deodorization, hydrogenation. Winterization. Rancidity - hydrolytic and oxidative rancidity and its prevention. Definition - margarine, butter, hydrogenated vegetable oil, lard.	15	PPT Slide share
IV	**Post-harvest changes in fruits and vegetables** – Climacteric rise, horticultural maturity, physiological maturity, physiological changes, physical changes, chemical changes during the storage of fruits and vegetables.	15	Chalk &Talk
V	**Meat** - Definition of carcass, concept of red meat and white meat, composition of meat, marbling, post-mortem changes in meat- rigor mortis, tenderization of meat, ageing of meat. Fish - Classification of fish (fresh water and marine), composition of fish, characteristics of fresh fish, spoilage of fish- microbiological, physiological, biochemical. Poultry - composition and nutritive value, egg proteins, characteristics of fresh egg, deterioration of egg quality, difference between broiler and layers.	15	Chalk &Talk

Course Designed by**: Ms. G. BHARATHI & Ms. M. RAGADEEPA**

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	K Level	Section A MCQs		Section B Short Answers		Section Section C Either or Choice	Section Section D Open Choice
			No. of. Questions	K - Level	No. of. Questions	K - Level		
CI AI	CO1	K1	1	K1	1	K1	2(K1&K1)	1(K1)
	CO2	K2	1	K2	2	K2	2(K2&K2)	2(K2&K2)
CI AII	CO3	K3	1	K3	1	K3	2(K3&K3)	1(K3)
	CO4	K4	1	K4	2	K3	2(K4&K4)	2(K4&K4)
Question Pattern CIA I & II		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	20

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	1	1	-	-	2	3.33	41.66
	K2	1	2	10	10	23	38.33	
	K3	1	1	10	10	22	36.67	36.67
	K4	1	2	-	10	13	21.67	21.67
	Marks	4	6	20	30	60	100	100
CIA II	K1	1	1	-	-	2	3.33	41.66
	K2	1	2	10	10	23	38.33	
	K3	1	1	10	10	22	36.37	36.67
	K4	1	2	-	10	13	21.67	21.67
	Marks	4	6	20	30	60	100	100

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, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MOQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	K1	2	K1&K2	1	K1	2(K1&K1)	1(K1)
2	CO2	K2	2	K1&K2	1	K2	2(K2&K2)	1(K2)
3	CO3	K3	2	K1&K2	1	K2	2(K3&K3)	1(K3)
4	CO4	K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
5	CO5	K4	2	K1&K2	1	K2	2(K4&K4)	1(K4)
No. of Questions to be Asked			10		5		10	5
No.of Questions to be answered			10		5		5	3
Marks for each question			2		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4	10		19	15.84	41.67
K2	5	6	10	10	31	25.83	
K3			20	20	40	33.33	33.33
K4			10	20	30	25	25
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions)
Answer All Questions **(10x1=10 marks)**

Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	

Section B (Short Answers)
Answer All Questions **(5x2=10 marks)**

Q.No	CO	K Level	Questions
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	

Section C (Either/Or Type)
Answer All Questions **(5 x 5 = 25 marks)**

Q.No	CO	K Level	Questions
16) a	CO1	K1	
16) b	CO1	K1	
17) a	CO2	K2	
17) b	CO2	K2	
18) a	CO3	K2	
18) b	CO3	K2	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K4	
20) b	CO5	K4	

NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels

Section D (Open Choice)
Answer Any Three questions **(3x10=30 marks)**

Q.No	CO	K Level	Questions
21	CO1	K1	
22	CO2	K2	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**PRINCIPLES OF FOOD PRODUCTION**							
Course Code	**21UFDA11**					**L**	**P**	**C**
Category	**Allied**					5	-	5
Nature of Course:	**EMPLOYBILITY**	✓	**SKILL ORIENTED**	✓	**ENTREPRENEURSHIP**			✓

Course Objectives:

- To Study Science behind transforming raw ingredients into prepared food products.
- To provide in-depth knowledge on production of processed fruits and vegetable products and the waste utilization techniques.
- To develop knowledge in skillful and profitable utilization of fruits and vegetables.
- To analyze the consistency variation while using pasta.
- To evaluate the processed product.

Unit: I	**Introduction to Professional Cookery**	**12**

Aims & Objectives of Cooking. of modern cookery. Kitchen Layout and Organization: Staffing in Various Category, Role of Executive Chef, Duties and Responsibilities of various Chefs, Co-operation with Other Departments Equipment, Fuel and Tools used in Cookery.

Unit: II	**Shortenings (Fats & Oil)**	**12**

Role of shortening. Varieties of shortenings. Advantages & Disadvantages of using different shortenings, Fats & Oil Types, varieties.. Sugar: Importance of sugar, Types of sugar, Cooking of various sugar. changes Effects of heat on vegetables, Cuts of vegetables.

Unit: III	**Preparation and Methods of Cooking**	**12**

Preparation of Ingredients – Washing, peeling, scrapping, cutting of vegetables, method of mixing foods, methods of cooking foods.

Unit: IV	**Fish Classification, selection procedures, cuts, and cooking of fish**	**12**

Classification, selection procedures, cuts, and cooking of fish.Butchery- Selection cuts, size, and uses of lamb, mutton, veal, beef, and porks.
Chicken- Classification, Selection procedures, cuts, and uses. Steak, Bacon, ham, gammon- Meaning.

Unit: V	**Basic Indian and Continental Cookery**	**12**

Condiments & Spices - Introduction to Indian Foods, Spices used in Indian Foods, Role of Spices in Indian Cookery. Masalas - Blending of Masalas, Different Masalas used in Indian Cookery. Pasta: meaning and types.

	Total Lecture Hours	**60**

Books For Study:

1. Srilakshmi, B, **Food Science,** New Age International Private Limited Publishers, New Delhi; Chennai(1997).

Books For Reference:
1. Philip E. Thangam., Modern Cookery for teaching and the Trade. Orient longman (2008). 2. Arora.K., Theory of Cookery. K.N.Gupta and Co (2008). 3. Auguste Escoffier., The Complete Guide to the Art of Modern Cookery. Heinema (2011).
Web Resources:
https://nptel.ac.in/content/storage2/courses/103103029/pdf/mod6.pdf

COURSE OUTCOME		**K Level**
CO1:	Understand the methods of professional cookery.	**K1**
CO2:	Study the process of shortenings.	**K2**
CO3:	Analyze the selection procedure of meat and sea foods.	**K2**
CO4:	Apply various methods of cookery.	**K3**
CO5:	Create many dishes using condiments and spices.	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**3**	**2**	**3**	**2**	**2**	**2**
CO 2	**3**	**3**	**2**	**2**	**2**	**1**
CO 3	**2**	**3**	**2**	**3**	**1**	**2**
CO 4	**2**	**2**	**2**	**3**	**2**	**1**
CO 5	**3**	**3**	**2**	**2**	**1**	**1**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

UNIT	SUBJECT NAME	Hrs	Mode
I	**Introduction to Professional Cookery** - Aims & Objectives of Cooking. of modern cookery. Kitchen Layout and Organization: Staffing in Various Category, Role of Executive Chef, Duties and Responsibilities of various Chefs, Co-operation with Other Departments Equipment, Fuel and Tools used in Cookery.	12	Chalk &Talk
II	**Shortenings (Fats & Oil):** Role of shortening. Varieties of shortenings. Advantages & Disadvantages of using different shortenings, Fats & Oil Types, varieties. Sugar: Importance of sugar, Types of sugar, Cooking of various sugar. changes Effects of heat on vegetables, Cuts of vegetables.	12	PPT
III	**Preparation and Methods of Cooking**. Preparation of Ingredients – Washing, peeling, scrapping, cutting of vegetables, method of mixing foods, methods of cooking foods.	12	Chalk &Talk
IV	**Fish-** Classification, selection procedures, cuts, and cooking of fish. Butchery- Selection cuts, size, and uses of lamb, mutton, veal, beef, and porks. **Chicken**- Classification, Selection procedures, cuts, and uses. Steak, Bacon, ham, gammon- Meaning.	12	PPT
V	**Basic Indian and Continental Cookery.** Condiments & Spices - Introduction to Indian Foods, Spices used in Indian Foods, Role of Spices in Indian Cookery. Masalas - Blending of Masalas, Different Masalas used in Indian Cookery. Pasta: meaning and types.	12	Chalk &Talk PPT

Course Designed by**: Ms. G. BHARATHI & Ms. M. RAGADEEPA**

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	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		
CI AI	CO1	K1	1	K1	1	K1	2(K&K1)	1(K1)
	CO2	K2	1	K2	2	K2	2(K2&K2)	2(K2&K2)
CI AII	CO3	K3	1	K3	1	K3	2(K3&K3)	1(K3)
	CO4	K4	1	K4	2	K3	2(K4&K4)	2(K4&K4)
Question Pattern CIA I & II	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	20

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	1	1	-	-	2	3.33	41.66
	K2	1	2	10	10	23	38.33	
	K3	1	1	10	10	22	36.67	36.67
	K4	1	2	-	10	13	21.67	21.67
	Marks	4	6	20	30	60	100	100
CIA II	K1	1	1	-	-	2	3.33	41.66
	K2	1	2	10	10	23	38.33	
	K3	1	1	10	10	22	36.37	36.37
	K4	1	2	-	10	13	21.67	21.67
	Marks	4	6	20	30	60	100	100

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, analyzing, presentation and make inferences with evidences
CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MOQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	**K1**	**2**	**K1&K2**	**1**	**K1**	**2(K1&K1)**	**1(K2)**
2	CO2	**K2**	**2**	**K1&K2**	**1**	**K1**	**2(K2&K2)**	**1(K3)**
3	CO3	**K3**	**2**	**K1&K2**	**1**	**K2**	**2(K3&K3)**	**1(K3)**
4	CO4	**K4**	**2**	**K1&K2**	**1**	**K2**	**2(K3&K3)**	**1(K4)**
5	CO5	**K4**	**2**	**K1&K2**	**1**	**K2**	**2(K4&K4)**	**1(K4)**
No. of Questions to be Asked			**10**		**5**		**10**	**5**
No.of Questions to be answered			**10**		**5**		**5**	**3**
Marks for each question			**2**		**2**		**5**	**10**
Total Marks for each section			**10**		**10**		**25**	**30**
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4	10		19	15.84	41.67
K2	5	6	10	10	31	25.83	
K3			20	20	40	33.33	33.33
K4			10	20	30	25	25
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q.No	**CO**	**K Level**	**Questions**
16) a	CO1	K1	
16) b	CO1	K1	
17) a	CO2	K2	
17) b	CO2	K2	
18) a	CO3	K2	
18) b	CO3	K2	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K4	
20) b	CO5	K4	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q.No	**CO**	**K Level**	**Questions**
21	CO1	K1	
22	CO2	K2	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**DAIRY FARMING AND RURAL DEVELOPMENT**							
Course Code	**21UFDS11**					**L**	**P**	**C**
Category	**SKILL**					**2**	**-**	**2**
Nature of course:	**EMPLOYBILITY**	✓	**SKILLORIENTED**	✓	**ENTREPRENEURSHIP**			✓

Course Objectives:

- To learn and understand development of dairy in India and World.
- To know about basic common practices following by dairying.
- To analyze the rural resources and its use.
- To Preparing a dairy farming project report by their own.
- To explain the Approaches to Management-Dairy Farming in India

Unit: I	**Development of Dairy Industry in India and World**	**6**

Livestock Development in India-Important breeds of Cattle and Buffalo- System of cross breeding – Breeding management, Milking management, Machine milking and Hand Milking.

Unit: II	**Feed and fodder Development/ Management**	**6**

Feed and fodder Resources – Green fodder, Dry fodder, Concentrate feed , By pass Protein Silage – Feed formula – Balanced ration- Feeding technique .

Unit: III	**Cooperative dairying**	**6**

Milk collection centers and its functions Methods for procurement of Milk- Structure of dairy cooperatives - primary milk cooperative societies - district milk producer's cooperative union – State level federation -objective and functions.

Unit: IV	**Economics of dairy farm**	**6**

Mode of milk and milk product sale - Farm management - income and expenditure - Estimating the cost of production of milk – Model project report – NABARD Schemes.

Unit: V	**Dairy Development in India**	**6**

Role of Dairying in Rural and Urban economy – Rural Resource appraisal Programme – Students will Visit farm in a village and study the Agro - dairy practices carried out by the farmer

	Total Lecture Hours	**30**

Books for study:

1. Jagadish Prasad, Principles and Practices of Dairy Farm Management, Kalyani Publishers, Ludhiana (1992).
2. Ramasamy. D., Dairy technologist hand book, International book distributing Co. Luknow (1999).
3. Robinson, Modern Dairy Technology, Vol.I, Advances in Milk Processing, Chapman and Hall India, Madras (1986).
4. Arora SP. 1997. Feeding of Dairy Cattle and Buffaloes. Kalyani.
5. Dutta G. 1994. Care and Management of Dairy Cattle and Buffaloes.
6. Thomas CK & Sastry NSR.1991 .Dairy Bovine Production. Kalyani.

Books for reference:

1. G. Sridhar and D. Rajasekhar: Rural Development in India-Concept Publishing Company
2. I.C.Dingra: Rural Economics.
3. A.N.Agarwal and Kundana Lal: Rural Economy of India.

Web Resources:

1. **https://www.tutorialspoint.com**
2. **https://collegeeduria.com**
3. **https://swayam.gov.in**

COURSE OUTCOME		**K Level**
On Successful Completion of Course the Student will able to,		
CO1:	Understand the Development of Dairy Industry in India and World.	**K1**
CO2:	Classify Methods for procurement of milk.	**K2**
CO3:	Analyze Cooperative dairying.	**K4**
CO4:	Student able to appraise the rural resources	**K3**
CO5:	Identify the cost of production of milk.	**K3**

CO & PO Mappings:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	2	2	2	2
CO 2	3	3	1	2	2	2
CO 3	2	2	2	3	1	2
CO 4	3	3	2	1	2	1
CO5	2	2	1	2	1	1

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

UNIT	SUBJECT NAME	Hrs	Mode
I	Livestock Development in India-Important breeds of Cattle and Buffalo-System of cross breeding – Breeding management, Milking management, Machine milking and Hand Milking.	**6**	**PPT**
II	Feed and fodder Resources – Green fodder, Dry fodder, Concentrate feed , By pass Protein Silage – Feed formula – Balanced ration- Feeding technique .	**6**	**PPT**
III	Milk collection centers and its functions Methods for procurement of Milk-Structure of dairy cooperatives - primary milk cooperative societies - district milk producer's cooperative union – State level federation - objective and functions.	**6**	**PPT**
IV	Mode of milk and milk product sale - Farm management - income and expenditure - Estimating the cost of production of milk – Model project report – NABARD Schemes.	**6**	**PPT**
V	Role of Dairying in Rural and Urban economy – Rural Resource appraisal Programme – Students will Visit farm in a village and study the Agro - dairy practices carried out by the farmer	**6**	**PPT**

Course Designed by: **Mr. N. SOWJANYAN & Mr. P.V. GOPIMANIVANAN**


SECOND SEMESTER

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**FOOD PROCESSING TECHNOLOGY**							
Course Code	**21UFDC21**					**L**	**P**	**C**
Category	**Core**					**5**	**-**	**5**
Nature of course:	**EMPLOYABILITY**	✓	**SKILLORIENTED**	✓	**ENTREPRENEURSHIP**	✓		

Course Objectives:

- To Study the Cold Preservation and freezers.
- To analyze various methods of Dehydration.
- To Highlight the importance of the role of Irradiation.
- To provide knowledge on Food Packaging.
- To Gain ideas related to different types Thermal Processing.

Unit: I	**Cold preservation**	**15**

Freezing: requirements of refrigerated storage – controlled low temperature, air circulation and humidity, changes in food during refrigerated storage, progressive freezing, changes during freezing –concentration effect and ice crystal damage, freezer burn. Refrigeration load, factors determining freezing rate-food composition and non compositional influences.

Unit: II	**Freezing- Mechanism and freezers**	**15**

Freezing methods –direct and indirect, still air sharp freezer, blast freezer, fluidized freezer, plate freezer, spiral freezer and cryogenic freezing.

Unit: III	**Dehydration**	**15**

Normal drying curve , effect of food properties on dehydration , change in food during drying ,drying methods and equipments air convection dryer, tray dryer, tunnel dryer , continuous belt dryer , fluidized bed dryer, spray dryer, drum dryer, vacuum dryer ,freeze drying ,foam mat drying.

Unit: IV	**Food Irradiation and Microwave Heating and Thermal processing**	**15**

Ionizing radiation and sources, unit of radiations, direct and indirect radiation effects, safety and wholesomeness of irradiated food. Microwave heating and application. Introduction, classification of Thermal Processes, Principles of thermal processing, Thermal resistance of microorganisms, Thermal Death Time, Lethality concept, characterization of heat penetration data, Thermal process Calculations.

Unit: V	**Packaging of foods**	**15**

Packaging: Properties of packaging material, factors determining the packaging requirements of various foods and brief description of packaging of frozen products, dried products, fats and oils and thermally processed foods.

	Total Lecture Hours	**75 Hrs**

Books for Study:

1. Potter NH, Food Science, CBS Publication, New Delhi, 1998

Books for References:

1. Desrosier NW and Desrosier JN, The Technology of Food Preservation, CBS Publication, New Delhi, 1998.
2. Paine FA and Paine HY, Handbook of Food Packaging, Thomson Press India Pvt Ltd, New Delhi- 1992.
3. Potter NH, Food Science, CBS Publication, New Delhi, 1998.

4. Ramaswamy H and Marcott M, Food Processing Principles and Applications CRC Press, 2006
5. Rao PG, Fundamentals of Food Engineering, PHI Learning Pvt Ltd, New Delhi, 2010.
6. Toledo Romeo T, Fundamentals of Food Process Engineering, Aspen Publishers, 1999

Web Resources:

https://nptel.ac.in/content/storage2/courses/103103029/pdf/mod6.pdf

Course Outcomes		**K Level**
On Successful Completion of Course the Student will able to,		
CO1:	Identify Mechanism and freezers.	**K1**
CO2:	Explain various Dehydration.	**K2**
CO3:	Apply various methods of preservation.	**K3**
CO4:	Analyze the different types of Packaging.	**K4**
CO5:	Discover various new food products using processing methods.	**K3**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**2**	**2**	**3**	**2**	**2**	**2**
CO 2	**3**	**2**	**1**	**2**	**1**	**1**
CO 3	**2**	**2**	**2**	**2**	**2**	**2**
CO 4	**2**	**1**	**2**	**2**	**1**	**1**
CO 5	**1**	**3**	**2**	**2**	**1**	**2**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 –** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	**Cold preservation** : Freezing: requirements of refrigerated storage – controlled low temperature, air circulation and humidity, changes in food during refrigerated storage, progressive freezing, changes during freezing – concentration effect and ice crystal damage, freezer burn. Refrigeration load, factors determining freezing rate-food composition and non compositional influences.	15	PPT, Chalk & Talk
II	**Freezing- Mechanism and freezers** : Freezing methods –direct and indirect, still air sharp freezer, blast freezer, fluidized freezer, plate freezer, spiral freezer and cryogenic freezing.	15	Chalk & Talk, PPT
III	**Dehydration** : Normal drying curve , effect of food properties on dehydration , change in food during drying ,drying methods and equipments air convection dryer, tray dryer, tunnel dryer ,continuous belt dryer , fluidized bed dryer, spray dryer, drum dryer, vacuum dryer ,freeze drying ,foam mat drying.	15	Chalk & Talk, PPT, Assignment
IV	**Food Irradiation and Microwave Heating and Thermal processing** : Ionizing radiation and sources, unit of radiations, direct and indirect radiation effects, safety and wholesomeness of irradiated food. Microwave heating and application. Introduction, classification of Thermal Processes, Principles of thermal processing, Thermal resistance of microorganisms, Thermal Death Time, Lethality concept, characterization of heat penetration data, Thermal process Calculations.	15	Chalk & Talk
V	**Packaging of foods** Packaging: Properties of packaging material, factors determining the packaging requirements of various foods and brief description of packaging of frozen products, dried products, fats and oils and thermally processed foods.	15	Chalk & Talk, PPT

Course Designed by: **Ms. M. RAGADEEPA & Ms. G. BHARATHI**

Learning Outcome Based Education & Assessment (LOBE) Formative Examination – Blue Print Articulation Mapping – K Levels with Course Outcomes (Cos)								
Internal	**Cos**	**K Level**	**Section A MCQs**		**Section B Short Answers**		**Section C Either or Choice**	**Section D Open Choice**
			No. of. Questions	**K – Level**	**No. of. Questions**	**K – Level**		
CIA I	**CO1**	**K1**	**1**	**K1**	**1**	**K1**	**2(K1&K1)**	**1(K1)**
	CO2	**K2**	**1**	**K2**	**2**	**K2**	**2(K2&K2)**	**2(K1&K2)**
CIA II	**CO3**	**K3**	**1**	**K3**	**1**	**K3**	**2(K3&K3)**	**1(K3)**
	CO4	**K4**	**1**	**K4**	**2**	**K3**	**2(K4&K4)**	**2(K3&K4)**
Question Pattern CIA I & II	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**	**20**

Distribution of Marks with K Level CIA I & CIA II								
	K Level	**Section A (Multiple Choice Questions)**	**Section B (Short Answer Questions)**	**Section C (Either / Or Choice)**	**Section D (Open Choice)**	**Total Marks**	**% of (Marks without choice)**	**Consolidate of %**
CIA I	**K1**	**1**	**1**	**-**	**-**	**2**	**3.33**	**41.66**
	K2	**1**	**2**	**10**	**10**	**23**	**38.33**	
	K3	**1**	**1**	**10**	**10**	**22**	**36.67**	**36.37**
	K4	**1**	**2**	**-**	**10**	**13**	**21.67**	**21.67**
	Marks	**4**	**6**	**20**	**30**	**60**	**100**	**100**
CIA II	**K1**	**1**	**1**	**-**	**-**	**2**	**3.33**	**41.66**
	K2	**1**	**2**	**10**	**10**	**23**	**38.33**	
	K3	**1**	**1**	**10**	**10**	**22**	**36.37**	**36.37**
	K4	**1**	**2**	**-**	**10**	**13**	**21.67**	**21.67**
	Marks	**4**	**6**	**20**	**30**	**60**	**100**	**100**

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, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (Cos)								
S.No	Cos	K – Level	MOQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	K1	2	K1&K2	1	K1	2(K1&K1)	1(K1)
2	CO2	K2	2	K1&K2	1	K2	2(K2&K2)	1(K2)
3	CO3	K3	2	K1&K3	1	K3	2(K3&K3)	1(K3)
4	CO4	K4	2	K1&K2	1	K2	2(K3&K3)	1(K3)
5	CO5	K4	2	K1&K2	1	K2	2(K4&K4)	1(K4)
No. of Questions to be Asked			10		5		10	5
No.of Questions to be answered			10		5		5	3
Marks for each question			2		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4	10		19	15.84	41.67
K2	5	6	10	10	31	25.83	
K3			20	20	40	33.33	33.33
K4			10	20	30	25	25
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations – Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q.No	**CO**	**K Level**	**Questions**
16) a	CO1	K1	
16) b	CO1	K1	
17) a	CO2	K2	
17) b	CO2	K2	
18) a	CO3	K2	
18) b	CO3	K2	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K4	
20) b	CO5	K4	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q.No	**CO**	**K Level**	**Questions**
21	CO1	K1	
22	CO2	K2	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**TECHNOLOGY OF FOOD PRESERVATION**							
Course Code	**21UFDC22**					**L**	**P**	**C**
Category	**Core**					**2**	**-**	**2**
Nature of course:	**EMPLOYABILITY**	✓	**SKILLORIENTED**	✓	**ENTREPRENEURSHIP**			✓

Course Objectives:

- To study the importance microorganisms in food preservation
- To introduce the basics of various food processing and preservation technologies
- To Highlight the importance of Drying and Dehydration.
- To provide knowledge on Irradiation.
- To Gain ideas high temperature.

Unit: I	**Food Microbiology**	**15**

Principles of Food Preservation, microorganisms associated with foods- bacteria, yeast and mold, Importance of bacteria, yeast and molds in foods. Classification of microorganisms based on temperature, Ph, water activity, nutrient and oxygen requirements, typical growth curve of micro-organisms. Classification of food based on Ph, Food infection, food intoxication, definition of shelf life, perishable foods, semi perishable foods, shelf stable foods.

Unit: II	**Food Preservation by Low temperature**	**15**

Freezing and Refrigeration :Introduction to refrigeration, cool storage and freezing, definition, principle of freezing, freezing curve, changes occurring during freezing, types of freezing i.e. slow freezing, quick freezing, introduction to thawing, changes during thawing and its effect on food.

Unit: III	**Food Preservation by high temperature**	**15**

Thermal Processing- Commercial heat preservation methods: Sterilization, commercial sterilization, Pasteurization, and blanching.

Unit: IV	**Food Preservation by Moisture control**	**15**

Drying and Dehydration – Definition, drying as a means of preservation, differences between sun drying and dehydration (i.e. mechanical drying), heat and mass transfer, factors affecting rate of drying, normal drying curve, names of types of driers used in the food industry. Evaporation – Definition, factors affecting evaporation, names of evaporators used in food industry.

Unit: V	**Food Preservation by Irradiation**	**15**

Introduction, units of radiation, kinds of ionizing radiations used in food irradiation, mechanism of action, uses of radiation processing in food industry, concept of cold sterilization.

	Total Lecture Hours	**75 Hrs**

Books for Study:

1. Srilakshmi, Food science, New Age Publishers,2002

Books for References:

1. Srilakshmi, Food science, New Age Publishers,2002
2. Meyer, Food Chemistry, New Age,2004
3. Bawa. A.S, O.P Chauhan etal. Food Science. New India Publishing agency, 2013
4. Frazier WC and Westhoff DC, Food Microbiology, TMH Publication, New Delhi, 2004

Web Resources:

https://ncert.nic.in/textbook/pdf/lehe105.pdf https://drive.google.com/file/d/1GAVEN44wEO4ATjdeADdOLO814VK6xdpV/view		
COURSE OUTCOMES		**K Level**
On Successful Completion of Course the Student will able to,		
CO1:	Identify microorganisms in food preservation	**K1**
CO2:	Explain various Food Preservation.	**K2**
CO3:	Apply various methods of Evaporation.	**K3**
CO4:	Analyze the different types of Dehydration.	**K4**
CO5:	Test for Food Preservation.	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**2**	**2**	**3**	**1**	**2**	**2**
CO 2	**2**	**2**	**1**	**2**	**1**	**2**
CO 3	**2**	**2**	**2**	**2**	**2**	**1**
CO 4	**3**	**3**	**2**	**1**	**1**	**1**
CO 5	**3**	**1**	**2**	**2**	**1**	**1**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 –** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	**Food Microbiology :** Principles of Food Preservation, microorganisms associated with foods- bacteria, yeast and mold, Importance of bacteria, yeast and molds in foods. Classification of microorganisms based on temperature, Ph, water activity, nutrient and oxygen requirements, typical growth curve of micro-organisms. Classification of food based on Ph, Food infection, food intoxication, definition of shelf life, perishable foods, semi perishable foods, shelf stable foods.	15	PPT, Chalk & Talk
II	**Food Preservation by Low temperature :** Freezing and Refrigeration :Introduction to refrigeration, cool storage and freezing, definition, principle of freezing, freezing curve, changes occurring during freezing, types of freezing i.e. slow freezing, quick freezing, introduction to thawing, changes during thawing and its effect on food.	15	Chalk & Talk, PPT
III	**Food Preservation by high temperature :** Thermal Processing-Commercial heat preservation methods: Sterilization, commercial sterilization, Pasteurization, and blanching.	15	Chalk & Talk, PPT, Assignment
IV	**Food Preservation by Moisture control** : Drying and Dehydration – Definition, drying as a means of preservation, differences between sun drying and dehydration (i.e. mechanical drying), heat and mass transfer, factors affecting rate of drying, normal drying curve, names of types of driers used in the food industry. Evaporation – Definition, factors affecting evaporation, names of evaporators used in food industry.	15	Chalk & Talk
V	**Food Preservation by Irradiation** : Introduction, units of radiation, kinds of ionizing radiations used in food irradiation, mechanism of action, uses of radiation processing in food industry, concept of cold sterilization.	15	Chalk & Talk, PPT

Course Designed by: **Mr. P.V. GOPIMANIVANNAN & Ms. M. RAGADEEPA**

Learning Outcome Based Education & Assessment (LOBE) Formative Examination – Blue Print Articulation Mapping – K Levels with Course Outcomes (Cos)								
Internal	Cos	K Level	Section A MCQs		Section B Short Answers		Section C Either or Choice	Section D Open Choice
			No. of. Questions	K – Level	No. of. Questions	K – Level		
CI AI	CO1	K1	1	K1	1	K1	2(K1&K1)	1(K1)
	CO2	K2	1	K2	2	K2	2(K2&K2)	2(K2&K2)
CI AII	CO3	K3	1	K3	1	K3	2(K3&K3)	1(K3)
	CO4	K4	1	K4	2	K4	2(K4&K4)	2(K3&K4)
Question Pattern CIA I & II		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	20

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	1	1	-	-	2	3.33	41.66
	K2	1	2	10	10	23	38.33	
	K3	1	1	10	10	22	36.67	58.34
	K4	1	2	-	10	13	21.67	
	Marks	4	6	20	30	60	100	100
CIA II	K1	1	1	-	-	2	3.33	41.66
	K2	1	2	10	10	23	38.33	
	K3	1	1	10	10	22	36.37	36.37
	K4	1	2	-	10	13	21.67	21.67
	Marks	4	6	20	30	60	100	100

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, analyzing, presentation and make inferences with evidences
CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (Cos)								
S.No	Cos	K – Level	MOQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	**K1**	**2**	**K1&K2**	**1**	**K1**	**2(K1&K1)**	**1(K1)**
2	CO2	**K2**	**2**	**K1&K2**	**1**	**K1**	**2(K2&K2)**	**1(K2)**
3	CO3	**K3**	**2**	**K1&K2**	**1**	**K2**	**2(K3&K3)**	**1(K3)**
4	CO4	**K4**	**2**	**K1&K2**	**1**	**K2**	**2(K3&K3)**	**1(K3)**
5	CO5	**K4**	**2**	**K1&K2**	**1**	**K2**	**2(K4&K4)**	**1(K4)**
No. of Questions to be Asked			**10**		**5**		**10**	**5**
No.of Questions to be answered			**10**		**5**		**5**	**3**
Marks for each question			**2**		**2**		**5**	**10**
Total Marks for each section			**10**		**10**		**25**	**30**
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4	10		19	15.84	41.67
K2	5	6	10	10	31	25.83	
K3			20	20	40	33.33	33.33
K4			10	20	30	25	25
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations – Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q.No	**CO**	**K Level**	**Questions**
16) a	CO1	K1	
16) b	CO1	K1	
17) a	CO2	K2	
17) b	CO2	K2	
18) a	CO3	K2	
18) b	CO3	K2	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K4	
20) b	CO5	K4	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q.No	**CO**	**K Level**	**Questions**
21	CO1	K1	
22	CO2	K2	
23	CO3	K3	
24	CO4	K3	
25	CO5	K4	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**TECHNOLOGY OF FOOD PRESERVATION**							
Course Code	**21UFDCP2**					**L**	**P**	**C**
Category	**Core – Practical**					**-**	**2**	**1**
Nature of Course:	**EMPLOYBILITY**	✓	**SKILL ORIENTED**	✓	**ENTREPRENEURSHIP**			✓

COURSE OBJECTIVES:

- To Recalling the Methods of Sampling
- To know about the Concept of shelf life of different foods.
- To differentiate the role and action of sterilization.
- To examine quality characteristics of foods preserved by drying/dehydration/ freezing.
- To identify the pasteurization of fluids using different methods.

1. Methods of Sampling.
2. Concept of shelf life of different foods.
3. To study the concept of sterilization.
4. Determination of Ph of different foods using Ph meter.
5. Study quality characteristics of foods preserved by drying/dehydration/ freezing.
6. To perform pasteurization of fluids using different methods.
7. To perform blanching of different plant foods.

Book for Study:

1. Srilakshmi, Food science, New Age Publishers,2002

Books for Reference:

1. Niesen. S.S (ed). Food analysis laboratory Manual.
2. Meyer, Food Chemistry, New Age,2004
3. Bawa. A.S, O.P Chauhan etal. Food Science. New India Publishing agency, 2013
4. Frazier WC and Westhoff DC, Food Microbiology, TMH Publication, New Delhi, 2004

Web References:

http:ncert.nic.in/textbook/pdf/lehel05.pdf

COURSE OUTCOMES		**K Level**
On successful completion of the course, the students will be able to,		
CO1:	Exhibit the Procedures used for Sampling.	**K1**
CO2:	Comparing the shelf life of different types of foods.	**K2**
CO3:	Find the various foods using Ph meter	**K2**
CO4:	Apply the learned procedures in industrial level.	**K3**
CO5:	Classify different blanching of different plant foods.	**K2**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	3	3	1	1
CO 2	2	3	2	2	1	2
CO 3	3	2	2	2	2	1
CO 4	3	2	1	2	2	1
CO5	2	2	2	3	1	1

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

S.NO	SUBJECT NAME	Hrs	Mode
1	Methods of Sampling.	3	Lab
2	Concept of shelf life of different foods	3	Lab
3	To study the concept of sterilization	3	Lab
4	Determination of pH of different foods using pH meter.	3	Lab
5	Study quality characteristics of foods preserved by drying/dehydration/ freezing.	4	Lab
6	To perform pasteurization of fluids using different methods.	4	Lab
7	To perform blanching of different plant foods.	4	Lab

Course Designed by: 1**. Mr. P.V. GOPIMANIVANNAN 2. Ms. M. RAGADEEPA**

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**FAST FOODS AND CATERING SERVICE**							
Course Code	**21UFDA21**					**L**	**P**	**C**
Category	**Allied**					**5**	**-**	**5**
Nature of course:	**EMPLOYABILITY**	✓	**SKILLORIENTED**	✓	**ENTREPRENEURSHIP**			✓

Course Objectives:

- To Study the Concepts of Fast Food.
- To analyze various methods of Continental cookery
- To Highlight the importance of Catering Industry
- To provide knowledge on Eating etiquettes
- To Gain ideas related to Front Office meaning and functions.

Unit: I	**Concepts of Fast Food**	**15**
Types- trends- general cooking methods of fast foods. Preparation of raw materials. Indian fast foods. South Indian and North Indian Vegetarian and non-vegetarian gravies. General Indian Flavourings. Kadai preparations and tawa preparation. Fried items.		
Unit: II	**Continental cookery**	**15**
cooking methods. Ingredients used. Continental fast foods – pizza-burgers-french fries – cutlets – bread preparations- pastas. Role of wine in continental cookery. Fast foods – Nutritional aspects.		
Unit: III	**Evolution of Catering Industry**	**15**
various types of catering establishments .Classification of hotels. Various functional departments. Functions of food and beverage service department. Organization structure. Types of service – water – budget etc.		
Unit: IV	**Eating etiquettes**	**15**
Star classification. Speciality restaurants. Other hospitality industry and career opportunities. Heritage hotels.		
Unit: V	**Front Office meaning and functions**	**15**
Front Office meaning and functions. Guest registration formalities. House keeping. Meaning and functions. Various cleaning procedures in a hotel.		
	Total Lecture Hours	**75 Hrs**

Books for Study:		
1. Thangam E. Philip 2010., Modern Cookery for Teaching and Trade, Volumes I and II.		
Books for References:		
1. Krishna Arora, Theory of Cookery, Frank Brothers and Company, New Delhi (2008). 2. Sudhir Andrews, Hotel House Keeping Manual, Tata McGraw Hill, New Delhi (2013).		
Web Resources:		
https://ncert.nic.in/textbook/pdf/lehe104.pdf		
COURSE OUTCOMES		**K Level**
On Successful Completion of Course the Student will able to,		
CO1:	Identify Concepts of Fast Foods.	**K1**
CO2:	Explain various Continental cookery	**K2**
CO3:	Apply various methods used in Catering Industry.	**K3**
CO4:	Analyze the different types Front Office.	**K4**
CO5:	Classify eating etiquettes.	**K3**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**2**	**2**	**3**	**1**	**2**	**1**
CO 2	**2**	**1**	**1**	**2**	**1**	**2**
CO 3	**2**	**2**	**2**	**1**	**2**	**1**
CO 4	**3**	**1**	**1**	**2**	**1**	**2**
CO 5	**3**	**3**	**2**	**1**	**1**	**1**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	**Concepts of Fast Food Types-** trends- general cooking methods of fast foods. Preparation of raw materials. Indian fast foods. South Indian and North Indian Vegetarian and non-vegetarian gravies. General Indian Flavourings. Kadai preparations and tawa preparation. Fried items.	**15**	**PPT, Chalk & Talk**
II	**Continental cookery** cooking methods. Ingredients used. Continental fast foods – pizza-burgers- french fries – cutlets – bread preparations- pastas. Role of wine in continental cookery. Fast foods – Nutritional aspects.	**15**	**Chalk & Talk, PPT**
III	**Evolution of Catering Industry** various types of catering establishments .Classification of hotels. Various functional departments. Functions of food and beverage service department. Organisation structure. Types of service – water – budget etc.	**15**	**Chalk & Talk, PPT, Assignment**
IV	**Eating etiquettes:** Star classification. Speciality restaurants. Other hospitality industry and career opportunities. Heritage hotels.	**15**	**Chalk & Talk**
V	**Front Office meaning and functions** Front Office meaning and functions. Guest registration formalities. House keeping. Meaning and functions. Various cleaning procedures in a hotel.	**15**	**Chalk & Talk, PPT**

Course Designed by: **Ms. M. RAGADEEPA & Ms .G. BHARATHI**

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	K Level	Section A MCQs		Section B Short Answers		Section C Either or Choice	Section D Open Choice
			No. of. Questions	K - Level	No. of. Questions	K - Level		
CI AI	CO1	K1	1	K1	1	K1	2(K1&K1)	1(K1)
	CO2	K2	1	K2	2	K2	2(K2&K2)	2(K2&K2)
CI AII	CO3	K3	1	K3	1	K3	2(K3&K3)	1(K3)
	CO4	K4	1	K4	2	K3	2(K4&K4)	2(K3&K4)
Question Pattern CIA I & II		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	20

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	1	1	-	-	2	3.33	41.66
	K2	1	2	10	10	23	38.33	
	K3	1	1	10	10	22	36.67	36.67
	K4	1	2	-	10	13	21.67	21.67
	Marks	4	6	20	30	60	100	100
CIA II	K1	1	1	-	-	2	3.33	41.66
	K2	1	2	10	10	23	38.33	
	K3	1	1	10	10	22	36.37	36.37
	K4	1	2	-	10	13	21.67	21.67
	Marks	4	6	20	30	60	100	100

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, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MOQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	**K1**	**2**	**K1&K2**	**1**	**K1**	**2(K1&K1)**	**1(K1)**
2	CO2	**K2**	**2**	**K1&K2**	**1**	**K1**	**2(K2&K2)**	**1(K2)**
3	CO3	**K3**	**2**	**K1&K2**	**1**	**K2**	**2(K3&K3)**	**1(K3)**
4	CO4	**K4**	**2**	**K1&K2**	**1**	**K2**	**2(K3&K3)**	**1(K4)**
5	CO5	**K4**	**2**	**K1&K2**	**1**	**K2**	**2(K4&K4)**	**1(K4)**
No. of Questions to be Asked			**10**		**5**		**10**	**5**
No.of Questions to be answered			**10**		**5**		**5**	**3**
Marks for each question			**2**		**2**		**5**	**10**
Total Marks for each section			**10**		**10**		**25**	**30**
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4	10		19	15.84	41.67
K2	5	6	10	10	31	25.83	
K3			20	20	40	33.33	33.33
K4			10	20	30	25	25
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q.No	**CO**	**K Level**	**Questions**
16) a	CO1	K1	
16) b	CO1	K1	
17) a	CO2	K2	
17) b	CO2	K2	
18) a	CO3	K2	
18) b	CO3	K2	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K4	
20) b	CO5	K4	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q.No	**CO**	**K Level**	**Questions**
21	CO1	K1	
22	CO2	K2	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**MARKET MILK**							
Course Code	**21UFDS21**					**L**	**P**	**C**
Category	**Skill**					**2**	**-**	**2**
Nature of course:	**EMPLOYABILITY**	✓	**SKILL ORIENTED**	✓	**ENTREPRENEURSHIP**			✓

Course Objectives:

- To enable them to learn about Market milk industry in India and abroad.
- To know about various treatment in dairy industry.
- To give knowledge on Thermal processing of milk.
- To apply processing methods in industry.
- To study the process of UHT.

Unit: I	**Market milk industry in India and abroad**	**6 hrs**

Market milk industry in India and abroad - Collection and transportation of milk - Organization of milk collection routes - Natural microbial inhibitors, lactoperoxidase system.

Unit: II	**Pre-processing steps**	**6 hrs**

Reception and treatment (pre-processing steps) of milk in the dairy plant - Reception, chilling, clarification, and storage - Definition, pretreatments, theories, synchronization of homogenizer with operation of pasteurizer (HTST)

Unit: III	**Thermal processing of milk**	**6 hrs**

Thermal processing of milk - Principles of thermal processing: kinetics of microbial destruction, thermal death curve - Definition and description of processes - Pasteurization, sterilization - Product control in market milk plant and distribution systems.

Unit: IV	**Manufacture of special milks**	**6 hrs**

Manufacture of special milks - toned, double toned, reconstituted, recombined, flavoured, homogenized, vitaminised and sweet acidophilus milk. . UHT processing of milk plants and shelf life.

Unit: V	**Modified Milk**	**6 hrs**

Humanized milk: Low fat milk – lactose free milk - Designer milk: definition –objectives- method of preparation – purpose – merits and demerits – nutritional value and therapeutic benefits.

	Total Lecture Hours	**30 Hrs**

Books for Study:

1. Text Book J. David, 2011, Technological advances in Market Milk, Kalyani- Publisher
2. Sukumar De,2019. Outlines of Dairy Technology, Oxford University Press, New Delhi.

Books for Reference:

1. Aneja.R.P, B.N Mathur, R.C Chandra and A.K. Banerjee, 2002. Technology of Indian Milk Products, Dairy India year book, A- 25 Priyadarshinivihar, Delhi 110092, India.
2. Dairy India year book, 2007. A- 25 Priyadarshinivihar, Delhi 110092, India.
3. Jagadish Prasad, 1992. Principles and Practices of Dairy Farm Management, Kalyani Publishers, Ludhiana.
4. Ramasamy. D., 1999. Dairy technologist hand book, International book distributing Co. Luknow.
5. Robinson, 1994. Modern Dairy Technology,Vol.I, Advances in Milk Processing

Web Resources:

1. Market Milk E course Book www.iaritoppers.com (ICAR)		
Course Outcomes		**K Level**
On Successful Completion of Course the Student will able to,		
CO1:	Understand the organization and functioning of milk procurement at farmer's level, private and government levels.	**K2**
CO2:	Explain the processing and marketing of milk.	**K2**
CO3:	Develop technical knowledge and skills.	**K3**
CO4:	Analyze the quality of milk	**K4**
CO5:	Examine the variation among marked milk products	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**3**	**2**	**2**	**2**	**2**	**2**
CO 2	**2**	**2**	**1**	**1**	**1**	**1**
CO 3	**3**	**3**	**2**	**2**	**2**	**2**
CO 4	**2**	**2**	**2**	**1**	**2**	**1**
CO 5	**2**	**1**	**1**	**1**	**1**	**1**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	**Market milk industry in India and abroad** : Market milk industry in India and abroad - Collection and transportation of milk - Organization of milk collection routes - Natural microbial inhibitors, lactoperoxidase system.	**6**	**PPT, Chalk & Talk**
II	**Pre-processing steps** : Reception and treatment (pre-processing steps) of milk in the dairy plant - Reception, chilling, and storage - Definition, pretreatments, theories, synchronization of homogenizer with operation of pasteurizer (HTST)	**6**	**Chalk & Talk, PPT**
III	**Thermal processing of milk** : Thermal processing of milk - Principles of thermal processing: kinetics of microbial destruction, thermal death curve - Definition and description of processes - Pasteurization, sterilization - Product control in market milk plant and distribution systems.	**6**	**Chalk & Talk, PPT, Assignment**
IV	**Modified Milk :** Manufacture of special milks - toned, double toned, flavoured, homogenized, vitaminised and sweet acidophilus milk. . UHT processing of milk plants and shelf life.	**6**	**Chalk & Talk**
V	**Modified Milk :** Humanized milk: Low fat milk – lactose free milk - Designer milk: definition –objectives- method of preparation – purpose – merits and demerits – nutritional value and therapeutic benefits.	**6**	**Chalk & Talk, PPT**

Course Designed by: **Mr. P.V. GOPIMANIVANNAN & Mr. N. SOWJANYAN**


THIRD SEMESTER

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**INTRODUCTION TO BIOCHEMISTRY**			
Course Code	**21UFDC31**	**L**	**P**	**C**
Category	**Core**	**5**	**-**	**5**

Nature of course:	**EMPLOYABILITY**	✓	**SKILL ORIENTED**	✓	ENTREPRENEURSHIP

Course Objectives:

- To understand basic cell functions and principle of Biochemistry
- To study energy transformation in living organisms
- To analyze the concept of metabolisms and catalysis
- To know role of small and large biomolecules
- To understand the transmission of genetic information

Unit: I	**Carbohydrates –Classification and Structures**	**15**

Carbohydrates- Definition, Classification – reducing and non-reducing sugars. Structures of glucose, fructose, lactose and maltose. Carbohydrates of the cell membrane – starch, cellulose and glycogen (Structure and utility). Metabolism: Glycolysis and Gluconeogenesis.

Unit: II	**Proteins – classification and Structures**	**15**

Amino acids – Essential and nonessential amino acids. Peptide bond- isoelectric point. Proteins – Definition, classification – primary, secondary, tertiary and quaternary structure. urea cycle and other possibilities of detoxification of ammonia

Unit: III	**Fatty acids – Classification and Properties**	**15**

Classification - neutral lipids, Phospholipids (lecithin's, cephalins, plasmalogens) importance. Fatty acids – saturated, unsaturated fatty acids, EFA, Fat metabolism. antioxidants. Addition reactions- Iodine value, Polenskenumber, Reichert- Meissel number, acetyl number. Hydrogenation

Unit: IV	**Enzymes and Coenzymes Classification**	**15**

Nomenclature, classification and properties-specificity, factors influencing enzyme action. Coenzymes – cofactors – prosthetic groups of enzymes (TPP, NAD, NADP, FAD, ATP). Their importance in enzyme action. Immobilization of enzymes. Enzyme specificity.

Unit: V	**DNA and RNA Classification and Biosynthesis**	**15**

Nucleosides and nucleotides – purine and pyrimidine bases. Nucleic acids Difference between DNA and RNA. Classification of RNA. Biosynthesis of DNA: Replication. Biosynthesis of mRNA: Transcription.

	Total Lecture Hours	**75Hrs**

Books for Study:

1. Sood, D. R., Kalim, S., & Sood, R. (2017). Studies on absorption of nutrients using intestinal sacs of rats fed on different diets. *Asian Journal of Dairy and Food Research*, *36*(2), 166-169.
2. Swaminathan, V., & Kaliappan, V. (2017). TE Shanmugam. *Eminent Indian Psychologists: 100 Years of Psychology in India*, 108.
3. Sathyanarayanan, A., Chandrasekaran, K. S., & Karunagaran, D. (2018). microRNA-145 downregulates SIP1-expression but differentially regulates proliferation, migration, invasion and Wnt signaling in SW480 and SW620 cells. *Journal of Cellular Biochemistry*, *119*(2), 2022-2035..

Books for References:

1. Nelson, D. L., Lehninger, A. L., & Cox, M. M. (2008). *Lehninger principles of biochemistry*. Macmillan
2. Sood, D. R., Kalim, S., & Sood, R. (2017). Studies on absorption of nutrients using intestinal sacs of rats fed on different diets. *Asian Journal of Dairy and Food Research*, *36*(2), 166-169.
3. Jayaraman, J., & Jayaraman, J. (1981). *Laboratory manual in biochemistry* (pp. 75-76). Delhi: Wiley Eastern.

Web Resources:

https://onlinecourses.nptel.ac.in/noc20_cy10/preview

Course Outcomes		**K Level**
On Successful Completion of Course, the student will be able to,		
CO1:	Understand the basic principle	**UptoK3**
CO2:	Identify the cell metabolism	**UptoK3**
CO3:	Analyze the concept of catalysis	**UptoK3**
CO4:	Apply the knowledge in gene transformation	**UptoK4**
CO5:	Discover ideas on energy pathways	**UptoK4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**3**	**1**	**2**	**2**	**1**	**3**
CO 2	**2**	**3**	**2**	**2**	**2**	**2**
CO 3	**3**	**2**	**3**	**3**	**1**	**3**
CO 4	**3**	**3**	**3**	**3**	**3**	**2**
CO 5	**3**	**2**	**3**	**3**	**2**	**2**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	**Carbohydrates –Classifications and Structures** Carbohydrates- Definition, Classification – reducing and non-reducing sugars. Structures of glucose, fructose, lactose and maltose. Carbohydrates of the cell membrane – starch, cellulose and glycogen (Structure and utility). Metabolism: Glycolysis and Gluconeogenesis.	15	Board & PPT
II	**Proteins – classification and Structures** Amino acids – Essential and nonessential amino acids. Peptide bond- isoelectric point. Proteins – Definition, classification – primary, secondary, tertiary and quaternary structure. urea cycle and other possibilities of detoxification of ammonia	15	Board & PPT
III	**Fatty acids – Classification and Properties** Classification - neutral lipids, Phospholipids (lecithin's, cephalins, plasmalogens) importance. Fatty acids – saturated, unsaturated fatty acids, EFA, Fat metabolism. antioxidants. Addition reactions-Iodine value, Polenske number, Reichert- Meissel number, acetyl number. Hydrogenation	15	Board & PPT
IV	**Enzymes and Coenzymes Classification** Nomenclature, classification and properties-specificity, factors influencing enzyme action. Coenzymes – cofactors – prosthetic groups of enzymes (TPP, NAD, NADP, FAD, ATP). Their importance in enzyme action. Immobilization of enzymes. Enzyme specificity.	15	Board & PPT
V	**DNA and RNA Classification and Biosynthesis** – Nucleosides and nucleotides- purine and pyrimidine bases. Nucleic acids Difference between DNA and RNA. Classification of RNA. Biosynthesis of DNA and RNA	15	

Course Designed by: **Ms. G. BHARATHI & Ms. M. RAGADEEPA**

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	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		
CI AI	CO1	UptoK3	2	K1	1	K2	2(K2&K2)	1(K2)
	CO2	UptoK4	2	K2	2	K2	2(K3&K3)	2(K3&K4)
CI AII	CO3	UptoK3	2	K1	1	K2	2(K2&K2)	1(K2)
	CO4	UptoK4	2	K2	2	K2	2(K3&K3)	2(K3&K4)
Question Pattern CIA I & II		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	20

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	-	-	-	2	3.33	50
	K2	2	6	10	10	28	46.67	
	K3	-	-	10	10	20	33.33	33
	K4	-	-	-	10	10	16.67	17
	Marks	4	6	20	30	60	100	100
CIA II	K1	2	-	-	-	2	3.33	50
	K2	2	6	10	10	28	46.67	
	K3	-	-	10	10	20	33.33	33
	K4	-	-	-	10	10	16.67	17
	Marks	4	6	20	30	60	100	100

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, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	UptoK3	1	K1-K2	1	K2	2(K3&K3)	1(K3)
2	CO2	UptoK3	1	K1-K2	1	K2	2(K2&K2)	1(K3)
3	CO3	UptoK3	1	K1-K2	1	K2	2(K3&K3)	1(K3)
4	CO4	UptoK4	1	K1-K2	1	K2	2(K2&K2)	1(K4)
5	CO5	UptoK4	1	K1-K2	1	K2	2(K3&K3)	1(K4)
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
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.16	33
K2	5	10	20	-	35	29.16	
K3	-		30	30	60	50	50
K4	-	-	-	20	20	16.67	17
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q.No	**CO**	**K Level**	**Questions**
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K2	
17) b	CO2	K2	
18) a	CO3	K2	
18) b	CO3	K2	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K4	
20) b	CO5	K4	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q.No	**CO**	**K Level**	**Questions**
21	CO1	K3	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**TECHNOLOGY OF FRUITS AND VEGETABLES**				
Course Code	**21UFDC32**		**L**	**P**	**C**
Category	**Core**		**2**	**-**	**2**
Nature of course:	**EMPLOYABILITY**	✓ SKILL ORIENTED	ENTREPRENEURSHIP		

Course Objectives:

- To know about the importance of fruits and vegetables and preservation
- To study about the processing of fruits and vegetables.
- To impart knowledge about the various products.
- To know about the technology of fruits and vegetables.
- To Gain ideas related to different types of food.

Unit: I	**Introduction of fruits and vegetables**	**15**

Importance of fruits and vegetables, history and need of preservation, reasons of spoilage, method of preservation (short& long term). General methods of preservation of whole fruits\vegetables and processed fruits and vegetables. Principles of preservation, Types of preservation commonly used in fruits and vegetables processing industry.

Unit: II	**Canning of fruits and vegetables**	**15**

Canning- Selection of fruits and vegetables, process of canning, factors affecting the process- time and temperature, containers of packaging, syrups and brines for canning, spoilage in canned foods. Types of canning- pressure canning & water bath canning, common causes of spoilage in canning of foods

Unit: III	**Fruit beverages**	**15**

Introduction, processing of fruit juices (selection, juice extraction, deaeration, straining, filtration, and clarification), preservation of fruit juices (pasteurization, chemically preserved with sugars, freezing, drying, tetra-packing, carbonation), processing of squashes, cordials, nectars, concentrates and powder.

Unit: IV	**Jams, Jellies, And Marmalades**	**15**

Introduction, Jams: Constituents, selection of fruits, processing & technology, Jelly: Essential constituents (Role of Pectin, ratio), Theory of jelly formation, processing & technology, defects in jelly, marmalade: types, processing & technology, defects.

Unit: V	**Pickles & Tomato products**	**15**

Pickles- processing, types, causes of spoilage in pickling, Problems relating to the shelf life of pickles Tomato products- selection of tomatoes, pulping& processing of tomato juice, tomato puree, paste, ketchup, sauce, soup, and chutney. Fermented fruits and vegetables like sauerkraut, pickles, and wines.

	Total Lecture Hours	**75 Hrs**

Books for Study:

1. Srilakshmi, M., Food science, New Age International (P) Ltd., Publishers2010.

Books for References:

1. Lal, G., & Siddappa, G. S. (1959). *Preservation of fruits and vegetables* (No. 664.828 L35).
2. W B crusses.2004. Commercial Unit and Vegetable products, W.V. Special Indian Edition,

Pub: Agrobios India.
3. Manay S and Swamy S, Food Facts and Principles, New Age International (P) Ltd Publishers, New Delhi,2001.

Web Resources:

http://lib.rudn.ru/file/Food_Science_Nutrition_Catalogue_ebook.pdf

Course Outcomes		**K Level**
On Successful Completion of Course, the student will be able to,		
CO1:	Identify the science behind the food products.	**UptoK3**
CO2:	Explain various methods of food preservation	**UptoK3**
CO3:	Apply various methods of preparation of food products.	**UptoK3**
CO4:	Analyze the role of difference foods in processing.	**UptoK4**
CO5:	Discover various new food products.	**UptoK4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**3**	**2**	**1**	**3**	**1**	**2**
CO 2	**3**	**2**	**1**	**3**	**2**	**3**
CO 3	**3**	**3**	**2**	**2**	**1**	**2**
CO 4	**3**	**3**	**2**	**3**	**1**	**2**
CO 5	**3**	**3**	**2**	**3**	**1**	**2**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	**Introduction of fruits and vegetables -**Importance of fruits and vegetables, history and need of preservation, reasons of spoilage, method of preservation (short& long term). General methods of preservation of whole fruits\vegetables and processed fruits and vegetables. Types of preservation commonly used in fruits and vegetables processing industry.	**15**	**PPT, Chalk &Talk**
II	**Canning of fruits and vegetables** -Canning- Selection of fruits and vegetables, process of canning, factors affecting the process- time and temperature, containers of packaging, syrups and brines for canning, spoilage in canned foods. Types of canning- pressure canning & water bath canning, common causes of spoilage in canning of foods.	**15**	**Chalk & Talk,PPT**
III	**Fruit beverages-**Introduction, processing of fruit juices (selection, juice extraction, deaeration, straining, filtration, and clarification), preservation of fruit juices (pasteurization, chemically preserved with sugars, freezing, drying, tetra-packing, carbonation), processing of squashes, cordials, nectars, concentrates and powder.	**15**	**Chalk & Talk, PPT, Assignment**
IV	**Jams, Jellies, And Marmalades**- Introduction, Jams: Constituents, selection of fruits, processing & technology, Jelly: Essential constituents (Role of Pectin, ratio), Theory of jelly formation, processing & technology, defects in jelly, marmalade: types, processing & technology, defects.	**15**	**Chalk & Talk**
V	**Pickles & Tomato products** -Pickles- processing, types, causes of spoilage in pickling, Problems relating to the shelf life of pickles Tomato products- selection of tomatoes, pulping& processing of tomato juice, tomato puree, paste, ketchup, sauce, soup, and chutney. Fermented fruits and vegetables like sauerkraut, pickles, and wines	**15**	**Chalk & Talk,PPT**

Course Designed by: **G. SUBRA JANANI & M. RAGADEEPA**

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	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		
CI AI	CO1	UptoK3	2	K1	1	K2	2(K2&K2)	1(K2)
	CO2	UptoK4	2	K2	2	K2	2(K3&K3)	2(K3&K4)
CI AII	CO3	UptoK3	2	K1	1	K2	2(K2&K2)	1(K2)
	CO4	UptoK4	2	K2	2	K2	2(K3&K3)	2(K3&K4)
Question Pattern CIA I & II		No. of Questions to be asked		4		3		4
		No. of Questions to be answered		4		3		2
		Marks for each question		1		2		5
		Total Marks for each section		4		6		10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	-	-	-	2	3.33	50
	K2	2	6	10	10	28	46.67	
	K3	-	-	10	10	20	33.33	33
	K4	-	-	-	10	10	16.67	17
	Marks	4	6	20	30	60	100	100
CIA II	K1	2	-	-	-	2	3.33	50
	K2	2	6	10	10	28	46.67	
	K3	-	-	10	10	20	33.33	33
	K4	-	-	-	10	10	16.67	17
	Marks	4	6	20	30	60	100	100

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, analyzing, presentation and make inferences with evidences
CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	UptoK3	1	K1-K2	1	K2	2(K3&K3)	1(K3)
2	CO2	UptoK3	1	K1-K2	1	K2	2(K2&K2)	1(K3)
3	CO3	UptoK3	1	K1-K2	1	K2	2(K3&K3)	1(K3)
4	CO4	UptoK4	1	K1-K2	1	K2	2(K2&K2)	1(K4)
5	CO5	UptoK4	1	K1-K2	1	K2	2(K3&K3)	1(K4)
No. of Questions to be Asked			10		5		5	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
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.17	33
K2	5	10	20	-	35	29.16	
K3	-		30	30	60	50	50
K4	-	-	-	20	20	16.67	17
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q.No	**CO**	**K Level**	**Questions**
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K2	
17) b	CO2	K2	
18) a	CO3	K2	
18) b	CO3	K2	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K4	
20) b	CO5	K4	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q.No	**CO**	**K Level**	**Questions**
21	CO1	K3	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**TECHNLOGY OF FRUITS AND VEGETABLES-PRACTICAL**					
Course Code	**21UFDCP3**			**L**	**P**	**C**
Category	**Core-Practical**			**-**	**2**	**2**
Nature of course:	EMPLOYABILITY	**SKILL ORIENTED**	✓	ENTREPRENEURSHIP		

Course Objectives:

- To remember the processing and preparation of food products.
- To apply different methods of Preservation.
- To analyze skills in handling appliances in laboratories.
- To give training on different types of food technology.
- To create new recipes in different methods.

Course Content:

1. Preparation of lime, mango, and mixed vegetable pickles.
2. Preparation and evaluation of pectin products. Preparation of seasonally available fruits and vegetable preservation.
3. Preparation of Food fermentation.
4. To study the steps involved in sensory analysis.
5. Dehydration of fruits and vegetables.
6. Rehydration of fruits and vegetables.
7. Estimation of total soluble solids (TSS).
8. Estimation of pH and acidity of products.
9. Estimation of brix : acidity ratio.

Books for Study:

1. Srilakshmi, M., Food science, New Age International (P) Ltd., Publishers2010.

Books for References:

1. Potter, Norman N., and Joseph H. Hotchkiss. Food Science. Springer Science & Business Media, 2012.
2. Girdhar Lal, G. S. Siddappa, G. L. Tandon, "Preservation of Fruits and Vegetables", Indian Council of Agricultural Research, New Delhi.
3. Sethi, V., & Sethi, S. (2006). *Processing of fruits and vegetables for value addition*. Indus Publishing.

Web Resources:

http://154.68.126.6/library/Food%20Science%20books/batch1/The%20Food%20Chemistry%20Laboratory.pdf

Course Outcomes		**K Level**
On Successful Completion of Course the student will be able to,		
CO1:	Remember the processing and preparation of food products.	**UptoK3**
CO2:	Understand the technologies for preservation of fruits and vegetables.	**UptoK3**
CO3:	Apply different method of processing technologies.	**UptoK3**
CO4:	Analyze skills in handling appliances in laboratories.	**UptoK4**
CO5:	Examine the product quality with reference to standard specifications.	**UptoK4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	1	3	1	2
CO 2	3	2	2	1	1	3
CO 3	3	3	2	2	2	2
CO 4	1	1	2	3	1	1
CO 5	2	3	2	2	1	1

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
1	Preparation of lime, mango, and mixed vegetable pickles.	2	Laboratory
2	Preparation and evaluation of pectin products.	2	Laboratory
3	Preparation of seasonally available fruits and vegetable preservation.	2	Laboratory
4	Preparation of Food fermentation.	2	Laboratory
5	To study the steps involved in sensory analysis.	2	Laboratory
6	Dehydration of fruits and vegetables.	2	Laboratory
7	Rehydration of fruits and vegetables.	2	Laboratory
8	Estimation of total soluble solids (TSS).	2	Laboratory
9	Estimation of pH and acidity of products.	2	Laboratory
10	Estimation of brix : acidity ratio	2	Laboratory

Course Designed by: **G. SUBRA JANANI & M. RAGADEEPA**

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**FOOD PRODUCT DEVELOPMENT AND MARKETING**				
Course Code	**21UFDA31**		**L**	**P**	**C**
Category	**Allied**		**5**	**-**	**4**
Nature of course:	EMPLOYABILITY	SKILL ORIENTED	**ENTREPRENEURSHIP**		✓

Course Objectives:

- To Analyze the concept of development of a new product.
- To prepare new products based on special dietary requirements, functionality, convenience, and improvisation of existing traditional Indian foods.
- To enable them a good training skill in industry level.
- To understand the importance of Consumer Research, Finance and Communication.
- To Understand and know various aspects of food product development including Food Science and Technology.

Unit: I	**New Food Products development**	**15**

New Food Products development, Phases in Food Product Development. Definition, classification, characterization, factors in fluency new product development – social concerns, health concerns impact of technology and marketplace influence (Corporate, marketplace, technological and governmental influences).

Unit: II	**New Product Ideas**	**15**

Generation of New Product Ideas. Internal sources of ideas-census data, magazine, reward cards, surveys. Polling, membership list, seller/retailer and distributor, telephone, and mails. External sources of ideas –competitors, food conference/exhibition, tradeshows and research symposia, public libraries, trade literature, government publications. Market place analysis, SWOT analysis.

Unit: III	**Screening**	**15**

Screening and refining the screening procedure for the product-Objectives of screening. Sensory Evaluation. Shelf-life testing. Food standards needed to introduce new product.

Unit: IV	**Development Process**	**15**

Development Process -Market Sector perspective and market research, Recipe development and standardization, newer techniques adopted in product development.

Unit: V	**Test Marketing**	**15**

Test Marketing; Evaluating results and analyzing. Entrepreneurship: Plant location, investment, financing the product. Cost analysis and nutrient calculation.

	Total Lecture Hours	**75 Hrs**

Books for Study:

1. Fuller, Gordon W. *New food product development: from concept to marketplace*. CRC Press, 2016.
2. Smith, Jim, and Edward Charter, eds. "Functional food product development."(2011).
3. Vijaya Khader “Textbook of Food Science and Technology”, Indian Council of Agricultural Research,2013.

Books for References:

1. Jacqueline H. Beckley, M. Michele Foley Elizabeth J. Topp&_J. C. Huang

WitoonPrinyawiwatkul, Accelerating New Food Product Design and Development. Blackwell Publishing Company. IFT Press. USA,2007.

2. Howard R. Moskowitz, I. Sam Saguy& Tim Straus (2009). An Integrated Approach to New Food Product Development. Taylor and Francis Group, LLC.USA,2009.

3. Mary Earle and Richard Earle, Case studies in food product development Wood head Publishing Limited and CRC Press LLC.USA, 2008.

Web Resources:

https://nzifst.org.nz/resources/foodproductdevelopment/Chapter-3-1-2.htm

Course Outcomes		**K Level**
On Successful Completion of Course the student will be able to,		
CO1:	Understand the concept of new food product development.	**UptoK3**
CO2:	Explain various foods products and their uses.	**UptoK3**
CO3:	Apply various methods of product processing.	**UptoK3**
CO4:	Analyze the shelf life, packaging and test the product.	**UptoK4**
CO5:	Discover various convenience foods.	**UptoK4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**2**	**2**	**2**	**3**	**1**	**2**
CO 2	**2**	**2**	**2**	**3**	**1**	**3**
CO 3	**2**	**1**	**1**	**1**	**2**	**2**
CO 4	**3**	**2**	**2**	**3**	**2**	**2**
CO 5	**3**	**1**	**1**	**3**	**1**	**1**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	**New Food Products development:** New Food Products development, Phases in Food Product Development. Definition, classification, characterization, factors in fluency new product development – social concerns, health concerns impact of technology and marketplace influence (Corporate, marketplace, technological and governmental influences).	15	PPT, Chalk & Talk
II	**New Product Ideas:** Generation of New Product Ideas. Internal sources of ideas-census data, magazine, reward cards, surveys. Polling, membership list, seller/retailer and distributor, telephone, and mails. External sources of ideas –competitors, food conference/exhibition, tradeshows and research symposia, public libraries, trade literature, government publications. Market place analysis, SWOT analysis.	15	Chalk & Talk, PPT
III	**Screening:** Screening and refining the screening procedure for the product-Objectives of screening - Sensory Evaluation. Shelf-life testing. Food standards needed to introduce new product.	15	Chalk & Talk, PPT,
IV	**Development Process:** Development Process -Market Sector perspective and market research, Recipe development and standardization, newer techniques adopted in product development.	15	Chalk & Talk
V	**Test Marketing:** Test Marketing Evaluating results and analyzing. Entrepreneurship: Plant location, investment, financing the project. Cost analysis and nutrient calculation.	15	Chalk & Talk, PPT Assignment

Course Designed by: **Ms. M. RAGADEEPA & Ms. G. BHARATHI**

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	**Cos**	**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**		
CI AI	**CO1**	**UptoK3**	**2**	**K1**	**1**	**K2**	**2(K2&K2)**	**1(K2)**
	CO2	**UptoK4**	**2**	**K2**	**2**	**K2**	**2(K3&K3)**	**2(K3&K4)**
CI AII	**CO3**	**UptoK3**	**2**	**K1**	**1**	**K2**	**2(K2&K2)**	**1(K2)**
	CO4	**UptoK4**	**2**	**K2**	**2**	**K2**	**2(K3&K3)**	**2(K3&K4)**
Question Pattern CIA I & II		No. of Questions to be asked	No. of Questions to be asked	**4**		**3**		**4**
		No. of Questions to be answered	No. of Questions to be answered	**4**		**3**		**2**
		Marks for each question	Marks for each question	**1**		**2**		**5**
		Total Marks for each section	Total Marks for each section	**4**		**6**		**10**

Distribution of Marks with K Level CIA I & CIA II								
	K Level	**Section A (Multiple Choice Questions)**	**Section B (Short Answer Questions)**	**Section C (Either / Or Choice)**	**Section D (Open Choice)**	**Total Marks**	**% of (Marks without choice)**	**Consolidate of %**
CIA I	**K1**	**2**	**-**	**-**	**-**	**2**	**3.33**	**50**
	K2	**2**	**6**	**10**	**10**	**28**	**46.67**	
	K3	**-**	**-**	**10**	**10**	**20**	**33.33**	**33**
	K4	**-**	**-**	**-**	**10**	**10**	**16.67**	**17**
	Marks	**4**	**6**	**20**	**30**	**60**	**100**	**100**
CIA II	**K1**	**2**	**-**	**-**	**-**	**2**	**3.33**	**50**
	K2	**2**	**6**	**10**	**10**	**28**	**46.67**	
	K3	**-**	**-**	**10**	**10**	**20**	**33.33**	**33**
	K4	**-**	**-**	**-**	**10**	**10**	**16.67**	**17**
	Marks	**4**	**6**	**20**	**30**	**60**	**100**	**100**

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, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	UptoK3	1	K1-K2	1	K2	2(K3&K3)	1(K3)
2	CO2	UptoK3	1	K1-K2	1	K2	2(K2&K2)	1(K3)
3	CO3	UptoK3	1	K1-K2	1	K2	2(K3&K3)	1(K3)
4	CO4	UptoK4	1	K1-K2	1	K2	2(K2&K2)	1(K4)
5	CO5	UptoK4	1	K1-K2	1	K2	2(K3&K3)	1(K4)
No. of Questions to be Asked			10		5		5	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
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.16	33
K2	5	10	20	-	35	29.16	
K3	-		30	30	60	50	50
K4	-	-	-	20	20	16.67	17
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q.No	**CO**	**K Level**	**Questions**
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K2	
17) b	CO2	K2	
18) a	CO3	K2	
18) b	CO3	K2	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K4	
20) b	CO5	K4	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q.No	**CO**	**K Level**	**Questions**
21	CO1	K3	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**TRADITIONAL INDIAN DAIRY PRODUCTS – PRACTICAL**					
Course Code	**21UFDSP1**			**L**	**P**	**C**
Category	**Skill-Practical**			**-**	**2**	**2**
Nature of course:	EMPLOYABILITY	**SKILL ORIENTED**	✓	**ENTREPRENEURSHIP**		✓

Course Objectives:

- To describe the classifications of traditional dairy products.
- To discuss and demonstrate the various processing techniques of Traditional Dairy Products.
- To give training to develop the different products.
- To analyze and evaluate the sensory quality of the products.
- To build and develop the entrepreneurial skills.

Course Content:

1. Preparation of concentrated and partially desiccated product Khoa.

2. Preparation of Khoa based sweet Gulabjamun.

3. Preparation of heat and acid coagulated product Channa .

4. Preparation of Channa based sweet Rasogolla and Rasomalai.

5. Preparation of heat and acid coagulated product paneer.

6. Preparation of Fermented products Dahi and Misti Dahi.

7. Preparation of Fat Rich Products - Butter and Ghee.

8. Preparation of cereal based puddings Kheer and payasam.

9. Preparation of Refreshing beverage - Lassi.

10. Visit to Dairy Plant.

Books for Study:

1. M.Ranganadam , Dept. of Dairy Technology, Traditional Dairy Products, SVVU, Tirupati & Sathish Kumar M.H.Devraja H.C.& F.C.Garg, Dairy Technology Division, NDRI,Karnal

Books for References:

1. De, S. (1980). Outlines of dairy technology..
2.Jagdish Prasad, Dairy Products Manufacturing Technology, Edition :1ST 2020.Kalyani Publishers, ISBN:9788194735717,
3. R.P. Aneja, B.N. Mathur, R.C. Chandran, A.K.Banerjee, Technology of Indian Milk Products, A Dairy Indian Publication.

Web Resources:

www.AgriMoon.Com

Course Outcomes		K Level
On Successful Completion of Course the student will able to,		
CO1:	Remember the processing techniques of Traditional Dairy Products	UptoK2
CO2:	Understand the value of the products	UptoK2
CO3:	Apply different methods of Preparation	UptoK2
CO4:	Evaluate the Sensory quality of the prepared products	UptoK2
CO5:	Examine Cost Analysis	UptoK2

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	2	2	1	2	2	2
CO 2	2	1	1	3	1	1
CO 3	3	3	1	2	1	2
CO 4	1	3	1	2	1	2
CO 5	1	2	1	2	1	1

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
1	Preparation of concentrated and partially desiccated product Khoa.	2	Laboratory
2	Preparation of Khoa based sweet Gulabjamun.	2	Laboratory
3	Preparation of heat and acid coagulated product Channa .	2	Laboratory
4	Preparation of Channa based sweet Rasogolla and Rasomalai.	2	Laboratory
5	Preparation of heat and acid coagulated product paneer.	2	Laboratory
6	Preparation of Fermented products Dahi and Misti Dahi.	2	Laboratory
7	Preparation of Fat Rich Products - Butter and Ghee.	2	Laboratory
8	Preparation of cereal-based puddings Kheer and payasam.	2	Laboratory
9	Preparation of Refreshing beverage - Lassi.	2	Laboratory
10	Visit to Dairy plant.	2	Laboratory

Course Designed by: **G. MEENAKSHI & P.V GOPIMANIVANAN,**

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**NUTRITION FOR HEALTH AND FITNESS**			
Course Code	**21UFDN31**	**L**	**P**	**C**
Category	**Non- Major Elective**	**2**	**-**	**2**

Nature of course:	EMPLOYABILITY	**SKILL ORIENTED**	✓	ENTREPRENEURSHIP

Course Objectives:

- To understand the role of food and nutrients.
- To apply knowledge in the maintenance of health and disease processes.
- To analyze the concept of nutrition.
- To provide theoretical enlightenment about fitness for life.
- To develop skill around Nutrition for Health and Fitness.

Unit: I	**Introduction to Human Nutrition**	**15**

Definition, History, Recent Developments, Role of Nutrition in Maintaining Health, Classification of Nutrients. Health – Definition, Under nutrition, over nutrition, malnutrition

Unit: II	**Nutrients**	**15**

Definition, Classification, function - Macro nutrients - Carbohydrate, Protein and Fat - Functions, Deficiency, Sources.

Unit: III	**Vitamins**	**15**

Vitamins - Fat soluble – vitamin A, D, E, K, water soluble - B complex and vitamin C- Functions, Deficiency, Sources.

Unit: IV	**Minerals**	**15**

Minerals - Calcium, Phosphorus, Magnesium, Potassium, Iron, Zinc, Sodium, Iodine - Functions, Deficiency, Sources.

Unit: V	**Life cycles**	**15**

Nutritional requirements for - Anaemia, pregnancy, adolescence, lactating woman, Breast feeding.

	Total Lecture Hours	**75Hrs**

Books for Study:

1. Srilakshmi.B, Human Nutrition (For B.Sc Nursing Students) New Age International Publishers, New Delhi.
2. Swaminathan,M.Advanced Textbook on Food Science and Nutrition, Vol:2, Second edition, Reprinted, Bangalore Printing and publishing Co Inc, Bangalore,2003.

Books for References:

1. Allowances, R. D. (2009). Nutrient requirements and recommended dietary allowances for Indians. *National Institute of Nutrition, Indian Council of Medical Research*.
2. Philip, T. E. (2003). *Modern Cookery: For Teaching and the Trade*. Orient Blackswan.
3. Robinson.B, Lawler.C. H, M. R.; CheiToweth, W. L. and Garwick, A. E.: Normal and Therapeutic Nutrition. 17th Ed. Mac Millan Publishing Co. Bombay

Web Resources:

https://www.studocu.com/row/document/east-africa-institute-of-certified-studies/diploma-in-nutrition-and-dietetics/nutrition-notes/11011299

Course Outcomes		K Level
On Successful Completion of Course, the student will be able to,		
CO1:	Identify different kinds of disease conditions.	UptoK2
CO2:	Explain diet management for specific disease.	UptoK2
CO3:	Apply knowledge of nutrition in day today life.	UptoK2
CO4:	Analyze the concept of fitness.	UptoK2
CO5:	Examine the nutrients.	UptoK2

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	2	2	2	2	2	2
CO 2	2	3	2	3	2	2
CO 3	2	2	3	3	2	3
CO 4	3	3	3	2	3	3
CO 5	3	2	3	3	3	3

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	**Introduction to Human Nutrition:** Definition, History, Recent Developments, Role of Nutrition in Maintaining Health, Classification of Nutrients. Health – Definition, Under nutrition, over nutrition, malnutrition	15	Board
II	**Nutrients -** Definition, Classification, function - Macro nutrients - Carbohydrate, Protein and Fat - Functions, Deficiency, Sources.	15	PPT Slide Share
III	**Vitamins** - (Vitamins - Fat soluble – vitamin A, D, E, K, water soluble - B complex and vitamin C- Functions, Deficiency, Sources.	15	PPT, Slide Share
IV	**Minerals -** Minerals - Calcium, Phosphorus, Magnesium, Potassium, Iron, Zinc, Sodium, Iodine - Functions, Deficiency, Sources.	15	Board
V	**Life cycles -** Nutritional requirements for - Anaemia, pregnancy, adolescence, lactating woman, Breast feeding.	15	Board

Course Designed by: Ms. M. Ragadeepa & G. Subra Janani, Assistant Professor


FOURTH SEMESTER

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**TECHNOLOGY OF CEREALS, PULSES AND OILSEEDS**			
Course Code	**21UFDC41**	**L**	**P**	**C**
Category	**Core**	**5**	**-**	**4**

Nature of course:	**EMPLOYABILITY**	✓	SKILL ORIENTED	ENTREPRENEURSHIP

Course Objectives:

- To study various technologies involved in food.
- To analyze different kinds of processing in food technology.
- To make use of latest technologies in foods.
- To teach technology of milling of various cereals.
- To impart technical knowledge of pulses and oilseeds refining.

Unit: I	**Technology of rice and wheat**	**15**

Rice – Physicochemical properties, milling (mechanical & solvent extraction), parboiling, ageing of rice, utilization of by-products. Wheat – Types, milling, flour grade, flour treatments (bleaching, maturing), flour for various purposes, Products and By-products.

Unit: II	**Technology of other cereals and millets**	**15**

Traditional & commercial milling (dry &wet), Traditional millets . Corn – Milling (wet & dry), cornflakes, corn flour, Barley – Milling (pearl barley, barley flakes & flour), Oats – Milling (oatmeal, oat flour & oat flakes), malting – principles of malted foods, benefits of malted foods.

Unit: III	**Technology of pulses**	**15**

Milling of pulses, Dry milling, Wet milling, and Improved milling method. Pretreatment of pulses for milling, Factors affecting milling of pulses, Pulse based processed products.

Unit: IV	**Technology of legumes**	**15**

Soaking – Principles, Methods of socking -Sprouting, Puffing, Roasting and Parboiling of Legumes, Physical and Bio-chemical changes during these processes. Cooking quality of dhal – methods, factors affecting quality of dhal and cooking of dhal. Quick cooking dhal, Instant dhal. Soy processing Soya as a source of protein and oil; soya milk, soy protein Isolate, soya paneer, soya sauce; extrusion technology and production of textured vegetable proteins.

Unit: V	**Technology of oilseeds**	**15**

Introduction, Extraction of oil and refining, Sources of protein (defatted flour, protein concentrates and isolates), properties and uses, protein texturization, fibre spinning. Oil extraction Traditional Methods, New Technologies in oil seed processing, Oil modification process- hydrogenation, inter esterification and dry fractionation.

	Total Lecture Hours	**75 Hrs**

Books for Study:

1. Manay S and Swamy S, Food Facts and Principles, New Age International (P) LtdPublishers, New Delhi,2001.

Books for References:

1. Kent, N.L. 2003. Technology of Cereal, 5th Ed. PergamonPress.
2. Chakraverty, A. (1988). *Post harvest technology of cereals, pulses and oilseeds*. Oxford & IBH Publishing Company.
3. Marshall, Rice Science and Technology. 1994. Wadsworth Ed., Marcel Dekker,New

York.		
Web Resources:		
https://ccsuniversity.ac.in/bridge-library/pdf/FST-Paper-II%20Technology%20of%20cereals,%20pulses%20and%20oilseeds-%20II%20Semester.pdf		
Course Outcomes		**K Level**
On Successful Completion of Course the student will able to,		
CO1:	Identify the technologies used in various kinds of food.	**UptoK3**
CO2:	Explain the techniques of food processing.	**UptoK3**
CO3:	Apply various technological methods in food.	**UptoK3**
CO4:	Analyze different kinds of equipments involved in food technology.	**UptoK4**
CO5:	Discover new technologies for future development in food technology.	**UptoK4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**2**	**3**	**1**	**2**	**1**	**3**
CO 2	**3**	**1**	**1**	**2**	**1**	**3**
CO 3	**2**	**2**	**3**	**2**	**2**	**2**
CO 4	**2**	**2**	**1**	**2**	**1**	**1**
CO 5	**1**	**2**	**3**	**2**	**2**	**1**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	**Technology of rice and wheat :** Rice – Physicochemical properties, milling (mechanical & solvent extraction), parboiling, ageing of rice, utilization of by-products. Wheat – Types, milling, flour grade, flour treatments (bleaching, maturing), flour for various purposes, Products and By-products.	15	PPT, Chalk & Talk
II	**Technology of other cereals and millets:** Traditional & commercial milling (dry &wet), Traditional millets . Corn – Milling (wet & dry), cornflakes, corn flour, Barley – Milling (pearl barley, barley flakes & flour), Oats – Milling (oatmeal, oat flour & oat flakes), malting – principles of malted foods, benefits of malted foods.	15	PPT, Chalk & Talk
III	**Technology of pulses**: Milling of pulses, Dry milling, Wet milling, Improved milling method. Pretreatment of pulses for milling, Factors affecting milling of pulses, Pulse based processed products.	15	Chalk & Talk, PPT
IV	**Technology of legumes** : Soaking – Principles, Methods of socking -Sprouting, Puffing, Roasting and Parboiling of Legumes, Physical and Bio-chemical changes during these processes. Cooking quality of dhal – methods, factors affecting quality of dhal and cooking of dhal. Quick cooking dhal, Instant dhal. Soy processing Soya as a source of protein and oil; soya milk, soy protein Isolate, soya paneer, soya sauce; extrusion technology and production of textured vegetable proteins.	15	Chalk & Talk, PPT, Assignment
V	**Technology of oilseeds :** Introduction, Extraction of oil and refining, Sources of protein (defatted flour, protein concentrates and isolates), properties and uses, protein texturization, fibre spinning. Oil extraction Traditional Methods, New Technologies in oil seed processing, Oil modification process- hydrogenation, inter esterification and dry fractionation.	15	Chalk & Talk

Course Designed by: **Ms. M. RAGADEEPA & Ms. G. BHARATHI**

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	**Cos**	**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**		
CI AI	**CO1**	**UptoK3**	**2**	**K1**	**1**	**K2**	**2(K2&K2)**	**1(K2)**
	CO2	**UptoK4**	**2**	**K2**	**2**	**K2**	**2(K3&K3)**	**2(K3&K4)**
CI AII	**CO3**	**UptoK3**	**2**	**K1**	**1**	**K2**	**2(K2&K2)**	**1(K2)**
	CO4	**UptoK4**	**2**	**K2**	**2**	**K2**	**2(K3&K3)**	**2(K3&K4)**
Question Pattern CIA I & II		No. of Questions to be asked	No. of Questions to be asked	**4**		**3**		**4**
		No. of Questions to be answered	No. of Questions to be answered	**4**		**3**		**2**
		Marks for each question	Marks for each question	**1**		**2**		**5**
		Total Marks for each section	Total Marks for each section	**4**		**6**		**10**

Distribution of Marks with K Level CIA I & CIA II								
	K Level	**Section A (Multiple Choice Questions)**	**Section B (Short Answer Questions)**	**Section C (Either / Or Choice)**	**Section D (Open Choice)**	**Total Marks**	**% Of (Marks without choice)**	**Consolidate of %**
CIA I	**K1**	**2**	**-**	**-**	**-**	**2**	**3.33**	**50**
	K2	**2**	**6**	**10**	**10**	**28**	**46.66**	
	K3	**-**	**-**	**10**	**10**	**20**	**33.33**	**33**
	K4	**-**	**-**	**-**	**10**	**10**	**16.67**	**17**
	Marks	**4**	**6**	**20**	**30**	**60**	**100**	**100**
CIA II	**K1**	**2**	**-**	**-**	**-**	**2**	**3.33**	**50**
	K2	**2**	**6**	**10**	**10**	**28**	**46.66**	
	K3	**-**	**-**	**10**	**10**	**20**	**33.33**	**33**
	K4	**-**	**-**	**-**	**10**	**10**	**16.67**	**17**
	Marks	**4**	**6**	**20**	**30**	**60**	**100**	**100**

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, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blueprint Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	UptoK3	1	K1-K2	1	K2	2(K3&K3)	1(K3)
2	CO2	UptoK3	1	K1-K2	1	K2	2(K2&K2)	1(K3)
3	CO3	UptoK3	1	K1-K2	1	K2	2(K3&K3)	1(K3)
4	CO4	UptoK4	1	K1-K2	1	K2	2(K2&K2)	1(K4)
5	CO5	UptoK4	1	K1-K2	1	K2	2(K3&K3)	1(K4)
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
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% Of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.16	33
K2	5	10	20	-	35	29.16	
K3	-		30	30	60	50	50
K4	-	-	-	20	20	16.67	17
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q.No	**CO**	**K Level**	**Questions**
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K2	
17) b	CO2	K2	
18) a	CO3	K2	
18) b	CO3	K2	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K4	
20) b	CO5	K4	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q.No	**CO**	**K Level**	**Questions**
21	CO1	K3	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**FOOD AND INDUSTRIAL MICROBIOLOGY**			
Course Code	**21UFDC42**	**L**	**P**	**C**
Category	**Core**	**2**	**-**	**2**

Nature of course: EMPLOYABILITY ✓ | SKILL ORIENTED ✓ | ENTREPRENEURSHIP

Course Objectives:

- To understand History and Scope of Food Microbiology.
- To study the basic characters of various Microorganisms.
- To analyze importance of food spoilage microorganisms
- To obtain basic knowledge in fermentation process and application of microorganisms in fermentation process
- To learn the Industrial application of Isolation, Screening Techniques and Strain Development**.**

Unit: I	**Introduction, incidence and growth factors**	**15**

Introduction, incidence and growth factors -Scope of microbiology, History and Classification, Characterization and Identification of microorganisms, Microbes in Air, water and soil, Factors affecting the growth of microbes in food, control and its destruction – Physical and chemical methods.

Unit: II	**Microbiology of cereals and cereal products**	**15**

Microbiology of cereals and cereal products – Cereal grains, flour, Bakery products – Bread, cakes.

Unit: III	**Microbiology of animal foods**	**15**

Microbiology of milk, egg, poultry, Meat, fish and canned foods – Contamination, spoilage and preservation.

Unit: IV	**Food Fermentation**	**15**

Food fermentation – Definition, principles, steps, microbial cultures used in food industry, fermented dairy products, food chemicals derived from fermentation – amino acid, enzymes, lactic acid, citric and vinegar.

Unit: V	**Downstream Processing**	**15**

Downstream Processing – Cell disruption – physical and chemical methods. Separation – precipitation, filtration, centrifugation, solid Liquid extraction, Liquid – liquid extraction, chromatography, solvent extraction, drying and crystallization.

	Total Lecture Hours	**75 Hrs**

Books for Study:

1. Adams M. R and Moss M. O, Food Microbiology, New Age International (P) Ltd., New Delhi, 2005.
2. Frazier C and Denis, W.C, Food Microbiology, 4th edition, Tata McGraw Hill publishing Company. New Delhi,2006.
3. Vijaya Ramesh, K. Food Microbiology, MJP Publishers, Chennai ,2007

Books for References:

1. Jay, J. M., Loessner, M. J., & Golden, D. A. (2008). *Modern food microbiology*. Springer Science & Business Media.
2. Parija SC, 2012, Textbook of Microbiology & Immunology, 2nd Edition, Elsevier India.
3. AnandanarayananR and Panicker CK, 2009, Textbook of Microbiology, Seventh edition, University Press, Hyderabad.

Web Resources:

https://www.studocu.com/row/document/jagannath-university/food-microbiology/food-microbiology-lecture-notes-1/3561336
https://run.edu.ng/directory/oermedia/11934434415399.pdf

Course Outcomes		**K Level**
CO1:	Understand History and Scope of Food Microbiology.	**UptoK3**
CO2:	Identify the basic characters of various Microorganisms.	**UptoK3**
CO3:	Analyze importance of food spoilage microorganisms	**UptoK3**
CO4:	Apply the process of fermentation and application of microorganisms in fermentation process	**UptoK4**
CO5:	Examine Isolation, Screening Techniques and Strain Development.	**UptoK4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	3	2	2	3
CO 2	3	2	2	3	1	2
CO 3	3	2	3	3	1	3
CO 4	3	3	3	3	1	2
CO 5	2	1	1	2	1	2

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	**Introduction, incidence and growth factors** -Scope of microbiology, History and Classification, Characterization and Identification of microorganisms, Microbes in Air, water and soil, Factors affecting the growth of microbes in food, control and its destruction – Physical and chemical methods.	15	Board
II	Microbiology of cereals and cereal products – Cereal grains, flour, Bakery products – Bread, cakes.	15	PPT Slide Share
III	**Microbiology of animal foods** Microbiology of milk, egg, poultry, Meat, fish and canned foods – Contamination, spoilage and preservation.	15	PPT Slide Share
IV	**Food fermentation –** Food fermentation – Definition, principles, steps, microbial cultures used in food industry, fermented dairy products, food chemicals derived from fermentation – amino acid, enzymes, lactic acid, citric and vinegar.	15	Board
V	**Downstream Processing** – Downstream Processing – Cell disruption – physical and chemical methods. Separation – precipitation, filtration, centrifugation, solid Liquid extraction, Liquid – liquid extraction, chromatography, solvent extraction, drying and crystallization.	15	Board

Course Designed by: P V Gopimanivanan, G. Meenakshi

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	**Cos**	**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**		
CI AI	**CO1**	**UptoK3**	**2**	**K1**	**1**	**K2**	**2(K2&K2)**	**1(K2)**
	CO2	**UptoK4**	**2**	**K2**	**2**	**K2**	**2(K3&K3)**	**2(K3&K4)**
CI AII	**CO3**	**UptoK3**	**2**	**K1**	**1**	**K2**	**2(K2&K2)**	**1(K2)**
	CO4	**UptoK4**	**2**	**K2**	**2**	**K2**	**2(K3&K3)**	**2(K3&K4)**
Question Pattern CIA I & II		No. of Questions to be asked		**4**		**3**		**4**
		No. of Questions to be answered		**4**		**3**		**2**
		Marks for each question		**1**		**2**		**5**
		Total Marks for each section		**4**		**6**		**10**

Distribution of Marks with K Level CIA I & CIA II								
	K Level	**Section A (Multiple Choice Questions)**	**Section B (Short Answer Questions)**	**Section C (Either / Or Choice)**	**Section D (Open Choice)**	**Total Marks**	**% of (Marks without choice)**	**Consolidate of %**
CIA I	**K1**	**2**	**-**	**-**	**-**	**2**	**3.33**	**50**
	K2	**2**	**6**	**10**	**10**	**28**	**46.66**	
	K3	**-**	**-**	**10**	**10**	**20**	**33.33**	**33**
	K4	**-**	**-**	**-**	**10**	**10**	**16.67**	**17**
	Marks	**4**	**6**	**20**	**30**	**60**	**100**	**100**
CIA II	**K1**	**2**	**-**	**-**	**-**	**2**	**3.33**	**50**
	K2	**2**	**6**	**10**	**10**	**28**	**46.66**	
	K3	**-**	**-**	**10**	**10**	**20**	**33.33**	**33**
	K4	**-**	**-**	**-**	**10**	**10**	**16.67**	**17**
	Marks	**4**	**6**	**20**	**30**	**60**	**100**	**100**

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, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	UptoK3	1	K1-K2	1	K2	2(K3&K3)	1(K3)
2	CO2	UptoK3	1	K1-K2	1	K2	2(K2&K2)	1(K3)
3	CO3	UptoK3	1	K1-K2	1	K2	2(K3&K3)	1(K3)
4	CO4	UptoK4	1	K1-K2	1	K2	2(K2&K2)	1(K4)
5	CO5	UptoK4	1	K1-K2	1	K2	2(K3&K3)	1(K4)
No. of Questions to be Asked			10		5		5	5
No.of Questions to be answered			10		5		5	3
Marks for each question			2		2		2	10
Total Marks for each section			10		10		10	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.16	33
K2	5	10	20	-	35	29.16	
K3	-		30	30	60	50	50
K4	-	-	-	20	20	16.67	17
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q.No	**CO**	**K Level**	**Questions**
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K2	
17) b	CO2	K2	
18) a	CO3	K2	
18) b	CO3	K2	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K4	
20) b	CO5	K4	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q.No	**CO**	**K Level**	**Questions**
21	CO1	K3	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**FOOD AND INDUSTRIAL MICROBIOLOGY- PRACTICALS**							
Course Code	**21UFDCP4**					**L**	**P**	**C**
Category	**Core-Practical**					**-**	**2**	**2**
Nature of course:	**EMPLOYABILITY**	✓	**SKILL ORIENTED**	✓	ENTREPRENEURSHIP			

Course Objectives:

- To enable students to operate all equipments in the food microbiology laboratory effectively.
- To analyze the isolation characteristics of microorganisms associated with different food products.
- To obtain knowledge in preparation of various Isolation media.
- To understand the principle of various Staining techniques.
- To equip students in identification and enumeration of microorganisms.

Course Content:

1. General care and maintenance of laboratory instruments.
2. Cleaning, Sanitization and sterilization of apparatus and equipments.
3. Preparation of Nutrient Agar Media.
4. Preparation of PDA media.
5. Preparation and use of Agar plates and slants.
6. Microscopic view of Microorganisms.
7. Simple Staining
8. Gram's Staining techniques.
9. MBRT – Methylene Blue Reduction Time Test.
10. Standard Plate Count Method by using milk samples.

Books for Study:

1. Frazier William. C and Westhoff, Dennis C. 2005.
2. Food Microbiology 6th Edition. TMH, New Delhi.
3. Patel, A. H. 2012. Industrial Microbiology, Macmillan India Ltd, New Delhi.

Books for References:

1. Jay, J. M., Loessner, M. J., & Golden, D. A. (2008). *Modern food microbiology*. Springer Science & Business Media..
2. Casida, L.E., 1991. Industrial microbiology, Fifth edition, Wiley Eastern Ltd, New Delhi.
3. Prescott. L.M, Reed G. Dunn (2004). Industrial microbiology, 4th Edition, CBS Publishers & Distributors, New Delhi

Web Resources:

https://run.edu.ng/directory/oermedia/11934434415399.pdf

Course Outcomes		**K Level**
On Successful Completion of Course the student will able to,		
CO1:	Identify various Staining techniques.	**UptoK3**
CO2:	Enable to isolate and characterize microorganisms associated with different food products.	**UptoK3**
CO3:	Understand basic knowledge to operate overall equipment in food microbiology laboratory.	**UptoK3**

CO4:	Apply knowledge in preparation of various Isolation medium.	**UptoK4**
CO5:	Examine different kinds of microorganisms.	**UptoK4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**2**	**2**	**1**	**2**	**1**	**2**
CO 2	**2**	**1**	**1**	**3**	**1**	**2**
CO 3	**3**	**3**	**1**	**2**	**1**	**2**
CO 4	**1**	**3**	**2**	**1**	**1**	**2**
CO 5	**1**	**2**	**1**	**2**	**1**	**2**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
1	General care and maintenance of laboratory instruments	**2**	**Laboratory**
2	Cleaning, Sanitization and sterilization of apparatus and equipment's	**2**	**Laboratory**
3	Preparation of Nutrient Agar Media.	**2**	**Laboratory**
4	Preparation of PDA media.	**2**	**Laboratory**
5	Preparation and use of Agar plates and slants.	**2**	**Laboratory**
6	Microscopic view of Microorganisms.	**2**	**Laboratory**
7	Simple Staining	**2**	**Laboratory**
8	Gram's Staining techniques.	**2**	**Laboratory**
9	MBRT – Methylene Blue Reduction Time Test.	**2**	**Laboratory**
10	Standard Plate Count Method by using milk samples.	**2**	**Laboratory**

Course Designed by: **P V Gopimanivannan, & G. Meenakshi**

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**BAKERY AND CONFECTIONARY - PRACTICAL**				
Course Code	**21UFDAP1**	**L**	**P**	**C**	
Category	**Allied – Practical**	**-**	**5**	**4**	
Nature of course:	**EMPLOYABILITY**	✓	SKILL ORIENTED	ENTREPRENEURSHIP	

Course Objectives:

- To Understand the basic principles involved in Bakery
- To Apply different methods of making Bakery products.
- To Analyze the basic techniques in processing of Confectionary Products
- To estimate the product quality
- To develop new Bakery and Confectionary products

Course Content:

1. Bread varieties
2. Muffins
3. Pizza
4. Croissant
5. Danish pastry
6. Biscuits (any two varieties)
7. Doughnuts
8. Brownies
9. Cream horns
10. Bakery unit visit

Books for Study:

1. Philip, T. E. (2003). *Modern Cookery: For Teaching and the Trade*. Orient Blackswan

Books for References:

1. Piper Davis and Ellen Jackson, The Grand Central Baking Book: Breakfast Pastries, Cookies,Pies, and Satisfying Savories from the Pacific Northwest's Celebrated Bakery, Ten Speed Press, 2009.

Web Resources:

https://vandemoortele.com/sites/default/files/2018-06/BakeryProductsCatalogueExport2018-2019_0.pdf

Course Outcomes		**K Level**
On Successful Completion of Course the student will able to,		
CO1:	Remember the processing and preparation of Bakery products	**UptoK3**
CO2:	Understand the technologies on Bakery and confectionery	**UptoK3**
CO3:	Apply different method of processing technologies	**UptoK3**
CO4:	Analyze skills in handling appliances in laboratories.	**UptoK4**
CO5:	Examine the new product quality	**UptoK4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	2	3	1	3	1	3
CO 2	2	2	1	3	1	3
CO 3	3	3	1	2	2	2
CO 4	1	3	3	1	1	1
CO 5	1	1	1	1	1	1

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
1	Bread varieties	2	Lab
2	Muffins	2	Lab
3	Pizza	2	Lab
4	Croissant	2	Lab
5	Danish pastry	2	Lab
6	Biscuits (any two varieties)	2	Lab
7	Doughnuts	2	Lab
8	Brownies	2	Lab
9	Cream horns	2	Lab
10	Bakery unit visit	2	Lab

Course Designed by: **Ms. G. BHARATHI & Ms. M. RAGADEEPA**

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**FERMENTED DAIRY PRODUCTS-PRACTICAL**			
Course Code	**21UFDSP2**	**L**	**P**	**C**
Category	**Skill-Practical**	**-**	**2**	**2**

Nature of course:	EMPLOYABILITY	**SKILL ORIENTED**	✓	**ENTREPRENEURSHIP**	✓

Course Objectives:

- To describe the importance of milk composition and microbiology of fermented dairy products.
- To discuss the basic knowledge required to produce a selected variety of fermented dairy products.
- Experiment with the starter organisms, their metabolism and genetics; different types of starters, propagation, preservation and applications of starters.
- To examine the knowledge about fermentation techniques used in dairy industry.
- To role of microorganisms in fermentation and to gain skills to control fermentation process.

Course Content:

1. Preparation of curd
2. Preparation of LASSI
3. Preparation of Butter milk
4. Preparation of Yoghurt
5. Preparation of Acidophilus milk
6. Preparation of fermented Whey drink
7. Preparation of Kefir
8. Preparation of Kumiss
9. Preparation of Cheese
10. Visit to Dairy Industry

Books for Study:

1. M.Ranganadam , Dept. of Dairy Technology, Traditional Dairy Products, SVVU, Tirupati & Sathish Kumar M.H.Devraja H.C.& F.C.Garg, Dairy Technology Division, NDRI,Karnal

Books for References:

1. De, S. (1980). Outlines of dairy technology.
2. Jagdish Prasad, Dairy Products Manufacturing Technology, Edition :(1ST 2020). Kalyani Publishers, ISBN:9788194735717,
3. R.P. Aneja, B.N. Mathur, R.C. Chandran, A.K.Banerjee, Technology of Indian Milk Products, A Dairy Indian Publication.

Web Resources:

www.AgriMoon.Com

Course Outcomes	**K Level**
On Successful Completion of Course the student will able to,	

CO1:	Remember the processing and preparation of food products.	**UptoK3**
CO2:	Understand the technologies for preservation of fruits and vegetables.	**UptoK3**
CO3:	Apply different method of processing technologies.	**UptoK3**
CO4:	Analyze skills in handling appliances in laboratories.	**UptoK4**
CO5:	Discover the product quality with reference to standard specifications.	**UptoK4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**2**	**2**	**1**	**2**	**1**	**2**
CO 2	**2**	**1**	**1**	**2**	**1**	**1**
CO 3	**3**	**3**	**1**	**2**	**1**	**3**
CO 4	**1**	**3**	**2**	**1**	**1**	**2**
CO 5	**1**	**2**	**1**	**2**	**1**	**2**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
1	Preparation of curd	**2**	**Laboratory**
2	Preparation of LASSI	**2**	**Laboratory**
3	Preparation of Butter milk	**2**	**Laboratory**
4	Preparation of Yoghurt	**2**	**Laboratory**
5	Preparation of Acidophilus milk	**2**	**Laboratory**
6	Preparation of fermented Whey drink	**2**	**Laboratory**
7	Preparation of Kefir	**2**	**Laboratory**
8	Preparation of Kumiss	**2**	**Laboratory**
9	Preparation of Cheese	**2**	**Laboratory**
10	Visit to a Dairy Industry	**2**	**Laboratory**

Course Designed by: **P V GOPIMANIVANAN & G. MEENAKSHI**

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**DAIRY BUSINESS MANAGEMENT**							
Course Code	**21UFDN41**					**L**	**P**	**C**
Category	**NON- MAJOR ELECTIVE**					**2**	**-**	**2**
Nature of course:	EMPLOYABILITY	**SKILL ORIENTED**	✓	**ENTREPRENEURSHIP**	✓			

Course Objectives:

- To learn the methods and tools necessary to manage a dairy business.
- To show and summarize the important breeds of cattle.
- To develop the career potential in agribusiness.
- To analyze and correlate dairy marketing and retailing
- To organize them in strategic thinking, communications, and leadership.

Unit: I	**Dairying in India and Abroad**	**15**

Dairy Development in India –Market milk in India and abroad – Dairy Co-operative Movement in India- The Three Tier Amul M
odel –Operation Flood Programs

Unit: II	**Dairy Farming and Management**	**15**

Meaning-Important breeds of cattle and Buffalo-Feeds and Fodder Development-Forage Crops-Milk Procurement and chilling centre Management.

Unit: III	**Dairy Processing and Plant Management**	**15**

Milk - Types of Milk (Standardized Milk, Full cream Milk, Toned Milk and Double Toned Milk) - Processing and Packaging of milk- Personal Management -Plant Management - Effluent Treatment Plant Management.

Unit: IV	**Dairy Marketing and Retailing**	**15**

Distribution and Dealership of Milk - Retailing packaged milk - Transportation and cooled chain of milk - Retailing through automatic vending machines.

Unit: V	**Entrepreneur Development schemes**	**15**

National Programme for Dairy Development (NPDD) - National Dairy Plan - Dairy Entrepreneurship Development Scheme (DEDS) - Dairy Processing and Infrastructure Development Fund (DIDF) - NABARD Schemes – State and Central Government Schemes.

	Total Lecture Hours	**75 Hrs**

Books for Study:

1. P.Venkateshwara Rao , 2008, Dairy Farm Business Management, Published by Biotech Books, ISBN 10: 8176221953/ ISBN 13: 9788176221955

Books for References:

1. R. M. Acharya, Puneet Kumar, 2013, Dairy Production and Business Management, ISBN: 9789381226544.

2. Prafullakumar V. Patil, Matsyagandha K. Patil , Milk Production Management, November 2, 2020,ISBN 9780367627379, Published by CRC Press.

Web Resources:

http://ecoursesonline.iasri.res.in/mod/page/view.php?id=65013
https://www.coursera.org/learn/dairy-production
https://www.fao.org/3/X6511E/X6511E07.htm

https://www.fao.org/3/X6511E/X6511E08.htm		
Course Outcomes		**K Level**
On Successful Completion of Course the student will able to,		
CO1:	Learn the necessary skills and hands-on-experience to manage successful dairy business.	**UptoK3**
CO2:	Get outline to start a Dairy farm	**UptoK3**
CO3:	Acquire knowledge and technique to expose their potentials	**UptoK3**
CO4:	Discover the basic dairy business related activities	**UptoK4**
CO5:	Discover entrepreneurship development in dairy processing and management of dairy business	**UptoK4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**2**	**2**	**3**	**3**	**2**	**2**
CO 2	**2**	**3**	**2**	**2**	**3**	**3**
CO 3	**3**	**2**	**3**	**3**	**3**	**3**
CO 4	**2**	**3**	**3**	**3**	**2**	**3**
CO 5	**3**	**2**	**3**	**2**	**2**	**3**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	**Dairying in India and Abroad:** Dairy Development in India - Market Milk in India and abroad-Dairy Co-operative Movement in India-The Three Tier Amul Model-Operation Flood Programs.	**15**	**Chalk & Talk**
II	**Dairy Farming and Management** Meaning-Important breeds of cattle and Buffalo-Feeds and Fodder Development-Forage Crops-Milk Procurement and chilling centre Management.	**15**	**PPT Slide Share**
III	**Dairy Processing and Plant Management:** Milk - Types of Milk (Standardized Milk, Full cream Milk, Toned Milk and Double Toned Milk) - Processing and Packaging of milk-Personal Management -Plant Management - Effluent Treatment Plant Management.	**15**	**PPT Slide Share**
IV	**Dairy Marketing and Retailing:** Distribution and Dealership of Milk - Retailing packaged milk - Transportation and cooled chain of milk - Retailing through automatic vending machines.	**15**	**Chalk & Talk PPT**
V	**Entrepreneur Development Schemes:** National Programme for Dairy Development (NPDD) - National Dairy Plan - Dairy Entrepreneurship Development Scheme (DEDS) - Dairy Processing and Infrastructure Development Fund (DIDF) - NABARD Schemes – State and Central Government Schemes.	**15**	**Chalk & Talk**

Course Designed by: **G.MEENAKSHI & P.V GOPIMANIVANNAN**


FIFTH SEMESTER

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**FOOD ENGINEERING**							
Course Code	**21UFDC51**					**L**	**P**	**C**
Category	**Core**					6	-	4
Nature of course:	**EMPLOYABILITY**	✓	SKILL ORIENTED		ENTREPRENURSHIP			

Course Objectives:

- To study the transport processes
- To analyze unit operations in food processing as demonstrated both conceptually and in practical laboratory settings
- To highlight the mass and energy balances for a given food process.
- To provide the unit operations required to produce a given food product.
- To gain ideas on basics of designing of food plant and storage system

Unit: I	**Food Plant**	**15**

Design of food plant - Important considerations for designing of food plants - Construction and design - Types of layout. Principle and equipment used in food industry.

Unit: II	**Fluid Flow in Food Processing**	**15**

Fluid Flow in Food Processing. Liquid Transport systems. Properties of Liquids. Newton's Law of Viscosity. Principle of capillary tube and rotational viscometer. Newtonian and Non-Newtonian fluids.

Unit: III	**Refrigeration and Freezing**	**15**

Refrigeration and Freezing- Concept and selection of a refrigerant. Description of a Refrigeration cycle. Frozen food storage. Vapor compression refrigeration Cycle.

Unit: IV	**Heat and Mass Transfer**	**15**

Application of steady state heat transfer- estimation of conductive heat transfer coefficient, convective heat transfer coefficient, over all heat transfer coefficient and, design of tubular heat exchanger.

Unit: V	**Psychometrics**	**15**

Properties of Dry Air. Properties of Water Vapour. Properties of air Vapour mixture. Psychometric Chart. Steam, Evaporation and Dehydration - Generation of steam. elevation. Types of evaporations. Design of single effect evaporators.

	Total Lecture Hours	**75 Hrs**

Books for Study:

1.Rao, D.G. 2010. Fundamentals of Food Engineering. PHI Learning private Ltd.
2. Manay S and Swamy S, Food Facts and Principles, New Age International (P) LtdPublishers, New Delhi,2001.

Books for References:

1. Rao, C. G, Essentials of Food Process Engineering. B S publications. 2006
2. Fellow P, Food Processing Technology.VCH Ellis Harwood Publications, 1988.
3. Singh, R. P and Heldman, D. R. 2009. Introduction to Food Engineering.Academic press 4th edition.

Web Resources: http://www.ucarecdn.com/fb7332e8-c35a-47b0-9805-051fa171f8fa/		
Course Outcomes		**K Level**
CO1:	Identify the principle of Unit operation	**K3**
CO2:	Explain fundamentals of food engineering	**K4**
CO3:	Apply knowledge on basics of designing of food plant and storage system	**K3**
CO4:	Analyze e familiarized with basic principles of refrigeration, freezing, fluid flow.	**K4**
CO5:	Discover uses of Newton and Non – Newton fluid	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**2**	**1**	**3**	**1**	**2**	**1**
CO 2	**2**	**1**	**1**	**2**	**1**	**1**
CO 3	**2**	**2**	**2**	**1**	**2**	**1**
CO 4	**3**	**1**	**2**	**1**	**1**	**1**
CO 5	**3**	**3**	**2**	**1**	**1**	**1**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Design of food plant - Important considerations for designing of food plants – Construction and design - Types of layout. Principle and equipment used in food industry	15	PPT, Chalk & Talk, Seminar, e-learning tools
II	Fluid Flow in Food Processing. Liquid Transport systems. Properties of Liquids. Newton's Law of Viscosity. Principle of capillary tube and rotational viscometer. Newtonian and Non- Newtonian fluids .	15	PPT, Chalk & Talk, e-learning tools, E-books
III	Refrigeration and Freezing- Concept and selection of a refrigerant. Description of a Refrigeration cycle. Frozen food storage. vapour compression refrigeration Cycle.	15	PPT, Chalk & Talk, Seminar, e-learning tools
IV	Application of steady state heat transfer- estimation of conductive heat transfer coefficient, convective heat transfer coefficient, over all heat transfer coefficient and, design of tubular heat exchanger.	15	PPT, Chalk & Talk, Seminar, e-learning tools
V	Properties of Dry Air. Properties of Water Vapour. Properties of air Vapour mixture. Psychometric Chart. Steam, Evaporation and Dehydration - Generation of steam. elevation. Types of evaporations. Design of single effect evaporators.	15	PPT, Chalk & Talk, Assignments, E-books

Course Designed by: **Ms.G.BHARATHI & Ms. M.RAGADEEPA**

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	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		
CI AI	CO1	UptoK3	2	K1	1	K2	2(K2&K2)	1(K2)
	CO2	UptoK4	2	K2	2	K2	2(K3&K3)	1(K3)
CI AII	CO3	UptoK3	2	K1	1	K2	2(K2&K2)	1(K3)
	CO4	UptoK4	2	K2	2	K2	2(K3&K3)	1K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	-	-	-	2	4	60
	K2	2	6	10	10	28	56	
	K3	-	-	10	10	20	40	40
	K4	-	-	-		-	-	
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	-	-	-	2	4	40
	K2	2	6	10	-	18	36	
	K3	-	-	10	10	20	40	40
	K4	-	-	-	10	10	20	20
	Marks	4	6	20	20	50	100	100

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, analyzing, presentation and make inferences with evidences
CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	UptoK3	1	K1&K2	1	K2	2(K3&K3)	1(K3)
2	CO2	UptoK4	1	K1&K2	1	K2	2(K2&K2)	1(K3)
3	CO3	UptoK3	1	K1&K2	1	K2	2(K3&K3)	1(K3)
4	CO4	UptoK4	1	K1&K2	1	K2	2(K2&K2)	1(K4)
5	CO5	UptoK4	1	K1&K2	1	K2	2(K3&K3)	1(K4)
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
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.16	33
K2	5	10	20	-	35	29.16	
K3	-		30	30	60	50	50
K4	-	-	-	20	20	16.67	17
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q.No	**CO**	**K Level**	**Questions**
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K2	
17) b	CO2	K2	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q.No	**CO**	**K Level**	**Questions**
21	CO1	K3	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**FOOD CHEMISTRY**							
Course Code	**21UFDC52**					**L**	**P**	**C**
Category	**Core**					4	-	2
Nature of course:	**EMPLOYABILITY**	✓	SKILL ORIENTED		ENTREPRENURSHIP			

Course Objectives:

- To understand the physio - chemical properties of food
- To enable the students to gain knowledge regarding the physical and chemical properties of the food constituents.
- To apply the terms and describe the general chemical structure of major components of foods.
- To analyze the chemistry of foods - composition of food, role of each component and their interaction.
- To explain the functional aspects of food components and to study their role in food processing.

Unit: I	**Physiochemical properties of food**	**15**

Colloids, Crystalloid - – definition, Classification of colloidal system, Properties of colloidal system, Definition and properties of solutions, Sols, Gels & Suspensions, Foams, Emulsions- definition and its properties, Definition of water in food, Structure of water and ice, Types of water.

Unit: II	**Carbohydrates**	**15**

Classification(mono, oligo and poly saccharides), Structure of important polysaccharides(starch, glycogen, cellulose, pectin, hemicellulose, gums) Chemical reactions of carbohydrates –oxidation, reduction , with acid & alkali , Modified celluloses and starches

Unit: III	**Lipids**	**15**

Classification of lipids, Physical properties-melting point, softening point, specific gravity, refractive index, smoke, flash and fire point, turbidity point. Auto-oxidation and its prevention. Interesterification, Fat Mimetic.

Unit: IV	**Proteins**	**15**

Protein classification and structure .Nature of food proteins(plant and animal proteins) . Properties of proteins (electrophoresis, sedimentation, amphoterism and denaturation,) . Functional properties of proteins. Organoleptic, solubility, viscosity ,binding gelation / texturization , emulsification , foaming.

Unit: V	**Food Hydrocolloids**	**15**

Definition, Classification of hydrocolloids, Gums definition, types, functions, food applications, Non- starch polysaccharide cellulose, pectin- Definition, functions, food application.

	Total Lecture Hours	**75 Hrs**

Books for Study:

1. Meyer, Food Chemistry, AVI Publications, New York (1991). \
2. Swaminathan, V., & Kaliappan, V. (2017). TE Shanmugam. *Eminent Indian Psychologists: 100 Years of Psychology in India*, 108.
3. Sathyanarayanan, A., Chandrasekaran, K. S., & Karunagaran, D. (2018). microRNA-145 downregulates SIP1-expression but differentially regulates proliferation, migration, invasion

and Wnt signaling in SW480 and SW620 cells. *Journal of Cellular Biochemistry*, *119*(2), 2022-2035..
Books for References:
1. DeMan, John M., Principles of Food Chemistry ,3rd Ed., Springer 1999 2. Desrosier, Norman W. and Desrosier.,James N.,The technology of food preservation , 4th Ed.,Westport, Conn. : AVI Pub. Co., 1977. 3. Fennema, Owen R, Food Chemistry, 3rd Ed., Marcell Dekker, New York, 1996 4. Fuller, Gordon W, New Product Development From Concept to Marketplace, CRC Press,2004. 5. Whitehurst and Law, Enzymes in Food Technology, CRC Press, Canada, 2002 6. Potter,N.N. and Hotchkiss, J.H, Food Science, 5th Edition, CBS Publishers and Distributors, New Delhi (1996).
Web Resources:
1. http://ecoursesonline.iasri.res.in/course/view.php?id=89

Course Outcomes		**K Level**
On Successful Completion of Course the student will be able to,		
CO1:	Identify physio-chemical aspects of food products.	**K3**
CO2:	Explain various chemical reactions of food.	**K4**
CO3:	Apply various functional properties of food.	**K3**
CO4:	Analyze the role of hydrocolloids in different foods.	**K4**
CO5:	Discover the role in food processing.	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**2**	**2**	**2**	**3**	**1**	**2**
CO 2	**2**	**2**	**2**	**3**	**1**	**3**
CO 3	**2**	**1**	**1**	**1**	**2**	**2**
CO 4	**3**	**2**	**2**	**3**	**2**	**2**
CO 5	**3**	**1**	**1**	**3**	**1**	**1**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	**Physiochemical properties of food:** Colloids, Crystalloid - – definition, Classification of colloidal system, Properties of colloidal system, Definition and properties of solutions, Sols, Gels & Suspensions, Foams, Emulsions- definition and its properties, Definition of water in food, Structure of water and ice, Types of water.	15	PPT, Chalk & Talk, Seminar E-books
II	**Carbohydrates:** Classification(mono, oligo and poly saccharides), Structure of important polysaccharides(starch, glycogen, cellulose, pectin, hemicellulose, gums) Chemical reactions of carbohydrates – oxidation, reduction , with acid & alkaki , Modified celluloses and starches	15	PPT, Chalk & Talk, Seminar E-learning tools
III	**Lipids:** Classification of lipids, Physical properties-melting point, softening point, specific gravity, refractive index, smoke, flash and fire point, turbidity point. Auto-oxidation and its prevention. Interesterification, Fat Mimetic.	15	PPT, Chalk & Talk, Assignmets, E- books
IV	**Protein:** Protein classification and structure .Nature of food proteins(plant and animal proteins) . Properties of proteins (electrophoresis, sedimentation, amphoterism and denaturation,) . Functional properties of proteins eg. organoleptic, solubility, viscosity ,binding gelation / texturization , emulsification , foaming.	15	PPT, Chalk & Talk, Assignments, E- books
V	**Food Hydrocolloids:** Definition, Classification of hydrocolloids, Gums definition, types, functions, food applications, Non- starch polysaccharide cellulose, pectin- Definition, functions, food application.	15	PPT, Chalk & Talk, Seminar, E-books

Course Designed by: MS.M. RAGADEEPA, MS. G. BHARATHI

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	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		
CI AI	CO1	UptoK3	2	K1	1	K2	2(K2&K2)	1(K2)
	CO2	UptoK4	2	K2	2	K2	2(K3&K3)	1(K3)
CI AII	CO3	UptoK3	2	K3	1	K2	2(K2&K2)	1(K3)
	CO4	UptoK4	2	K4	2	K2	2(K3&K3)	1K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	-	-	-	2	4	60
	K2	2	6	10	10	28	56	
	K3	-	-	10	10	20	40	40
	K4	-	-	-		-	-	
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	-	-	-	2	4	40
	K2	2	6	10	-	18	36	
	K3	-	-	10	10	20	40	40
	K4	-	-	-	10	10	20	20
	Marks	4	6	20	20	50	100	100

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, analyzing, presentation and make inferences with evidences
CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	UptoK3	1	K1&K2	1	K2	2(K3&K3)	1(K3)
2	CO2	UptoK4	1	K1&K2	1	K2	2(K2&K2)	1(K3)
3	CO3	UptoK3	1	K1&K2	1	K2	2(K3&K3)	1(K3)
4	CO4	UptoK4	1	K1&K2	1	K2	2(K2&K2)	1(K4)
5	CO5	UptoK4	1	K1&K2	1	K2	2(K3&K3)	1(K4)
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
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.16	33
K2	5	10	20	-	35	29.16	
K3	-		30	30	60	50	50
K4	-	-	-	20	20	16.67	17
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q.No	**CO**	**K Level**	**Questions**
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K2	
17) b	CO2	K2	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q.No	**CO**	**K Level**	**Questions**
21	CO1	K3	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**FOOD CHEMISTRY – PRACTICAL**									
Course Code	**21UFDCP5**							**L**	**P**	**C**
Category	**Core-Practical**							**-**	**2**	**2**
Nature of course:	EMPLOYABILITY		**SKILL ORIENTED**	✓	ENTREPRENEURSHIP					

Course Objectives:

- To remember the processing and preparation of secondary solutions.
- To estimate different food parameters.
- To analyze smoking point and fatty acids.
- To give training on different food analysis.
- To understand basic concepts of food analysis.

Course Content:

1. Preparation of primary and secondary solutions
2. Estimation of moisture content
3. Determination of gelatinization temperature range (GTR) of different starches and effect of additives on GTR.
4. Determination of refractive index and specific gravity of fats and oils.
5. Determination of smoke point and percent fat absorption for different fat and oils.
6. Determination of percent free fatty acids
7. Estimation of saponification value
8. Estimation of reducing and non-reducing sugars using potassium ferricyanide method.
9. Qualitative analysis of carbohydrate, protein and fat.

Books for Study:

1. Fennema, Owen R, Food Chemistry, 3rd Ed., Marcell Dekker, New York, 1996

Books for References:

1. Whitehurst and Law, Enzymes in Food Technology, CRC Press, Canada, 2002
2. Wong, Dominic WS, Food Enzymes, Chapman and Hall, New York, 1995
3. Potter,N.N.and Hotchkiss,J.H, Food Science, 5th Ed., Chapman & Hall,1995
4. 5. DeMan, J.M., Principles of Food Chemistry, AVI, NewYork, 1980

Web Resources:

1. **https://gpadampur.files.wordpress.com/2015/08/3-2-fcn-practical.pdf**
2. **https://dl.icdst.org/pdfs/files/42dc13712c69228c56615b2fdfe70632.pdf**

Course Outcomes		**K Level**
On Successful Completion of Course the student will be able to,		
CO1:	Remember the different parameters of food products.	**K2**
CO2:	Understand the technologies to estimate different food constituents.	**K3**
CO3:	Apply different method of food technologies.	**K3**
CO4:	Analyze skills in handling appliances in laboratories.	**K4**
CO5:	Examine the product quality with reference to standard specifications.	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	1	3	1	2
CO 2	3	2	2	1	1	3
CO 3	3	3	2	2	2	2
CO 4	1	1	2	3	1	1
CO 5	2	3	2	2	1	1

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
1	Preparation of primary and secondary solutions	2	Laboratory
2	Estimation of moisture content	2	Laboratory
3	Determination of gelatinization temperature range (GTR) of different starches and effect of additives on GTR.	3	Laboratory
4	Determination of refractive index and specific gravity of fats and oils.	2	Laboratory
5	Determination of smoke point and percent fat absorption for different fat and oils.	2	Laboratory
6	Determination of percent free fatty acids	2	Laboratory
7	Estimation of saponification value	2	Laboratory
8	Estimation of reducing and non-reducing sugars using potassium ferricyanide method.	3	Laboratory
9	Qualitative analysis of carbohydrate, protein and fat.	3	Laboratory

Course Designed by: **MS. M. RAGADEEPA, MS. G. BHARATHI**

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**TECHNOLOGY OF DAIRY PRODUCTS**							
Course Code	**21UFDC53**					**L**	**P**	**C**
Category	**Core**					4	-	2
Nature of course:	**EMPLOYABILITY**	✓	SKILL ORIENTED		ENTREPRENURSHIP			

Course Objectives:

- To understand the physio - chemical properties milk.
- To acquire knowledge on milk and milk products processing.
- To study the working of equipments used in milk and milk products processing.
- To expand the knowledge for preparation of different milk products.
- To interpret processing methods of market milk.

Unit: I	**Cream**	**15**
Cream- Classification- Composition- Nutritive value- Physico- chemical properties Pasteurization of cream-Manufacture of different types of cream -Packaging and Storage uses of cream- Possible defects and control measures.		
Unit: II	**Butter and Ghee**	**15**
Butter-classification-composition –Nutritive value-method of manufacture-butter churn method-continuous butter making-packaging and storage-Defects and control measures-Ghee-Nutritive value-Method of manufacture-Defects and prevention.		
Unit: III	**Ice cream**	**15**
Definition-classification-composition- Nutritive value-Method of manufacture-packaging-Hardening and storage-Defects and control measures.		
Unit: IV	**Paneer**	**15**
Paneer-composition-Nutritive value-manufacture of paneer-Tofu-composition-nutritive value-yield-uses		
Unit: V	**Condensed Milk and Dried Milk**	**15**
Condensed milk-composition-Nutritive value-Method of manufacture-Sweetened condensed milk-packaging and storage of condensed milk-Dried milk-composition-Food and Nutritive value-method of manufacture of WMP and SMP-uses. Infant Formula.		
	Total Lecture Hours	**75 Hrs**

Books for Study:

1. Sukumar De, Outlines of Dairy Technology, Oxford University Press, 1980,New Delhi.

Books for References:

1. Aneja.R.P, B.NMathur, R.C Chandra and A.K. Banerjee, Technology of Indian Milk and Milk Products, Dairy India Publication 2002,New Delhi.
2. H. Douglas Goff, "The Dairy Science and Technology eBook" Dairy Science and Technology Education Series, University of Guelph, Canada.
3.Robinson, R. Advances in Milk Processing-Springer publication

Web Resources:

1.https://www.pdfdrive.com/dairy-technology-books.html 2. https://diaspereira.weebly.com/uploads/5/6/3/9/5639534/dairy_handbook.pdf		
Course Outcomes		**K Level**
On Successful Completion of Course the student will be able to,		
CO1:	Identify physio-chemical aspects of milk products.	**K3**
CO2:	Explain various chemical reactions of milk and milk products.	**K4**
CO3:	Apply various methods of manufacture.	**K3**
CO4:	Analyze the nutritive value of the products..	**K4**
CO5:	Discover the new technology.	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**2**	**2**	**3**	**3**	**2**	**2**
CO 2	**2**	**2**	**2**	**2**	**3**	**3**
CO 3	**2**	**3**	**3**	**2**	**2**	**2**
CO 4	**2**	**2**	**2**	**2**	**2**	**2**
CO 5	**3**	**1**	**3**	**3**	**1**	**3**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	**Cream-** Cream- Classification- Composition- Nutritive value-Physico- chemical propertiesPasteurization of cream-Manufacture of different types of cream -Packaging and Storage uses of cream-Possible defects and control measures.	**15**	**PPT, Chalk & Talk, Seminar, E-books**
II	**Butter and Ghee-** Butter-classification-composition –Nutritive value-method of manufacture-butter churn method-continuous butter making-packaging and storage-Defects and control measures-Ghee-Nutritive value-Method of manufacture-Defects and prevention.	**15**	**PPT, Chalk & Talk, Assignments, e-learning tools**
III	**Ice cream-** Definition-classification-composition- Nutritive value-Method of manufacture-packaging-Hardening and storage-Defects and control measures.	**15**	**PPT, Chalk & Talk, Seminar, E-books**
IV	**Paneer-** Paneer-composition-Nutritive value-manufacture of paneer-Tofu-composition-nutritive value-yield-uses	**15**	**PPT, Chalk & Talk, Assignments, e-learning tools**
V	**Condensed Milk and Dried Milk-** Condensed milk-composition-Nutritive value-Method of manufacture-Sweetened condensed milk-packaging and storage of condensed milk-Dried milk-composition-Food and Nutritive value-method of manufacture of WMP and SMP-uses. Infant Formula.	**15**	**PPT, Chalk & Talk, E-books, Industrial visit**

Course Designed by: P V GOPIMANIVANNAN & G.MEENAKSHI

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	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		
CI AI	CO1	UptoK3	2	K1	1	K2	2(K2&K2)	1(K2)
	CO2	UptoK4	2	K2	2	K2	2(K3&K3)	1(K3)
CI AII	CO3	UptoK3	2	K1	1	K2	2(K2&K2)	1(K3)
	CO4	UptoK4	2	K2	2	K2	2(K3&K3)	1K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	-	-	-	2	4	60
	K2	2	6	10	10	28	56	
	K3	-	-	10	10	20	40	40
	K4	-	-	-		-	-	
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	-	-	-	2	4	40
	K2	2	6	10	-	18	36	
	K3	-	-	10	10	20	40	40
	K4	-	-	-	10	10	20	20
	Marks	4	6	20	20	50	100	100

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, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	UptoK3	1	K1-K2	1	K2	2(K3&K3)	1(K3)
2	CO2	UptoK4	1	K1-K2	1	K2	2(K2&K2)	1(K3)
3	CO3	UptoK3	1	K1-K2	1	K2	2(K3&K3)	1(K3)
4	CO4	UptoK4	1	K1-K2	1	K2	2(K2&K2)	1(K4)
5	CO5	UptoK4	1	K1-K2	1	K2	2(K3&K3)	1(K4)
No. of Questions to be Asked			10		5		5	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
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.16	33
K2	5	10	20	-	35	29.16	
K3	-		30	30	60	50	50
K4	-	-	-	20	20	16.67	17
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q.No	**CO**	**K Level**	**Questions**
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K2	
17) b	CO2	K2	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q.No	**CO**	**K Level**	**Questions**
21	CO1	K3	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**TECHNOLOGY OF DAIRY PRODUCTS-PRACTICAL**									
Course Code	**21UFDCP6**							**L**	**P**	**C**
Category	**Core-Practical**							-	2	2
Nature of course:	**EMPLOYABILITY**	✓	SKILL ORIENTED		ENTREPRENURSHIP					

Course Objectives:

- To prepare cream, butter and ice cream by using the appropriate machines.
- To analyze the various quality parameters of prepared dairy products.
- To acquire the knowledge on platform and organoleptic test.
- To enlighten the fat rich products.
- To create milk based new by Products.

Course Content:

1. Preparation of Cream.

2. Acidity of cream

3. Estimation of fat in cream.

4. Preparation of butter.

5. Estimation of butter fat.

6. Preparation of Ghee from Cream.

7. Preparation of Ghee from butter.

8. Preparation of Ice cream.

9. Preparation of Paneer.

10. Dairy Plant Visit.

Books for Study:

1. Sukumar De, Outlines of Dairy Technology, Oxford University Press, 1980,New Delhi.

Books for References:

1. Aneja.R.P, B.NMathur, R.C Chandra and A.K. Banerjee, Technology of Indian Milk andMilk Products, Dairy India Publication 2002,New Delhi.
2. H. Douglas Goff, "The Dairy Science and Technology eBook" Dairy Science andTechnology Education Series, University of Guelph, Canada.
3.Robinson, R. Advances in Milk Processing-Springer publication

Web Resources:

1. https://www.scribd.com/document/313319766/Dairy-products-Technology-Practical-Manual-Txt-Book-XII

Course Outcomes		K Level
On Successful Completion of Course the student will be able to,		
CO1:	Remember the different methods of preparation .	K2
CO2:	Understand the technologies to estimate different types of fat rich products..	K3
CO3:	Apply different methods of technologies.	K3
CO4:	Analyze skills in handling appliances in laboratories.	K4
CO5:	Examine the product quality with reference to standard specifications.	K4

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	1	3	1	2
CO 2	3	2	2	3	2	3
CO 3	2	3	2	3	2	2
CO 4	1	3	2	3	2	2
CO 5	2	3	2	2	1	2

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
1	Preparation of Cream.	2	Laboratory
2	Acidity of cream	2	Laboratory
3	Estimation of fat in cream.	3	Laboratory
4	Preparation of butter.	2	Laboratory
5	Estimation of butter fat.	2	Laboratory
6	Preparation of Ghee from Cream	2	Laboratory
7	Preparation of Ghee from butter.	2	Laboratory
8	Preparation of Ice cream.	2	Laboratory
9	Preparation of Paneer.	2	Laboratory
10	Dairy Plant Visit.	3	Laboratory

Course Designed by: **G. MEENAKSHI , P V GOPIMANIVANNAN**

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**FOOD BIOTECHNOLOGY**							
Course Code	**21UFDE51**					**L**	**P**	**C**
Category	**Core Elective**					5	-	5
Nature of course:	**EMPLOYABILITY**	✓	SKILL ORIENTED		ENTREPRENURSHIP			

Course Objectives:

- To enable students to understand the concepts of biotechnology.
- To gain knowledge on role of microorganism in food industry.
- To apply biotechnology in food processing.
- To know basic microbiology of food products.
- To understand fermentation technology.

Unit: I	**Biotechnological approaches in food processing**	**15**

Biotechnology –Definition. Food technology and food laboratory - Scope, Importance and applications in fields of medicine, agriculture, industry and environment. Microorganisms associated with food biotechnology – Bacteria, Yeast, Mould. Wine and beer making.

Unit: II	**Basics of microbiology**	**15**

Spoilage, contamination and preservation of foods Factors affecting microbial growth, Microbial kinetics.

Unit: III	**Production of cultures for food fermentation**	**15**

Culture of food microbes - Preparation of nutrient media, Sterilization and disinfection, inoculation techniques, Staining methods, Microbial examination.

Unit: IV	**Fermentation technology**	**15**

Fermentation – Definition, Fermentation process, Fermented food Products – Yoghurt, Cheese, Tempeh, saurkraut, Idli, Dosa. Advantages of fermented products.

Unit: V	**Single cell protein**	**15**

Single cell Protein: Definition, Microorganisms used for SCP production, Substrates, procedure for production of SCP, Biomass recovery, Advantages of SCP, Limitations of SCP.

	Total Lecture Hours	**75 Hrs**

Books for Study:

1. Sri Ram Sridhar (2005). Enzyme Biotechnology, Dominant Publishers and Distributors, New Delhi.

Books for References:

1. Frazier, (1989) .Food Microbiology, THM Publications
2. Gupta, P.K. (1995).Elements of Biotechnology, Rastogi Publications, Meerut.
3. Jay, (1987). Modern Food Microbiology, CBS Publishers,
4. Rita Singh. (2004).Food Biotechnology, Global Vision Publishing House, Delhi.
5. Singh, B. D (2004). Biotechnology Expanding Horizons, Kalyani Publishers, Ludhiana.

Web Resources:

1. http://www.businessdictionary.com/definition/foodbiotechnology.html
2. http://www.mrothery.co.uk/genetech/genetechnotes.htm
3. http://www.wpi.edu/Pubs/E-project/Available/E-project-031405-

135846/unrestricted/IQP.pdf 4. http://www.sciencedaily.com/articles/t/transgenic_plants.htm		
Course Outcomes		**K Level**
On Successful Completion of Course the student will be able to,		
CO1:	Define the concepts of biotechnology, its branches and scope	**K3**
CO2:	Classify the food microorganisms and to Identify the factors affecting the microbial growth	**K4**
CO3:	Explain the techniques of preparation of culture media, sterilization, inoculation and staining	**K3**
CO4:	Build knowledge on fermentation process and its application	**K4**
CO5:	Infer the production of single cell protein	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**3**	**2**	**2**	**3**	**1**	**2**
CO 2	**2**	**2**	**2**	**3**	**1**	**1**
CO 3	**2**	**1**	**1**	**1**	**1**	**1**
CO 4	**3**	**2**	**2**	**2**	**2**	**1**
CO 5	**2**	**1**	**1**	**2**	**1**	**1**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	**Biotechnological approaches in food processing:** Biotechnology – Definition. Food technology and food laboratory - Scope, Importance and applications in fields of medicine, agriculture, industry and environment. Microorganisms associated with food biotechnology – Bacteria, Yeast, Mould. Wine and beer making.	15	PPT, Chalk & Talk, E-books, Seminar
II	**Basics of microbiology:** Spoilage, contamination and preservation of foods Factors affecting microbial growth, Microbial kinetics.	15	PPT, Chalk & Talk, Assignments, e-learning tools
III	**Production of cultures for food fermentation:** Culture of food microbes - Preparation of nutrient media, Sterilization and disinfection, inoculation techniques, Staining methods, Microbial examination.	15	PPT, Chalk & Talk, E-books, Seminar
IV	**Fermentation technology:** Fermentation – Definition, Fermentation process, Fermented food Products – Yoghurt, Cheese, Tempeh, saurkraut, Idli, Dosa. Advantages of fermented products.	15	PPT, Chalk & Talk, Assignments, e-learning tools
V	**Single cell protein:** Single cell Protein: Definition, Microorganisms used for SCP production, Substrates, procedure for production of SCP, Biomass recovery, Advantages of SCP, Limitations of SCP.	15	PPT, Chalk & Talk, Seminar, e-learning tools

Course Designed by: Ms. M. RAGADEEPA, Ms. G. BHARATHI

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	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		
CI AI	CO1	UptoK3	2	K1	1	K2	2(K2&K2)	1(K2)
	CO2	UptoK4	2	K2	2	K2	2(K3&K3)	1(K3)
CI AII	CO3	UptoK3	2	K1	1	K2	2(K2&K2)	1(K3)
	CO4	UptoK4	2	K2	2	K2	2(K3&K3)	1K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	-	-	-	2	4	60
	K2	2	6	10	10	28	56	
	K3	-	-	10	10	20	40	40
	K4	-	-	-		-	-	
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	-	-	-	2	4	40
	K2	2	6	10	-	18	36	
	K3	-	-	10	10	20	40	40
	K4	-	-	-	10	10	20	20
	Marks	4	6	20	20	50	100	100

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, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	UptoK3	1	K1-K2	1	K2	2(K3&K3)	1(K3)
2	CO2	UptoK4	1	K1-K2	1	K2	2(K2&K2)	1(K3)
3	CO3	UptoK3	1	K1-K2	1	K2	2(K3&K3)	1(K3)
4	CO4	UptoK4	1	K1-K2	1	K2	2(K2&K2)	1(K4)
5	CO5	UptoK4	1	K1-K2	1	K2	2(K3&K3)	1(K4)
No. of Questions to be Asked			10		5		5	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
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.16	33
K2	5	10	20	-	35	29.16	
K3	-		30	30	60	50	50
K4	-	-	-	20	20	16.67	17
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q.No	**CO**	**K Level**	**Questions**
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K2	
17) b	CO2	K2	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q.No	**CO**	**K Level**	**Questions**
21	CO1	K3	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**FOOD TOXICOLOGY**							
Course Code	**21UFDE52**					**L**	**P**	**C**
Category	**Core Elective**					5	-	5
Nature of course:	**EMPLOYABILITY**	✓	SKILL ORIENTED		ENTREPRENURSHIP			

Course Objectives:

- To study general knowledge in food toxicology
- To analyze different Carcinogens
- To make use of physical treatment in food and health hazard
- To teach about the substances intentionally added to foods.
- To impart technical knowledge in toxins detection.

Unit: I	**Introduction to toxicology**	**15**

Importance of Toxicology. Natural toxins in food and natural toxins of importance in food. Toxins of plant and animal origin, microbial toxins (e.g., bacterial toxins, fungal toxins and Algal toxins), natural occurrence, toxicity.

Unit: II	**Food Allergies**	**15**

Food allergies and sensitivities: natural sources and chemistry of food allergens, handling of food allergies. Food sensitivities. Safety of genetically modified food, potential toxicity and allergenisity of GM foods. Safety of children consumables.

Unit: III	**Food Contaminants**	**15**

Environmental contaminants and drug residues in food. Fungicide and pesticide residues in foods, heavy metal and their health impacts. Other contaminants in food, radioactive contamination of food.

Unit: IV	**Treatment for Hazard**	**15**

Physical treatment and chemical treatment of food and health hazards. Irradiation - heat treatment. Residual chemicals utilized in food production and processing: Pesticides, Heavy metals, Hormones in food. GMP, HACCP.

Unit: V	**Food Additives**	**15**

Food additives and toxicants added or formed during food processing. Food processing generated toxicants: nitroso- compounds, heterocyclic amines, dietary Supplements and toxicity related to dose: common dietary supplements, possible toxic effects.

	Total Lecture Hours	**75 Hrs**

Books for Study:

1. Klaassen, Curtis; Watkins III, John B. (2015), Casarett & Doull's Essentials of Toxicology, Third Edition, McGraw-Hill Medical, ISBN 10: 0071847081 ISBN 13: 9780071847087.
2. Tõnu Püssa (2013), Principles of Food Toxicology, Second Edition, CRC Press, ISBN 9781466504103.
3. S.S. Deshpande Ed (2013), Handbook of Food Toxicology, CRC Press, ISBN 9780824707606.

Books for References:

1. Helferich, W., and Winter, C.K. (2001) Food Toxicology, CRC Press, LLC. Boca Raton, FL
2. Shibamoto, T., and Bjeldanes, L. (2009) Introduction to Food Toxicology, 2nd Ed. Elsevier Inc.,Burlington, MA.
3. Watson, D.H. (1998) Natural Toxicants in Food, CRC Press, LLC. Boca Raton, FL

Web Resources: 1. https://ncert.nic.in/textbook/pdf/lehe106.pdf		
Course Outcomes		**K Level**
CO1:	Identify the toxicants in Food	**K3**
CO2:	Explain the most important contaminants in food	**K4**
CO3:	Apply various mechanisms of action of specific food toxicants	**K3**
CO4:	Analyze food allergies in versus food toxicants	**K4**
CO5:	Discover master terminology related to food toxicology	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**2**	**2**	**2**	**3**	**1**	**2**
CO 2	**2**	**3**	**2**	**3**	**1**	**2**
CO 3	**2**	**1**	**1**	**1**	**2**	**2**
CO 4	**3**	**2**	**2**	**2**	**2**	**2**
CO 5	**3**	**1**	**1**	**3**	**1**	**1**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	**Introduction to toxicology**: Importance of Toxicology. Natural toxins in food and natural toxins of importance in food. Toxins of plant and animal origin, microbial toxins (e.g., bacterial toxins, fungal toxins and Algal toxins), natural occurrence, toxicity.	15	PPT, Chalk & Talk, e-learning tools, E-books
II	**Food Allergies**: Food allergies and sensitivities: natural sources and chemistry of food allergens, handling of food allergies. Food sensitivities. Safety of genetically modified food, potential toxicity and allergenisity of GM foods. Safety of children consumables.	15	PPT, Chalk & Talk, Seminar, E-books
III	**Food Contaminants**: Environmental contaminants and drug residues in food. Fungicide and pesticide residues in foods, heavy metal and their health impacts. Other contaminants in food, radioactive contamination of food.	15	PPT, Chalk & Talk, e-learning tools, Assignments
IV	**Treatment for Hazard**: Physical treatment and chemical treatment of food and health hazards. Irradiation - heat treatment. Residual chemicals utilized in food production and processing: Pesticides, Heavy metals, Hormones in food. GMP, HACCP	15	PPT, Chalk & Talk, Seminar, E-books
V	**Food Additives**: Food additives and toxicants added or formed during food processing. Food processing generated toxicants: nitroso-compounds, heterocyclic amines, dietary Supplements and toxicity related to dose: common dietary supplements, possible toxic effects	15	PPT, Chalk & Talk, Assignments, E-books

Course Designed by: **Ms.G.BHARATHI & Ms. M.RAGADEEPA**

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	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		
CI AI	CO1	UptoK3	2	K1	1	K2	2(K2&K2)	1(K2)
	CO2	UptoK4	2	K2	2	K2	2(K3&K3)	1(K3)
CI AII	CO3	UptoK3	2	K3	1	K2	2(K2&K2)	1(K3)
	CO4	UptoK4	2	K4	2	K2	2(K3&K3)	1K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	-	-	-	2	4	60
	K2	2	6	10	10	28	56	
	K3	-	-	10	10	20	40	40
	K4	-	-	-		-	-	
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	-	-	-	2	4	40
	K2	2	6	10	-	18	36	
	K3	-	-	10	10	20	40	40
	K4	-	-	-	10	10	20	20
	Marks	4	6	20	20	50	100	100

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, analyzing, presentation and make inferences with evidences
CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	UptoK3	1	K1&K2	1	K2	2(K3&K3)	1(K3)
2	CO2	UptoK3	1	K1&K2	1	K2	2(K2&K2)	1(K3)
3	CO3	UptoK3	1	K1&K2	1	K2	2(K3&K3)	1(K3)
4	CO4	UptoK4	1	K1&K2	1	K2	2(K2&K2)	1(K4)
5	CO5	UptoK4	1	K1&K2	1	K2	2(K3&K3)	1(K4)
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
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.16	33
K2	5	10	20	-	35	29.16	
K3	-		30	30	60	50	50
K4	-	-	-	20	20	16.67	17
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q.No	**CO**	**K Level**	**Questions**
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K2	
17) b	CO2	K2	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q.No	**CO**	**K Level**	**Questions**
21	CO1	K3	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

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MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**DAIRY BY PRODUCTS TECHNOLOGY**			
Course Code	**21UFDE53**	**L**	**P**	**C**
Category	**Core Elective**	5	-	5

Nature of course:	**EMPLOYABILITY**	✓	SKILL ORIENTED		ENTREPRENURSHIP	

Course Objectives:

- To identify different milk by products status.
- To dstinguish different methods of manufacturing Technology.
- To learn the efficient utilization of milk in dairy Industries.
- To adopt different dairy products processing methods.
- To gain Knowledge about different milk Products.

Unit: I	**Status of Dairy Industry**	**15**

Introduction –Definition-Global and Indian status availability and utilization of dairy by products-Nutritional characteristics of by-products.

Unit: II	**Skim Milk**	**15**

Definition-Composition-Physio-chemical properties of skim Milk-Method of manufacture of Skim Milk Powder-Uses of Skim Milk Powder.

Unit: III	**Casein**	**15**

Definition-classification and specifications –Types of Casein- manufacturing methods ()–Industrial uses of casein.

Unit: IV	**Whey**	**15**

Definition-Composition –Physio -chemical characteristics of whey-Manufacture of condensed whey products and dried whey- Fermented products from whey-Uses.

Unit: V	**Butter Milk**	**15**

Definition-composition- Physio-chemical characteristics of buttermilk and its preservation-Types-Methods of manufacture-utilization of butter milk.

	Total Lecture Hours	**75Hrs**

Books for Study:

4. Sukumar De, Outlines of Dairy Technology, Oxford University Press,New Delhi,1980.

Books for References:

1.Aneja.R.P, Mathur.B.N, R.C Chandra and A.K. Banerjee, Technology of Indian Milk andMilk Products, Dairy India Publication 2002,New Delhi.
2.Douglas Goff.H, "The Dairy Science and Technology eBook" Dairy Science and TechnologyEducation Series, University of Guelph, Canada.
3.Robinson, R. Advances in Milk Processing-Springer publication.

Web Resources:

1. http://ecoursesonline.iasri.res.in/course/view.php?id=347
2. https://gcwgandhinagar.com/econtent/document/15871824941FSTSE0601_ByProductsOfDairyIndustryAndTheirUtilization.pdf

Course Outcomes		**K Level**
CO1:	Identify the dairy by-products availability .	**K3**

CO2:	Explain the physical properties of by products.	**K4**
CO3:	Apply knowledge on its manufacturing process.	**K3**
CO4:	Analyze the nutritive value of the by-products.	**K4**
CO5:	Discover the new methods to prepare by-products.	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**2**	**2**	**2**	**3**	**1**	**2**
CO 2	**2**	**2**	**2**	**3**	**1**	**3**
CO 3	**2**	**1**	**1**	**1**	**2**	**2**
CO 4	**3**	**2**	**2**	**3**	**2**	**2**
CO 5	**3**	**1**	**1**	**3**	**1**	**1**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	**Status of Dairy Industry-** Introduction –Definition-Global and Indian status availability and utilization of dairy by products-Nutritional characteristics of by-products.	**15**	**PPT, Chalk & Talk, Assignments, E-books**
II	**Skim Milk-** Definition-Composition-Physio-chemical properties of skim Milk-Method of manufacture of Skim Milk Powder-Uses of Skim Milk Powder.	**15**	**PPT, Chalk & Talk, e-learning tools, Seminar**
III	**Casein-** Definition-classification and specifications –Types of Casein- manufacturing methods–Industrial uses of casein.	**15**	**PPT, Chalk & Talk, Seminar, E-books**
IV	**Whey** - Definition-Composition –Physio -chemical characteristics of whey-Manufacture of condensed whey products and dried whey-Fermented products from whey-Uses.	**15**	**PPT, Chalk & Talk, e-learning tools, Assignments**
V	**Butter Milk-** Definition-composition- Physio-chemical characteristics of buttermilk and its preservation-Types- Methods of manufacture-utilization of butter milk.	**15**	**PPT, Chalk & Talk, Industrial Visit, E-books**

Course Designed by: G.MEENAKSHI & P V GOPIMANIVANNAN

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	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		
CI AI	CO1	UptoK3	2	K1	1	K2	2(K2&K2)	1(K2)
	CO2	UptoK4	2	K2	2	K2	2(K3&K3)	1(K3)
CI AII	CO3	UptoK3	2	K1	1	K2	2(K2&K2)	1(K3)
	CO4	UptoK4	2	K2	2	K2	2(K3&K3)	1K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	-	-	-	2	4	60
	K2	2	6	10	10	28	56	
	K3	-	-	10	10	20	40	40
	K4	-	-	-		-	-	
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	-	-	-	2	4	40
	K2	2	6	10	-	18	36	
	K3	-	-	10	10	20	40	40
	K4	-	-	-	10	10	20	20
	Marks	4	6	20	20	50	100	100

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, analyzing, presentation and make inferences with evidences
CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	UptoK3	1	K1-K2	1	K2	2(K3&K3)	1(K3)
2	CO2	UptoK4	1	K1-K2	1	K2	2(K2&K2)	1(K3)
3	CO3	UptoK3	1	K1-K2	1	K2	2(K3&K3)	1(K3)
4	CO4	UptoK4	1	K1-K2	1	K2	2(K2&K2)	1(K4)
5	CO5	UptoK4	1	K1-K2	1	K2	2(K3&K3)	1(K4)
No. of Questions to be Asked			10		5		5	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
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.16	33
K2	5	10	20	-	35	29.16	
K3	-		30	30	60	50	50
K4	-	-	-	20	20	16.67	17
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions)
Answer All Questions **(10x1=10 marks)**

Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	

Section B (Short Answers)
Answer All Questions **(5x2=10 marks)**

Q.No	CO	K Level	Questions
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	

Section C (Either/Or Type)
Answer All Questions **(5 x 5 = 25 marks)**

Q.No	CO	K Level	Questions
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K2	
17) b	CO2	K2	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	

NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels

Section D (Open Choice)
Answer Any Three questions **(3x10=30 marks)**

Q.No	CO	K Level	Questions
21	CO1	K3	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**DAIRY EXTENSION EDUCATION**							
Course Code	**21UFDE54**					**L**	**P**	**C**
Category	**Core Elective**					5	-	5
Nature of course:	EMPLOYABILITY	✓	SKILL ORIENTED		ENTREPRENURSHIP			

Course Objectives:

- To understand the meaning of extension.
- To enable the students to gain knowledge regarding the audio-visual aids.
- To apply the methods to their community.
- To analyze the socio economic causes.
- To expose the students to various dairy development program and institutions.

Unit: I	**Extension Education**	**15**

Definition-Extension –Education-Dairy Extension-History and concept of extension education-Difference between formal education and extension education-principles of extension education.

Unit: II	**Extension Methods**	**15**

Meaning-Purpose-classification-Farm and home visit-office call- telephone call- personal letter-result demonstration-Method of demonstration-general meeting-group discussion-Extension journals-Exhibition.

Unit: III	**Audio-Visual Aids**	**15**

Audio recordings-Types of Recordings-Tape recorder -MP3 players and public address system-**Visual**-Literature-Symbolized charts and Graphs-Three dimensional-models,specimens and objects-MS Power point presentations.

Unit: IV	**Socio-economic status and causes**	**15**

Importance and scope of dairying in the economical development of rural India-Birth and development of A.H department-administration and services-intensive dairy development program and Dairy co-operative movement-Technology mission on Dairy development.

Unit: V	**Establishment and activities**	**15**

Establishment and activities of Indian Dairy cooperation NDRI,IVRI,IRMA,AMUL,NCDFI and TANUVAS.

	Total Lecture Hours	**75Hrs**

Books for Study:

1. Annamalai, R. 1993. Extension Education and Programme Planning. Palaniappa Printers, Tirunelveli.

Books for References:

1. Dahama, O.P and O.P.Bhatnagar. 1996. Education and Communication for Development, Oxford & IBH Publishing Co., Ltd., New Delhi.
2. Rogers, G.M., and F.F. Shoemaker. 1971. Communication of Innovations- A Cross cultural approach.
3. Seetharaman, Netaji. R., et.al. 1990. A Manual on Audio-visual Aids.
4. Sundaramari, M. 2006. Agriculture and Dairying- A Rural Development Perspective, NCBH, Chennai.

Web Resources: 1. http://ecoursesonline.iasri.res.in/mod/resource/view.php?id=89010		
Course Outcomes		**K Level**
CO1:	Identify the different between formal education and extension education.	**K3**
CO2:	Explain the extension methods.	**K4**
CO3:	Apply knowledge on audio-visual aids.	**K3**
CO4:	Analyze the socio-economic causes of their surroundings.	**K4**
CO5:	Discover the new ideas to extend their entrepreneurship activities.	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**1**	**2**	**3**	**3**	**2**	**2**
CO 2	**2**	**2**	**2**	**3**	**1**	**3**
CO 3	**3**	**3**	**1**	**1**	**2**	**2**
CO 4	**2**	**2**	**3**	**3**	**2**	**2**
CO 5	**2**	**1**	**2**	**2**	**2**	**1**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	**Extension Education-** Definition-Extension –Education-Dairy Extension-History and concept of extension education- Difference between formal education and extension education-principles of extension education.	15	PPT, Chalk & Talk, Assignments, e-learning books
II	**Extension Methods-** Meaning-Purpose-classification-Farm and home visit-office call- telephone call- personal letter- result demonstration-Method of demonstration-general meeting-group discussion-Extension journals-Exhibition.	15	PPT, Chalk & Talk, Seminar, E-books
III	**Audio-Visual Aids-** Audio recordings-Types of Recordings-Tape recorder -MP3 players and public address system-**Visual-**Literature-Symbolized charts and Graphs-Three dimensional-models, specimens and objects-MS Power point presentations.	15	PPT, Chalk & Talk, Assignments, e-leaning books
IV	**Socio-economic status and causes-** Importance and scope of dairying in the economical development of rural India-Birth and development of A.H department-administration and services-intensive dairy development program and Dairy co-operative movement-Technology mission on Dairy development.	15	PPT, Chalk & Talk, Seminar, E-books
V	**Establishment and activities-** Establishment and activities of Indian Dairy cooperation NDRI, IVRI, IRMA, AMUL, NCDFI and TANUVAS.	15	PPT, Chalk & Talk, E-books, e-learning tools

Course Designed by: G.MEENAKSHI & P V GOPIMANIVANNAN

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	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		
CI AI	CO1	UptoK3	2	K1	1	K2	2(K2&K2)	1(K2)
	CO2	UptoK4	2	K2	2	K2	2(K3&K3)	1(K3)
CI AII	CO3	UptoK3	2	K1	1	K2	2(K2&K2)	1(K3)
	CO4	UptoK4	2	K2	2	K2	2(K3&K3)	1K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	-	-	-	2	4	60
	K2	2	6	10	10	28	56	
	K3	-	-	10	10	20	40	40
	K4	-	-	-		-	-	
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	-	-	-	2	4	40
	K2	2	6	10	-	18	36	
	K3	-	-	10	10	20	40	40
	K4	-	-	-	10	10	20	20
	Marks	4	6	20	20	50	100	100

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, analyzing, presentation and make inferences with evidences
CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	UptoK3	1	K1-K2	1	K2	2(K3&K3)	1(K3)
2	CO2	UptoK4	1	K1-K2	1	K2	2(K2&K2)	1(K3)
3	CO3	UptoK3	1	K1-K2	1	K2	2(K3&K3)	1(K3)
4	CO4	UptoK4	1	K1-K2	1	K2	2(K2&K2)	1(K4)
5	CO5	UptoK4	1	K1-K2	1	K2	2(K3&K3)	1(K4)
No. of Questions to be Asked			10		5		5	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
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.16	33
K2	5	10	20	-	35	29.16	
K3	-		30	30	60	50	50
K4	-	-	-	20	20	16.67	17
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q.No	**CO**	**K Level**	**Questions**
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K2	
17) b	CO2	K2	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q.No	**CO**	**K Level**	**Questions**
21	CO1	K3	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**PHYSIO - CHEMICAL ASPECTS OF MILK**			
Course Code	**21UFDE55**	**L**	**P**	**C**
Category	**Core Elective**	5	-	5

Nature of course:	**EMPLOYABILITY**	✓	SKILL ORIENTED		ENTREPRENURSHIP	

Course Objectives:

- Identify the various components of milk.
- Understand the important constituents present in milk.
- Learn the distribution of macro and micro components in milk.
- Gain Knowledge about important properties of milk .
- Analyze the effect of nutritional value of milk.

Unit: I	**Milk**	**15**

Milk - definition - Anatomy of Mammary gland and physiology of milk secretion - Composition of milk -factors affecting composition of milk

Unit: II	**Constituents of Milk**	**15**

Important constituents of Milk-Variation in major constituents of different milk-Energy value of different constituents-changes of milk due to boiling-stone formation in milk(Fouling at low and high temperature)

Unit: III	**Important properties of Milk**	**15**

Density and specific gravity-Total solids and Total SNF-Freezing Point-Boiling point-Specific heat-Thermal Conductivity-Acidity and pH-Viscosity-Surface Tension-Color of milk- Refractive Index-Flavour-Effect of metal on milk-Desirable characteristics of metals for dairy equipment-Selection on metals for dairy equipment.

Unit: IV	**Macro and Micro Components of Milk**	**15**

Fat-Lactose-Molecular structure of lactose-Concentration of Protein in milk-Milk enzymes and NPN substances-Vitamins and minerals in milk

Unit: V	**Nutritive value of Milk**	**15**

Nutritive value of milk and energy calculation Colostrums: composition – importance of colostrums.

	Total Lecture Hours	**75Hrs**

Books for Study:

1. Mathur MP, Roy DD and Dinakar P., ***Textbook of Dairy Chemistry***, ICAR (1999).

Books for References:

1. Anantha Krishnan, C.P., **Technology of milk processing**, Sri LakshmiPublications, Chennai -10 (1991).
2. Eeckles.CH.Combs, W.B and Macy.H, **Milk and Milk Products**, Tata McGrawHill Publishing Co.Pvt.Ltd., New Delhi (1955).
3. Sukumar De, **Outlines of Dairy Technology**, Oxford University Press, NewDelhi (1980).

Web Resources:

1.https://www.agricultureinindia.net/dairy-science/milk/physico-chemical-properties-of-milk-and-milk-constituents/20025 2. http://ecoursesonline.iasri.res.in/mod/page/view.php?id=147892 3. https://www.youtube.com/watch?v=1-m4NPcpgwQ 4. https://books.lib.uoguelph.ca/dairyscienceandtechnologyebook/chapter/physical-properties-of-milk	
Course Outcomes	**K Level**
CO1: Identify the major constituents of different milk	**K3**
CO2: Explain the factors affecting the composition of milk.	**K4**
CO3: Apply knowledge on distinguishing the various properties of milk .	**K3**
CO4: Analyze the nutritive value of colostrums.	**K4**
CO5: Acquire knowledge on desirable characteristics of metal for dairy equipment.	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	1	2	2	3	2	2
CO 2	2	2	2	3	2	3
CO 3	1	1	3	2	2	2
CO 4	2	2	2	3	2	2
CO 5	3	2	3	3	3	3

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	**Milk-** definition - Anatomy of Mammary gland and physiology of milk secretion - Composition of milk -factors affecting composition of milk	**15**	**PPT, Chalk & Talk, Assignments, E-books**
II	**Constituents of Milk-** Important constituents of Milk-Variation in major constituents of different milk-Energy value of different constituents-changes of milk due to boiling-stone formation in milk(Fouling at low and high temperature)	**15**	**PPT, Chalk & Talk, Group Discussion**
III	**Important properties of Milk-** Density and specific gravity-Total solids and Total SNF-Freezing Point-Boiling point-Specific heat-Thermal Conductivity-Acidity and pH-Viscosity-Surface Tension-Color of milk- Refractive Index-Flavour-Effect of metal on milk-Desirable characteristics of metals for dairy equipment-Selection on metals for dairy equipment.	**15**	**PPT, Chalk & Talk, Laboratory Testing**
IV	**Macro and Micro Components of Milk-** Fat-Lactose-Molecular structure of lactose-Concentration of Protein in milk-Milk enzymes and NPN substances-Vitamins and minerals in milk.	**15**	**PPT, Chalk & Talk, Seminar, e-learning tools**
V	**Nutritive value of Milk-** Nutritive value of milk and energy calculation Colostrum: composition – importance of colostrum.	**15**	**PPT, Chalk & Talk, e-learning tools**

Course Designed by: G.MEENAKSHI & P V GOPIMANIVANNAN

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	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		
CI AI	CO1	UptoK3	2	K1	1	K2	2(K2&K2)	1(K2)
	CO2	UptoK4	2	K2	2	K2	2(K3&K3)	1(K3)
CI AII	CO3	UptoK3	2	K1	1	K2	2(K2&K2)	1(K3)
	CO4	UptoK4	2	K2	2	K2	2(K3&K3)	1K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	-	-	-	2	4	60
	K2	2	6	10	10	28	56	
	K3	-	-	10	10	20	40	40
	K4	-	-	-		-	-	
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	-	-	-	2	4	40
	K2	2	6	10	-	18	36	
	K3	-	-	10	10	20	40	40
	K4	-	-	-	10	10	20	20
	Marks	4	6	20	20	50	100	100

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, analyzing, presentation and make inferences with evidences
CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	UptoK3	1	K1-K2	1	K2	2(K3&K3)	1(K3)
2	CO2	UptoK4	1	K1-K2	1	K2	2(K2&K2)	1(K3)
3	CO3	UptoK3	1	K1-K2	1	K2	2(K3&K3)	1(K3)
4	CO4	UptoK4	1	K1-K2	1	K2	2(K2&K2)	1(K4)
5	CO5	UptoK4	1	K1-K2	1	K2	2(K3&K3)	1(K4)
No. of Questions to be Asked			10		5		5	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
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.16	33
K2	5	10	20	-	35	29.16	
K3	-		30	30	60	50	50
K4	-	-	-	20	20	16.67	17
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q.No	**CO**	**K Level**	**Questions**
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K2	
17) b	CO2	K2	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q.No	**CO**	**K Level**	**Questions**
21	CO1	K3	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**HUMAN NUTRITION**							
Course Code	**21UFDE56**					**L**	**P**	**C**
Category	**Core Elective**					5	-	5
Nature of course:	EMPLOYABILITY		SKILL ORIENTED	✓	ENTREPRENURSHIP			

Course Objectives:

- To learn the basic information about human nutrition.
- Understand the factors that affect the human nutrition.
- Learn how to carry out and interpret the nutritional assessment of an individual
- Compile growth monitoring and promotion of different age group people.
- Know the nutritional and energy requirements of human beings at different stages of life, and the physiological situations associated with nutrition.

Unit: I	**Introduction**	**15**

Basic terms used in study of food and nutrition, Definition- Malnutrition, Under nutrition, Over nutrition, BMI, Understanding relationship between foods, nutrition and health.

Unit: II	**Nutrition During Pregnancy**	**15**

Factors affecting pregnancy outcome, importance of adequate weight gain during pregnancy, antenatal care and its schedule, Nutritional requirements during pregnancy and modification of existing diet and supplementation, Deficiency of nutrients, specially energy, iron, folic acid, protein, calcium, iodine.

Unit: III	**Nutrition during Lactation**	**15**

Nutritional requirements during lactation, dietary management, food supplements, galactogogues, preparation for lactation. Hormonal control of lactation.

Unit: IV	**Nutrition during Infancy**	**15**

Infant physiology relevant to feeding and care Breast feeding colostrum, its composition and importance in feeding. Advantages of exclusive breast feeding. Basic principles of breast feeding. Weaning - Introduction of supplementary foods.

Unit: V	**Nutrition from children to adolescents**	**15**

Nutritional needs of toddlers, preschool, school going children- and adolescents - Dietary management.

	Total Lecture Hours	**75 Hrs**

Books for Study:

1. B. Srilakshmi: Dietetics, New Age International Publishers.2006

Books for References:

1. Robinson, C. H. Lawler, M. R.; Chei Toweth, W. L. and Garwick, A. E.: Normal and Therapeutic Nutrition. 17th Ed. Mac Millan Publishing Co.
2. Indian Council of Medical Research: Nutrient Requirements and Recommended-Dietary Allowance for Indians, New Delhi.
3. Thangam. E. Philip (1965): Modern Cookery, Orient Longman, II edition. Vol II, Bombay.

Web Resources:

1. https://www.britannica.com/science/human-nutrition/BMR-and-REE-energy-balance

Course Outcomes		K Level
On Successful Completion of Course the student will be able to,		
CO1:	Identify the relationship between food, nutrition and health.	K3
CO2:	Explain various food groups and balanced diet.	K4
CO3:	Apply various the functions of food.	K3
CO4:	Analyze the digestion, absorption and function of various nutrients and their sources.	K4
CO5:	Discover the role in nutrition in life.	K4

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	2	2	2	3	1	2
CO 2	2	2	2	3	1	3
CO 3	2	1	1	1	2	2
CO 4	3	2	2	3	2	2
CO 5	3	1	1	3	1	1

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	**Introduction:** Basic terms used in study of food and nutrition, Definition- Malnutrition, Under nutrition, Over nutrition, BMI, Understanding relationship between foods, nutrition and health.	15	PPT, Chalk & Talk, e-learning tools
II	**Nutrition During Pregnancy:** Factors affecting pregnancy outcome, importance of adequate weight gain during pregnancy, antenatal care and its schedule, Nutritional requirements during pregnancy and modification of existing diet and supplementation, Deficiency of nutrients, specially energy, iron, folic acid, protein, calcium, iodine.	15	PPT, Chalk & Talk, Seminar, E-books
III	**Nutrition during Lactation:** Nutritional requirements during lactation, dietary management, food supplements, galactogogues, preparation for lactation. Hormonal control of lactation.	15	PPT, Chalk & Talk, Assignments, e-learning tools
IV	**Nutrition during Infancy:** Infant physiology relevant to feeding and care Breast feeding colostrum, its composition and importance in feeding. Advantages of exclusive breast feeding. Basic principles of breast feeding. Weaning - Introduction of supplementary foods.	15	PPT, Chalk & Talk, Seminar, E-books
V	**Nutrition from children to adolescents:** Nutritional needs of toddlers, preschool, school going children- and adolescents - Dietary management.	15	PPT, Chalk & Talk, Assignments, e-learning tools

Course Designed by: MS.M. RAGADEEPA, MS. G. BHARATHI

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	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		
CI AI	CO1	UptoK3	2	K1	1	K2	2(K2&K2)	1(K2)
	CO2	UptoK4	2	K2	2	K2	2(K3&K3)	1(K3)
CI AII	CO3	UptoK3	2	K1	1	K2	2(K2&K2)	1(K3)
	CO4	UptoK4	2	K2	2	K2	2(K3&K3)	1K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	-	-	-	2	4	60
	K2	2	6	10	10	28	56	
	K3	-	-	10	10	20	40	40
	K4	-	-	-		-	-	
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	-	-	-	2	4	40
	K2	2	6	10	-	18	36	
	K3	-	-	10	10	20	40	40
	K4	-	-	-	10	10	20	20
	Marks	4	6	20	20	50	100	100

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, analyzing, presentation and make inferences with evidences
CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	UptoK3	1	K1-K2	1	K2	2(K3&K3)	1(K3)
2	CO2	UptoK4	1	K1-K2	1	K2	2(K2&K2)	1(K3)
3	CO3	UptoK3	1	K1-K2	1	K2	2(K3&K3)	1(K3)
4	CO4	UptoK4	1	K1-K2	1	K2	2(K2&K2)	1(K4)
5	CO5	UptoK4	1	K1-K2	1	K2	2(K3&K3)	1(K4)
No. of Questions to be Asked			10		5		5	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
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.16	33
K2	5	10	20	-	35	29.16	
K3	-		30	30	60	50	50
K4	-	-	-	20	20	16.67	17
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q.No	**CO**	**K Level**	**Questions**
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K2	
17) b	CO2	K2	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q.No	**CO**	**K Level**	**Questions**
21	CO1	K3	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**TECHNOLOGY OF ICE CREAM AND FROZEN DESSERTS-PRACTICAL**									
Course Code	**21UFDSP3**							**L**	**P**	**C**
Category	**Skill-Practical**							**-**	**2**	**2**
Nature of course:	EMPLOYABILITY		**SKILL ORIENTED**	✓	ENTREPRENEURSHIP					

Course Objectives:

- To remember the preparation methods of ice cream.
- To estimate different parameters in ice cream.
- To analyze overrun in ice cream.
- To give training on preparing variety of ice cream.
- To understand basic concepts of ice cream.

Course Content:

1. Preparation of Ice cream mix –I (standardization, blending, Homogenization)
2. Preparation of Ice cream mix-II (Pasteurization, cooling, ageing and flavor addition)
3. Preparation of fruit and Nut ice cream.
4. Preparation of chocolate ice cream.
5. Preparation of probiotic ice cream
6. Estimation of carbohydrate, fat, protein ,minerals and overrun in ice cream.
7. Preparation of Ice Lollies
8. Preparation of Kulfi.
9. Nutritional Labeling in ice cream.
10. Visit to Ice cream Industry.

Books for Study:

1. A.Jana,Suneeta Pinto,P.R.S.Moorthy,Ice Cream and Frozen Desserts.

Books for References:

1. Ice cream,H.Douglas Goff,Richard W.Hartel,seventh edition,springer

Web Resources:

1.https://egyankosh.ac.in/bitstream/123456789/9620/1/EXPERIMENT13.pdf
2. http://www.teachnlearnchem.com/Solutions/PDF/Ice%20Cream%20Lab.pdf

Course Outcomes		**K Level**
On Successful Completion of Course the student will be able to,		
CO1:	Remember the different methods of preparation.	**K2**
CO2:	Understand the technologies to estimate different types of ice cream.	**K3**
CO3:	Apply different methods of technologies.	**K3**
CO4:	Analyze skills in handling appliances in laboratories.	**K4**
CO5:	Examine the product quality with reference to standard specifications.	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	2	2	1	2	1	2
CO 2	2	2	2	1	1	3
CO 3	1	1	2	2	2	2
CO 4	1	3	2	1	2	2
CO 5	2	2	2	2	1	2

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
1	Preparation of Ice cream mix –I (standardization, blending, Homogenization).	2	Laboratory
2	Preparation of Ice cream mix-II (Pasteurization, cooling, ageing and flavor addition)	2	Laboratory
3	Preparation of fruit and Nut ice cream.	3	Laboratory
4	Preparation of chocolate ice cream.	2	Laboratory
5	Preparation of probiotic ice cream	2	Laboratory
6	Estimation of carbohydrate, fat, protein, minerals and overrun in ice cream.	2	Laboratory
7	Preparation of Ice Lollies	2	Laboratory
8	Preparation of Kulfi.	2	Laboratory
9	Nutritional Labeling in ice cream.	2	Laboratory
10	Visit to Ice cream Industry	3	Laboratory

Course Designed by: **G. MEENAKSHI , P V GOPIMANIVANNAN**


SIXTH SEMESTER

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**FOOD QUALITY AND SENSORY EVALUATION**							
Course Code	**21UFDC61**					**L**	**P**	**C**
Category	**Core Elective**					6	-	4
Nature of course:	**EMPLOYABILITY**	✓	SKILL ORIENTED		ENTREPRENURSHIP			

Course Objectives:

- To describe the quality attributes of food.
- To discuss and demonstrate the various gustation attributes.
- To give training to analyze different products.
- To analyze and evaluate the sensory quality of the products.
- To build and develop sensory analysis skills.

Unit: I	**Introduction to organoleptic properties of food**	**15**

Appearance, flavor, textural factors and additional quality factors.

Unit: II	**Gustation**	**15**

Introduction and importance of gustation. Structure and physiology of taste organs- tongue, papillae, taste buds, salivary glands. Mechanism of taste perception. Chemical dimensions of basic tastes- sweet, salt, sour, bitter and umami. Factors affecting taste quality, reaction time, taste modification, absolute and recognition threshold.

Unit: III	**Olfaction**	**15**

Introduction, definition and importance of odour and flavor Anatomy of nose, physiology of odour perception. Mechanism of odour perception. Theories of odour classification, chemical specificity of odour. Olfactory abnormalities.

Unit: IV	**Colour**	**15**

Introduction and importance of colour, Dimensions of colour and attributes of colour; gloss etc. Perception of colour. Colour Measurement: Munsell colour system, CIE colour system, Hunter colour system, etc. Colour abnormalities

Unit: V	**Texture**	**15**

Introduction, definition and importance of texture. Texture perception, receptors involved in texture perception. Rheology of foods. Texture classification. Application of texture measurement in cereals, fruits and vegetables, dairy, meat and meat products

	Total Lecture Hours	**75 Hrs**

Books for Study:

1. Rao E. S. (2013). Food Quality Evaluation. Variety Books.
2. Pomeranz Y and Meloan CE (2002). Food Analysis – Theory and Practice, CBS Publishers and Distributors, New Delhi.

Books for References:

1. deMan J. (2007). Principles of Food Chemistry, 3rd ed., Springer.
2. Meilgard (1999). Sensory Evaluation Techniques, 3rd ed. CRC Press LLC, 1999.
3. Amerine, Pangborn & Roessler (1965). Principles of Sensory Evaluation of food, Academic Press, London.

Web Resources:		
1. http://ecoursesonline.iasri.res.in/mod/page/view.php?id=6033		
Course Outcomes		**K Level**
On Successful Completion of Course the student will be able to,		
CO1:	Remember the quality characteristics of different foods.	**K3**
CO2:	Understand the quality of food products.	**K4**
CO3:	Apply different methods of Preparation.	**K3**
CO4:	Evaluate the Sensory quality of the prepared products.	**K4**
CO5:	Examine sensory Analysis.	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**2**	**2**	**2**	**3**	**1**	**2**
CO 2	**2**	**2**	**2**	**3**	**1**	**3**
CO 3	**2**	**1**	**1**	**1**	**2**	**2**
CO 4	**3**	**2**	**2**	**3**	**2**	**2**
CO 5	**3**	**1**	**1**	**3**	**1**	**1**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	**Introduction to organoleptic properties of food:** Appearance, flavour, textural factors and additional quality factors.	15	PPT, Chalk & Talk, e-learning tools
II	**Gustation:** Introduction and importance of gustation. Structure and physiology of taste organs- tongue, papillae, taste buds, salivary glands. Mechanism of taste perception. Chemical dimensions of basic tastes- sweet, salt, sour, bitter and umami. Factors affecting taste quality, reaction time, taste modification, absolute and recognition threshold.	15	PPT, Chalk & Talk, Assignments, E-books
III	**Olfaction**: Introduction, definition and importance of odour and flavor Anatomy of nose, physiology of odour perception. Mechanism of odour perception. Theories of odour classification, chemical specificity of odour. Olfactory abnormalities.	15	PPT, Chalk & Talk, e-learning tools, E-books
IV	**Colour:** Introduction and importance of colour, Dimensions of colour and attributes of colour; gloss etc. Perception of colour. Colour Measurement: Munsell colour system, CIE colour system, Hunter colour system, etc. Colour abnormalities	15	PPT, Chalk & Talk, Seminar, E-books
V	**Texture:** Introduction, definition and importance of texture. Texture perception, receptors involved in texture perception. Rheology of foods. Texture classification. Application of texture measurement in cereals, fruits and vegetables, dairy, meat and meat products	15	PPT, Chalk & Talk, Assignments, e-learning tools

Course Designed by: MS. M. RAGADEEPA, MS. G. BHARATHI

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	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		
CI AI	CO1	UptoK3	2	K1	1	K2	2(K2&K2)	1(K2)
	CO2	UptoK4	2	K2	2	K2	2(K3&K3)	1(K3)
CI AII	CO3	UptoK3	2	K1	1	K2	2(K2&K2)	1(K3)
	CO4	UptoK4	2	K2	2	K2	2(K3&K3)	1K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	-	-	-	2	4	60
	K2	2	6	10	10	28	56	
	K3	-	-	10	10	20	40	40
	K4	-	-	-		-	-	
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	-	-	-	2	4	40
	K2	2	6	10	-	18	36	
	K3	-	-	10	10	20	40	40
	K4	-	-	-	10	10	20	20
	Marks	4	6	20	20	50	100	100

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, analyzing, presentation and make inferences with evidences
CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	UptoK3	1	K1-K2	1	K2	2(K3&K3)	1(K3)
2	CO2	UptoK4	1	K1-K2	1	K2	2(K2&K2)	1(K3)
3	CO3	UptoK3	1	K1-K2	1	K2	2(K3&K3)	1(K3)
4	CO4	UptoK4	1	K1-K2	1	K2	2(K2&K2)	1(K4)
5	CO5	UptoK4	1	K1-K2	1	K2	2(K3&K3)	1(K4)
No. of Questions to be Asked			10		5		5	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
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.16	33
K2	5	10	20	-	35	29.16	
K3	-		30	30	60	50	50
K4	-	-	-	20	20	16.67	17
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q.No	**CO**	**K Level**	**Questions**
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K2	
17) b	CO2	K2	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q.No	**CO**	**K Level**	**Questions**
21	CO1	K3	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**IN PLANT TRAINING**								
Course Code	**21UFDIP1**						**L**	**P**	**C**
Category	**Core**						**6**	**-**	**4**
Nature of course:	**EMPLOYABILITY**	✓	SKILL ORIENTED		ENTREPRENEURSHIP				

Course Objectives:

- Gain knowledge about food and dairy industries.
- Know various technologies involved in food industries.
- Understand different processing methods of food.
- Analyze different kinds of packaging materials of foods.
- Apply chemical, microbiological and nutritional analysis of food.

Course Content:

Each Group – 4 members
Area of learning – Raw material procurement, quality checking, processing & packaging Methods
Record submission – A hard bound report to be submitted to the Department.
Evaluation – Project (oral) presentation followed by a brief Viva

Course Description

The Project is conducted by the following Course Pattern.

Internal

Presentation Submission	**} 40**
External Project Report Viva Voce	**} 60**
Total	**100**

Course Outcomes		**K Level**
On Successful Completion of Course the student will be able to,		
CO1:	Indentify different analysis of food product development and storage.	**K1**
CO2:	Explain the technologies learned throughout degree.	**K2**
CO3:	Apply the knowledge of developing a product and evaluation.	**K3**

CO4:	Analyze the shelf life and preservation of products.	**K4**
CO5:	Discover new products and innovations.	**K3**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**2**	**1**	**2**	**2**	**1**	**2**
CO 2	**2**	**2**	**2**	**3**	**1**	**1**
CO 3	**3**	**1**	**1**	**1**	**2**	**1**
CO 4	**2**	**2**	**2**	**2**	**2**	**1**
CO 5	**1**	**1**	**1**	**1**	**1**	**1**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**PROJECT AND VIVA – VOCE**							
Course Code	**21UFDPR1**					**L**	**P**	**C**
Category	**Core**					**6**	**-**	**4**
Nature of course:	**EMPLOYABILITY**	✓	**SKILL ORIENTED**	✓	ENTREPRENEURSHIP			

- **Course Objectives:**
- Know various preservation techniques and storage methods of foods.
- Gain knowledge about developing a new food product.
- Apply ideas of food testing and microbial testing.
- Understand the concept of nutritional analysis and cost fixing.
- Apply knowledge of novel technologies in food and dairy.

Course Content:

Group – 4 Member
Record submission – A hard bound report to be submitted to the Department.
Evaluation – Project (oral) presentation followed by a brief Viva
Internal 40 Marks (Course teacher)
External 60 Marks (Course teacher & External member from other department)

Course Description

The Project is conducted by the following Course Pattern.

Internal
Presentation
Submission } **40**
External
Project Report
Viva Voce } **60**

Total **100**

Course Outcomes		K Level
On Successful Completion of Course the student will be able to,		
CO1:	Indentify different technologies involved in food industries.	K1
CO2:	Explain various departments of food industries.	K2
CO3:	Apply theoretical knowledge at food and dairy industry.	K3
CO4:	Analyze different machineries and products.	K4
CO5:	Evaluate processing methods involved in food and dairy industries.	K3

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	2	1	2	2	1	2
CO 2	2	2	2	1	1	1
CO 3	1	1	1	1	2	2
CO 4	2	2	2	2	1	1
CO 5	1	1	1	1	2	1

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**FUNCTIONAL FOODS AND NUTRACEUTICALS**							
Course Code	**21UFDE61**					**L**	**P**	**C**
Category	**Core Elective**					5	-	5
Nature of course	**EMPLOYABILITY**	✓	SKILL ORIENTED		ENTREPRENURSHIP			

Course Objectives:

- To Understand about functional foods and its properties
- To Understand regarding Metabolic disorders and its relation with functional foods.
- To Learn the benefits of fortification in Food supplements
- To Understand the importance of Prebiotic and probiotic foods
- To Solve problems to new situations by applying Nutraceuticals knowledge

Unit: I	**Introduction to Nutraceuticals**	**15**

Historical Reviews- Teleology of nutraceuticals- Organization models for nutraceuticals – Classification of Nutraceuticals based on the sources– Animal, Plant and Microbial – Nutraceuticals in specific foods.

Unit: II	**Food recommended for metabolic disorder**	**15**

Food recommended and restricted in metabolic disorders and disturbances, gastrointestinal disorders; fever and infection; liver, blood, circulatory and cardiac diseases; urinary and musculo skeletal diseases; allergies**.**

Unit: III	**Nutritional deficiencies**	**15**

Nutritional deficiencies and its correction trough fortification and supplementation of foods. Beneficial effect of spices, honey, spirulina etc.

Unit: IV	**Health benefits of Micronutrients**	**15**

Health benefits/ mode of action of PUFA/gamma linolenic acids, antioxidants, dietary fiber, oligosaccharides, sugar alcohols, peptides and proteins, glycosides, alcohols, iso- prenoides and vitamins, choline, LAB, phenolics, flavonols, minerals

Unit: V	**Herbs as Functional foods**	**15**

Herbal medicine–Herbs as ingredients in functional foods–actions of herbal and evidence of efficacy, Cruciferous vegetables and cancer prevention, Evolution of marketing environment for Functional foods and Nutraceuticals.

	Total Lecture Hours	**75 Hrs**

Books for Study:

1.Rao, D.G. 2010. Fundamentals of Food Engineering. PHI Learning private Ltd.

2. Singh, R. P and Heldman, D. R. 2009. Introduction to Food Engineering.Academic press 4th edition.

Books for References:

1. Developing New Functional Food and Nutraceutical Products –Cookbook- USA
2.Essential of functional foods –Marry scheward-Springer publication

Web Resources:

1. https://www.fda.gov.tw/upload/189/content/20140128170435362 59.pdf

Course Outcomes		**K Level**
CO1:	Define the concept of Nutraceuticals	**K3**
CO2:	Classify the Bio available compound in food	**K4**

CO3:	Explain the techniques used in Food recommended for metabolic disorder	**K3**
CO4:	Build the knowledge on supplementation in foods	**K4**
CO5:	Examine the marketing environment for Functional foods	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**3**	**2**	**2**	**3**	**1**	**2**
CO 2	**2**	**2**	**2**	**3**	**1**	**1**
CO 3	**2**	**1**	**1**	**1**	**1**	**1**
CO 4	**2**	**2**	**2**	**2**	**2**	**1**
CO 5	**2**	**1**	**1**	**2**	**1**	**1**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Historical Reviews- Teleology of nutraceuticals- Organization models for nutraceuticals – Classification of Nutraceuticals based on the sources– Animal, Plant and Microbial – Nutraceuticals in specific foods.	**15**	**PPT, Chalk & Talk, E-books**
II	Food recommended and restricted in metabolic disorders and disturbances, gastrointestinal disorders; fever and infection; liver, blood, circulatory and cardiac diseases; urinary and musculo skeletal diseases; allergies**.**	**15**	**PPT, Chalk & Talk, Seminar, e-learning tools**
III	Nutritional deficiencies and its correction trough fortification and supplementation of foods. Beneficial effect of spices, honey, spirulina etc.	**15**	**PPT, Chalk & Talk, Assignments, e-learning tools**
IV	Health benefits/ mode of action of PUFA/gamma linolenic acids, antioxidants, dietary fiber, oligosaccharides, sugar alcohols, peptides and proteins, glycosides, alcohols, iso- prenoides and vitamins, choline, LAB, phenolics, flavonols, minerals	**15**	**PPT, Chalk & Talk, Seminar, E-books**
V	Herbal medicine–Herbs as ingredients in functional foods–actions of herbal and evidence of efficacy, Cruciferous vegetables and cancer prevention, Evolution of marketing environment for Functional foods and Nutraceuticals.	**15**	**PPT, Chalk & Talk, Industrial Visit, E-books**

Course Designed by: **Ms.G.BHARATHI & Ms. M.RAGADEEPA**

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	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		
CI AI	CO1	UptoK3	2	K1	1	K2	2(K2&K2)	1(K2)
	CO2	UptoK4	2	K2	2	K2	2(K3&K3)	1(K3)
CI AII	CO3	UptoK3	2	K1	1	K2	2(K2&K2)	1(K3)
	CO4	UptoK4	2	K2	2	K2	2(K3&K3)	1K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	-	-	-	2	4	60
	K2	2	6	10	10	28	56	
	K3	-	-	10	10	20	40	40
	K4	-	-	-		-	-	
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	-	-	-	2	4	40
	K2	2	6	10	-	18	36	
	K3	-	-	10	10	20	40	40
	K4	-	-	-	10	10	20	20
	Marks	4	6	20	20	50	100	100

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, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S. No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	UptoK3	1	K1-K2	1	K2	2(K3&K3)	1(K3)
2	CO2	UptoK4	1	K1-K2	1	K2	2(K2&K2)	1(K3)
3	CO3	UptoK3	1	K1-K2	1	K2	2(K3&K3)	1(K3)
4	CO4	UptoK4	1	K1-K2	1	K2	2(K2&K2)	1(K4)
5	CO5	UptoK4	1	K1-K2	1	K2	2(K3&K3)	1(K4)
No. of Questions to be Asked			10		5		5	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
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.16	33
K2	5	10	20	-	35	29.16	
K3	-		30	30	60	50	50
K4	-	-	-	20	20	16.67	17
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q. No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q. No	**CO**	**K Level**	**Questions**
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q. No	**CO**	**K Level**	**Questions**
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K2	
17) b	CO2	K2	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q. No	**CO**	**K Level**	**Questions**
21	CO1	K3	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**TECHNOLOGY OF POULTRY AND MEAT PROCESSING**			
Course Code	**21UFDE62**	**L**	**P**	**C**
Category	**Core Elective**	**5**	**-**	**5**

Nature of course:	**EMPLOYABILITY**	✓	SKILL ORIENTED		ENTREPRENURSHIP	

Course Objectives:

- To understand the characteristics of poultry meat.
- To enable the students to know about the methods of slaughtering.
- To analyze the technology for processing of poultry meat.
- To expose the students to poultry meat processing industry.
- To disseminate the preservation techniques of meat.

Unit: I	**Meat**	**15**

Introduction- characteristics of poultry meat-composition of carcass- muscle structure -Factors influencing the quality of meat- Meat Microbiology and safety.

Unit: II	**Slaughtering**	**15**

Slaughtering- Ante mortem inspection and handling, Stunning types, Slaughtering types. Steps in slaughtering (Pig, Cattle, Sheep/Goat) and dressing .Slaughter house operations-Hoisting rail and traveling pulley system; Modern abattoirs, typically out and features, Offal handling and inspection. Grading of meat-retail and whole sale cuts. Operational factors affecting meat quality. By product utilization.

Unit: III	**Processing and preservation of meat**	**15**

Chilling and freezing of meat-Canning- cooking- drying-pickling-curing and Smoking- prepared meat products like sausages-kebabs etc.- Intermediate moisture and dried meat products, Packaging of meat products. Tenderizing agents.

Unit: IV	**Poultry**	**15**

Methods of slaughtering-Slaughtering equipment and operations- dressing-handling- storage and preservation of poultry meat-Spoilage and its control-Freezing and chillingof poultry-Whole sale and retail cuts- Eggs- Composition-handling-candeling- washing-coating- packaging and storage.

Unit: V	**Meat hygiene and sanitation in meat and poultry industry**	**15**

Meat hygiene-principles of meat hygiene-possible sources of contamination-Control Measures-Good hygiene practices in meat processing-HACCP-Cleaning and sanitation.

	Total Lecture Hours	**75Hrs**

Books for Study:

1. Legarreta,I.G. " Handbook of Poultry Science and Technology"(Volume I and Volume II),John Wiley &Sons,Inc., Hoboken, 2010

Books for References:

1. Mead M. "Poultry Meat Processing and Quality". Wood head Publ. 2004.
2. Pearson, A.M.&Gillett, T.A. " Processed Meat". 3rdEd. Chapman &Hall, 2006.
3.Marine Products Export Review by MPEDA publications

Web Resources:

1. http://ecoursesonline.iasri.res.in/mod/resource/view.php?id=147721

2. https://www.fao.org/3/ai407e/ai407e.pdf		
Course Outcomes		**K Level**
CO1:	Identify the carcass	**K3**
CO2:	Explain the composition	**K4**
CO3:	Apply knowledge in preparation methods.	**K3**
CO4:	Analyze the processing techniques.	**K4**
CO5:	Discover the new methods for hygiene.	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**1**	**2**	**3**	**3**	**2**	**2**
CO 2	**2**	**2**	**2**	**2**	**1**	**2**
CO 3	**3**	**3**	**1**	**2**	**1**	**2**
CO 4	**2**	**2**	**3**	**1**	**2**	**2**
CO 5	**2**	**1**	**2**	**3**	**2**	**1**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	**Meat-** Introduction- characteristics of poultry meat-composition of carcass- muscle structure -Factors influencing the quality of meat-Meat Microbiology and safety.	15	PPT, Chalk & Talk, E-books
II	**Slaughtering-** Ante mortem inspection and handling, Stunning types, Slaughtering types. Steps in slaughtering (Pig, Cattle, Sheep/Goat)and dressing .Slaughter house operations-Hoisting rail and traveling pulley system; Modern abattoirs, typically out and features, Offal handling and inspection. Grading of meat-retail and whole sale cuts. Operational factors affecting meat quality. By product utilization .	15	PPT, Chalk & Talk, Assignments, e-learning tools
III	**Processing and preservation of meat-** Chilling and freezing of meat-Canning- cooking- drying-pickling-curing and Smoking-prepared meat products like sausages-kebabs etc.- Intermediate moisture and dried meat products, Packaging of meat products. Tenderizing agents.	15	PPT, Chalk & Talk, Seminar, E-books
IV	**Poultry-** Methods of slaughtering-Slaughtering equipment and operations- dressing-handling- storage and preservation of poultry meat-Spoilage and its control-Freezing and chilling of poultry-Whole sale and retail cuts- Eggs- Composition-handling-candeling-washing-coating- packaging and storage.	15	PPT, Chalk & Talk, Seminar, E-books
V	**Meat hygiene and sanitation in meat and poultry industry-** Meat hygiene-principles of meat hygiene-possible sources of contamination-Control Measures-Good hygiene practices in meat processing-HACCP-Cleaning and sanitation.	15	PPT, Chalk & Talk, Industrial Visit, E-books

Course Designed by: G.MEENAKSHI & P V GOPIMANIVANNAN

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	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		
CI AI	CO1	UptoK3	2	K1	1	K2	2(K2&K2)	1(K2)
	CO2	UptoK4	2	K2	2	K2	2(K3&K3)	1(K3)
CI AII	CO3	UptoK3	2	K1	1	K2	2(K2&K2)	1(K3)
	CO4	UptoK4	2	K2	2	K2	2(K3&K3)	1K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	-	-	-	2	4	60
	K2	2	6	10	10	28	56	
	K3	-	-	10	10	20	40	40
	K4	-	-	-		-	-	
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	-	-	-	2	4	40
	K2	2	6	10	-	18	36	
	K3	-	-	10	10	20	40	40
	K4	-	-	-	10	10	20	20
	Marks	4	6	20	20	50	100	100

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, analyzing, presentation and make inferences with evidences
CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S. No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	UptoK3	1	K1-K2	1	K2	2(K3&K3)	1(K3)
2	CO2	UptoK4	1	K1-K2	1	K2	2(K2&K2)	1(K3)
3	CO3	UptoK3	1	K1-K2	1	K2	2(K3&K3)	1(K3)
4	CO4	UptoK4	1	K1-K2	1	K2	2(K2&K2)	1(K4)
5	CO5	UptoK4	1	K1-K2	1	K2	2(K3&K3)	1(K4)
No. of Questions to be Asked			10		5		5	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
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.16	33
K2	5	10	20	-	35	29.16	
K3	-		30	30	60	50	50
K4	-	-	-	20	20	16.67	17
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q. No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q. No	**CO**	**K Level**	**Questions**
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q. No	**CO**	**K Level**	**Questions**
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K2	
17) b	CO2	K2	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q. No	**CO**	**K Level**	**Questions**
21	CO1	K3	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**EFFLUENT TREATMENT AND ENVIRONMENTAL SAFETY**							
Course Code	**21UFDE63**					**L**	**P**	**C**
Category	**Core Elective**					5	-	5
Nature of course:	EMPLOYABILITY	✓	SKILL ORIENTED		ENTREPRENURSHIP			

Course Objectives:

- To disseminate the knowledge to waste water treatment in dairy plants.
- To understand the environmental issues and remedial measures.
- To analyze the types of waste water treatment.
- To predict and characterize the impact of pollutants on the environment.
- To enable the students to recycle and utilize the dairy wastes.

Unit: I	**Effluent Treatment**	**15**
Introduction-Meaning-Treatment process-process concept –process unit-unit description and operation.		
Unit: II	**Types of waste water treatment process**	**15**
ETP-STP-CETP-Meaning-Types- Primary Treatment –Secondary Treatment-Advantages-Estimation of BOD and COD.		
Unit: III	**Dairy waste**	**15**
Meaning-General characteristics of dairy waste-waste discharged from dairy industry-sources of dairy waste water-components of dairy waste water-Treatment of waste water system.		
Unit: IV	**Waste Management**	**15**
Definition- Types of wastes in food processing plants-waste minimization-process control-solid waste management.		
Unit: V	**Pollution: causes ,effects and control measures**	**15**
Meaning-Types of pollution-Primary pollutants-secondary pollutants-effects of pollution-control measures.		
	Total Lecture Hours	**75Hrs**

Books for Study:

1.V.Vijaya Geetha, Department of dairy Technology,SVVU ,Tirupathi,Dairy Plant Management and pollution control.

Books for References:

1.Anantha Krishnan, C.P., **Technology of milk processing**, Sri Lakshmi Publications,(1991),Chennai -10.

2.Subhasish Biswas, Subhash Kumar Battacharyya, **Milk and milk products technology**,Jaypee Brothers medical publishers (P) Ltd, (2006),New Delhi.

3.Dalzall, J. M. **Food Industry and the Environment-** Springer publication

Web Resources:

1. https://neoakruthi.com/blog/effluent-treatment-plant-1.html.
2. https://www.netsolwater.com/what-is-effluent-treatment-plant-and-etp-working-process.php?blog=107.

3. https://vikaspedia.in/health/sanitation-and-hygiene/effluent-treatment-plant. **4. https://www.yourarticlelibrary.com/water/types-of-wastewater-treatment-process-etp-stp-and-cetp/27418**	
Course Outcomes	**K Level**
CO1: To describe methods for waste water treatment.	**K3**
CO2: To understand the different waste water treatment process.	**K4**
CO3: To apply the tools for effluent treatment .	**K3**
CO4: To interpret and evaluate the results.	**K4**
CO5: To grasp the microbiological processes in the activated sludge process.	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**1**	**2**	**3**	**3**	**2**	**2**
CO 2	**2**	**2**	**2**	**3**	**1**	**3**
CO 3	**2**	**3**	**1**	**1**	**2**	**2**
CO 4	**2**	**2**	**3**	**3**	**2**	**2**
CO 5	**3**	**1**	**2**	**3**	**2**	**1**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	**Effluent treatment-**Introduction-Meaning-Treatment process-process concept –process unit-unit description and operation.		**PPT, Chalk & Talk, E-books**
II	**Types of waste water treatment process** -ETP-STP-CETP-Meaning-Types- Primary Treatment –Secondary Treatment-Advantages-Estimation of BOD and COD.	**15**	**PPT, Chalk & Talk, e-learning tools**
III	**Dairy waste** -Meaning-General characteristics of dairy waste-waste discharged from dairy industry-sources of dairy waste water-components of dairy waste water-Treatment of waste water system.	**15**	**PPT, Chalk & Talk, Assignments, E-books**
IV	**Waste Management** -Definition- Types of wastes in food processing plants-waste minimization-process control-solid waste management.	**15**	**PPT, Chalk & Talk, Seminar, e-learning tools**
V	**Pollution: causes ,effects and control measures** -Meaning-Types of pollution-Primary pollutants-secondary pollutants-effects of pollution-control measures.	**15**	**PPT, Chalk & Talk, e-learning tools, Seminar**

Course Designed by: G.MEENAKSHI & P V GOPIMANIVANNAN

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	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		
CI AI	CO1	UptoK3	2	K1	1	K2	2(K2&K2)	1(K2)
	CO2	UptoK4	2	K2	2	K2	2(K3&K3)	1(K3)
CI AII	CO3	UptoK3	2	K1	1	K2	2(K2&K2)	1(K3)
	CO4	UptoK4	2	K2	2	K2	2(K3&K3)	1K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	-	-	-	2	4	60
	K2	2	6	10	10	28	56	
	K3	-	-	10	10	20	40	40
	K4	-	-	-		-	-	
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	-	-	-	2	4	40
	K2	2	6	10	-	18	36	
	K3	-	-	10	10	20	40	40
	K4	-	-	-	10	10	20	20
	Marks	4	6	20	20	50	100	100

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, analyzing, presentation and make inferences with evidences
CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S. No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	UptoK3	1	K1-K2	1	K2	2(K3&K3)	1(K3)
2	CO2	UptoK4	1	K1-K2	1	K2	2(K2&K2)	1(K3)
3	CO3	UptoK3	1	K1-K2	1	K2	2(K3&K3)	1(K3)
4	CO4	UptoK4	1	K1-K2	1	K2	2(K2&K2)	1(K4)
5	CO5	UptoK4	1	K1-K2	1	K2	2(K3&K3)	1(K4)
No. of Questions to be Asked			10		5		5	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
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.16	33
K2	5	10	20	-	35	29.16	
K3	-		30	30	60	50	50
K4	-	-	-	20	20	16.67	17
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q. No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q. No	**CO**	**K Level**	**Questions**
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q. No	**CO**	**K Level**	**Questions**
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K2	
17) b	CO2	K2	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q. No	**CO**	**K Level**	**Questions**
21	CO1	K3	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**VALUE ADDED DAIRY PRODUCTS**							
Course Code	**21UFDE64**					**L**	**P**	**C**
Category	**Core Elective**					**5**	**-**	**5**
Nature of course:	EMPLOYABILITY		SKILL ORIENTED		**ENTREPRENURSHIP**			✓

Course Objectives:

- To understand the meaning of value addition.
- To acquire knowledge on various values added dairy products.
- To apply the methodology of preparation.
- To analyze the nutritive value.
- To expose the students to various values added products industry.

Unit: I	**Value added Dairy products**	**15**

Definition –need of value addition – Reason for value addition-globalization of traditional dairy products –classification of traditional milk products.

Unit: II	**Heat desiccated milk products**	**15**

Khoa – Classification- methods of manufacture – Factors affecting yield of khoa –yield and cost analysis of khoa-Confections made from khoa –burfi, peda, milkcake, kalakand, gulabjamun, rabri, malai, khurchan, basundhi – composition – manufacturing practices – Nutritive value

Unit: III	**Heat acid coagulated product**	**15**

Paneer: definition-mechanization of paneer manufacturing - paneer based products – storage and packaging and preservation methods – Nutritive value of paneer.

Unit: IV	**Channa based products**	**15**

Chhana – Product description- methods of manufacture- packaging and preservation-Chhana based sweets – Rasogolla-Sandesh, Rasmalai, and Chhana podo - their manufacturing practices-compositional profile and mechanization of manufacturing process including packaging

Unit: V	**Milk based pudding desserts**	**15**

Kheer and Payasam – Product description -methods of manufacture- sensory evaluation- value added dairy products –definition –types – method of manufacture – packaging processes (canning) –interaction between milk and cereal constituents- yield and cost benefit analysis.

	Total Lecture Hours	**75Hrs**

Books for Study:

1.Aneja.R.P, B.N Mathur, R.C Chandra and A.K. Banerjee 2002,Technology of Indian Milk and Milk Products, Dairy India Publication.

Books for References:

1.Dairy India year book 2007 & 2017, A- 25 Priyadarshinivihar, Delhi 110092, India.

2. David.J, 2009 “Technologies advanced in indigenous milk products” published by KitabMahal, 22-A, Sarojini Naidu Marg, Allahabad (2nded).

3. Eeckless C.H, W.B Combs and H.Mecy (1955), Milk and Milk Products, Tata McGraw Hill Publishing Co.Pvt.Ltd. New Delhi.

4. Sukumar De (1980), Outlines of Dairy Technology, Oxford University Press, New Delhi.

Web Resources:

1. https://krishijagran.com/featured/value-addition-of-milk-and-milk-

products/#:~:text=Value%2Dadded%20products%20include%20cheese,simply%20mixing%20with%20liquid%20milk.		
Course Outcomes		**K Level**
CO1:	Identify the different types of value added products.	**K3**
CO2:	Explain the methods of preparation.	**K4**
CO3:	Apply knowledge on preparing the products by own.	**K3**
CO4:	Analyze the Nutritive value of the products.	**K4**
CO5:	Discover the new ideas about the value added products.	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**1**	**2**	**3**	**3**	**2**	**2**
CO 2	**2**	**2**	**2**	**3**	**1**	**3**
CO 3	**2**	**3**	**1**	**1**	**2**	**2**
CO 4	**3**	**2**	**2**	**2**	**2**	**2**
CO 5	**2**	**1**	**2**	**2**	**2**	**1**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Value added dairy Products-Definition –need of value addition – Reason for value addition-globalization of traditional dairy products –classification of traditional milk products.	15	PPT, Chalk & Talk, e-learning tools
II	**Heat desiccated milk products** -Khoa – Classification-methods of manufacture – Factors affecting yield of khoa – yield and cost analysis of khoa-Confections made from khoa – burfi, peda, milkcake, kalakand, gulabjamun, rabri, malai, khurchan, basundhi – composition – manufacturing practices – Nutritive value	15	PPT, Chalk & Talk, Assignments, E-books
III	**Heat acid coagulated product** Paneer: definition-mechanization of paneer manufacturing - paneer based products – storage and packaging and preservation methods – Nutritive value of paneer.	15	PPT, Chalk & Talk, Seminar, e-learning tools
IV	**Channa based products-**Chhana – Product description-methods of manufacture- packaging and preservation-Chhana based sweets – Rasogolla-Sandesh, Rasmalai, and Chhana podo - their manufacturing practices-compositional profile and mechanization of manufacturing process including packaging	15	PPT, Chalk & Talk, e-learning tools, Assignments
V	**Milk based pudding desserts -**Kheer and Payasam – Product description -methods of manufacture- sensory evaluation- value added dairy products –definition –types – method of manufacture – packaging processes (canning) –interaction between milk and cereal constituents- yield and cost benefit analysis	15	PPT, Chalk & Talk, e-learning tools, E-books

Course Designed by: G.MEENAKSHI & P V GOPIMANIVANNAN

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	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		
CI AI	CO1	UptoK3	2	K1	1	K2	2(K2&K2)	1(K2)
	CO2	UptoK4	2	K2	2	K2	2(K3&K3)	1(K3)
CI AII	CO3	UptoK3	2	K1	1	K2	2(K2&K2)	1(K3)
	CO4	UptoK4	2	K2	2	K2	2(K3&K3)	1K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	-	-	-	2	4	60
	K2	2	6	10	10	28	56	
	K3	-	-	10	10	20	40	40
	K4	-	-	-		-	-	
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	-	-	-	2	4	40
	K2	2	6	10	-	18	36	
	K3	-	-	10	10	20	40	40
	K4	-	-	-	10	10	20	20
	Marks	4	6	20	20	50	100	100

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, analyzing, presentation and make inferences with evidences
CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S. No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	UptoK3	1	K1-K2	1	K2	2(K3&K3)	1(K3)
2	CO2	UptoK4	1	K1-K2	1	K2	2(K2&K2)	1(K3)
3	CO3	UptoK3	1	K1-K2	1	K2	2(K3&K3)	1(K3)
4	CO4	UptoK4	1	K1-K2	1	K2	2(K2&K2)	1(K4)
5	CO5	UptoK4	1	K1-K2	1	K2	2(K3&K3)	1(K4)
No. of Questions to be Asked			10		5		5	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
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.16	33
K2	5	10	20	-	35	29.16	
K3	-		30	30	60	50	50
K4	-	-	-	20	20	16.67	17
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q. No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q. No	**CO**	**K Level**	**Questions**
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q. No	**CO**	**K Level**	**Questions**
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K2	
17) b	CO2	K2	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q. No	**CO**	**K Level**	**Questions**
21	CO1	K3	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**TECHNOLOGY OF SEA FOODS**							
Course Code	**21UFDE65**					**L**	**P**	**C**
Category	**Core Elective**					5	-	5
Nature of course:	EMPLOYABILITY		**SKILL ORIENTED**	✓	ENTREPRENURSHIP			

Course Objectives:

- Identify the nutritional components of fish
- Understand the concept of preservation
- Learn canning of fish
- Compile the fishery products processing
- Know the methods of controlling fish spoilage

Unit: I	**Introduction**	**15**

Classification of fish, Nutritional value of different types of fish, Characteristics and selection of fresh fish.

Unit: II	**Low temperature and high temperature preservation**	**15**

Freezing on board, Onshore processing, chilling and Freezing of fish. Relationship between chilling and storage life, general aspects of freezing. Changes in quality in chilled and frozen storage, thawing. Dehydration.

Unit: III	**Canning of fish**	**15**

Principles of canning, classification based on pH groupings, effect of heat processing on fish, pre-process operations, post process operations, storage of canned fish.

Unit: IV	**Fishery by-products**	**15**

Surimi- Introduction, fish muscle proteins, the surimi production process, and Fish eggs (caviar), Fish Protein Concentrates (FPC), Fish Protein Extracts (FPE), and Fish Protein Hydrolysate (FPH).

Unit: V	**Packaging and Spoilage of Fish**	**15**

Sea foods and its products - LDPE, HDPE, vacuum packaging, MAP, bottling and canning. spoilage of fish – methods of controlling spoilage (Drying and salting of fish-salting process, salting methods, preservation by smoking).

	Total Lecture Hours	**75 Hrs**

Books for Study:

1.Shahidi F and Botta JR, Seafoods: Chemistry, Processing, Technology and Quality, Blackie Academic & Professional, London, 1994.

Books for References:

1. Hall GM, Fish Processing Technology, VCH Publishers Inc., NY, 1992
2. Sen DP, Advances in Fish Processing Technology, Allied Publishers Pvt. Limited 2005

Web Resources:

1. https://ncert.nic.in/ncerts/l/lebo109.pdf

Course Outcomes	**K Level**
On Successful Completion of Course the student will be able to,	
CO1: Indentify different types of sea foods.	**K3**

CO2:	Explain methods of preservation and processing.	**K4**
CO3:	Apply awareness on preservation and processing	**K3**
CO4:	Analyze the shelf life of different types of fish	**K4**
CO5:	Discover the importance of fish industry	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**2**	**1**	**2**	**2**	**1**	**2**
CO 2	**2**	**2**	**2**	**3**	**1**	**3**
CO 3	**3**	**1**	**1**	**1**	**2**	**2**
CO 4	**2**	**2**	**2**	**2**	**2**	**2**
CO 5	**3**	**1**	**1**	**1**	**1**	**1**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	**Introduction** Classification of fish, Nutritional value of different types of fish, Characteristics and selection of fresh fish.	**15**	**PPT, Chalk & Talk, e-learning tools**
II	**Low temperature and high temperature preservation** -Freezing on board, Onshore processing, chilling and Freezing of fish. Relationship between chilling and storage life, general aspects of freezing. Changes in quality in chilled and frozen storage, thawing, Dehydration.	**15**	**PPT, Chalk & Talk, Assignments, E-books**
III	**Canning of fish** Principles of canning, classification based on pH groupings, effect of heat processing on fish, pre-process operations, post process operations, storage of canned fish.	**15**	**PPT, Chalk & Talk, Seminar, E-books**
IV	**Fishery by-products** Surimi- Introduction, fish muscle proteins, the surimi production process, and Fish eggs (caviar), Fish Protein Concentrates (FPC), Fish Protein Extracts (FPE), Fish Protein Hydrolysate (FPH).	**15**	**PPT, Chalk & Talk, Assignments, E-books**
V	**Packaging and Spoilage of Fish** Sea foods and its products - LDPE, HDPE, vacuum packaging, MAP, bottling and canning. Spoilage of fish – methods of controlling spoilage (Drying and salting of fish-salting process, salting methods, preservation by smoking).	**15**	**PPT, Chalk & Talk, Seminar, E-books**

Course Designed by: MS. G. BHARATHI, MS.M. RAGADEEPA

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	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		
CI AI	CO1	UptoK3	2	K1	1	K2	2(K2&K2)	1(K2)
	CO2	UptoK4	2	K2	2	K2	2(K3&K3)	1(K3)
CI AII	CO3	UptoK3	2	K1	1	K2	2(K2&K2)	1(K3)
	CO4	UptoK4	2	K2	2	K2	2(K3&K3)	1K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	-	-	-	2	4	60
	K2	2	6	10	10	28	56	
	K3	-	-	10	10	20	40	40
	K4	-	-	-		-	-	
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	-	-	-	2	4	40
	K2	2	6	10	-	18	36	
	K3	-	-	10	10	20	40	40
	K4	-	-	-	10	10	20	20
	Marks	4	6	20	20	50	100	100

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, analyzing, presentation and make inferences with evidences
CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S. No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	UptoK3	1	K1-K2	1	K2	2(K3&K3)	1(K3)
2	CO2	UptoK4	1	K1-K2	1	K2	2(K2&K2)	1(K3)
3	CO3	UptoK3	1	K1-K2	1	K2	2(K3&K3)	1(K3)
4	CO4	UptoK4	1	K1-K2	1	K2	2(K2&K2)	1(K4)
5	CO5	UptoK4	1	K1-K2	1	K2	2(K3&K3)	1(K4)
No. of Questions to be Asked			10		5		5	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
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.16	33
K2	5	10	20	-	35	29.16	
K3	-		30	30	60	50	50
K4	-	-	-	20	20	16.67	17
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q. No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q. No	**CO**	**K Level**	**Questions**
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q. No	**CO**	**K Level**	**Questions**
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K2	
17) b	CO2	K2	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q. No	**CO**	**K Level**	**Questions**
21	CO1	K3	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**FOOD PACKAGING TECHNOLOGY**								
Course Code	**21UFDE66**						**L**	**P**	**C**
Category	**Core Elective**						5	-	5
Nature of course:	EMPLOYABILITY		**SKILL ORIENTED**	✓	ENTREPRENURSHIP				

Course Objectives:

- Understand packaging materials and its importance in food Industry
- Adapt and utilize packaging materials for right application in Food Industry
- Standardize testing methods for packaging material to assure quality
- Consumer packaging: Important functionally, but not attitudinally
- Create testing techniques for recent trends in packaging

Unit: I	**Introduction to Food packaging**	**15**

Packaging terminology – definition, Functions of Food Package, Packaging environment. Characteristics of food stuff that influences packaging selection.

Unit: II	**Packaging systems and methods**	**15**

Cellulose and Polymeric packaging materials and forms: Food grade polymeric packaging materials, Rigid plastic packages - Regenerated cellulose film- plastic films- Aluminum foils and laminations Special packaging methods. Bio degradable packages.

Unit: III	**Packaging material and their properties**	**15**

Glass and Metal containers: Glass: Composition, Properties, Bottle making and Closures for glass containers Metal: Bulk containers; Tin-plate containers, Tin free steel containers. Biodegradable and edible packaging.

Unit: IV	**Packaging of fresh and processed foods**	**15**

Packaging of Fruits and vegetables, - Fats and Oils, Spices, meat, Poultry and sea foods, Dairy Products, Bakery, beverages, Dehydrated and frozen foods.

Unit: V	**Packaging designs and environmental issues in packaging**	**15**

Food marketing and role of packaging-Packaging aesthetic and graphic design; Packaging Laws and Regulations, Safety aspects of packaging materials; sources of toxic materials and migration of toxins into food materials.

	Total Lecture Hours	**75 Hrs**

Books for Study:

1. Robertson,G.L. "Food Packaging: Principles and Practice (2ndEdn). Taylor & Francis.2006.

Books for References:

1. Han,J.H. " Innovations in Food Packaging". Elsevier Academic Press, 2005.
2. Ahvenainen.R. "Novel Food Packaging Techniques". CRC Press. 2003.
3. Coles.R., Mc Dowell,D. and Kirwan,M.J. " Food Packaging Technology". CRC Press.2003.

Web Resources:

1. http://ecoursesonline.iasri.res.in/course/view.php?id=28

Course Outcomes	**K Level**
On Successful Completion of Course the student will be able to,	

CO1:	Identify different kinds of packaging materials.	**K3**
CO2:	Explain various Packaging systems and methods	**K4**
CO3:	Apply various Packaging material and their properties	**K3**
CO4:	Analyze the right application in Food Industry	**K4**
CO5:	Discover new technologies of packaging.	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**2**	**2**	**2**	**3**	**1**	**2**
CO 2	**2**	**2**	**2**	**3**	**1**	**3**
CO 3	**2**	**1**	**1**	**1**	**2**	**2**
CO 4	**1**	**2**	**2**	**3**	**2**	**2**
CO 5	**1**	**1**	**1**	**3**	**1**	**1**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	**Introduction to Food packaging** Packaging terminology – definition, Functions of Food Package, Packaging environment. Characteristics of food stuff that influences packaging selection.	15	PPT, Chalk & Talk, E-books
II	**Packaging systems and methods** Cellulose and Polymeric packaging materials and forms: Food grade polymeric packaging materials, Rigid plastic packages - Regenerated cellulose film-plastic films- Aluminum foils and laminations Special packaging methods. Bio degradable packages.	15	PPT, Chalk & Talk, e-learning tools
III	**Packaging material and their properties** Glass and Metal containers: Glass: Composition, Properties, Bottle making and Closures for glass containers Metal: Bulk containers; Tin-plate containers, Tin free steel containers. Biodegradable and edible packaging.	15	PPT, Chalk & Talk, Seminar, E-books
IV	**Packaging of fresh and processed foods** Packaging of Fruits and vegetables, - Fats and Oils, Spices, meat, Poultry and sea foods, Dairy Products, Bakery, beverages, Dehydrated and frozen foods.	15	PPT, Chalk & Talk, Assignments, E-books
V	**Packaging designs and environmental issues in packaging** Food marketing and role of packaging-Packaging aesthetic and graphic design; Packaging Laws and Regulations, Safety aspects of packaging materials; sources of toxic materials and migration of toxins into food materials.	15	PPT, Chalk & Talk, Assignments, e-learning tools

Course Designed by: MS.M. RAGADEEPA, MS. G. BHARATHI

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	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		
CI AI	CO1	UptoK3	2	K1	1	K2	2(K2&K2)	1(K2)
	CO2	UptoK4	2	K2	2	K2	2(K3&K3)	1(K3)
CI AII	CO3	UptoK3	2	K1	1	K2	2(K2&K2)	1(K3)
	CO4	UptoK4	2	K2	2	K2	2(K3&K3)	1K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	-	-	-	2	4	60
	K2	2	6	10	10	28	56	
	K3	-	-	10	10	20	40	40
	K4	-	-	-		-	-	
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	-	-	-	2	4	40
	K2	2	6	10	-	18	36	
	K3	-	-	10	10	20	40	40
	K4	-	-	-	10	10	20	20
	Marks	4	6	20	20	50	100	100

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, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S. No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	UptoK3	1	K1-K2	1	K2	2(K3&K3)	1(K3)
2	CO2	UptoK4	1	K1-K2	1	K2	2(K2&K2)	1(K3)
3	CO3	UptoK3	1	K1-K2	1	K2	2(K3&K3)	1(K3)
4	CO4	UptoK4	1	K1-K2	1	K2	2(K2&K2)	1(K4)
5	CO5	UptoK4	1	K1-K2	1	K2	2(K3&K3)	1(K4)
No. of Questions to be Asked			10		5		5	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
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.16	33
K2	5	10	20	-	35	29.16	
K3	-		30	30	60	50	50
K4	-	-	-	20	20	16.67	17
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q. No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q. No	**CO**	**K Level**	**Questions**
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q. No	**CO**	**K Level**	**Questions**
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K2	
17) b	CO2	K2	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q. No	**CO**	**K Level**	**Questions**
21	CO1	K3	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF FOOD AND DAIRY TECHNOLOGY
(For those who joined in 2021-2022 and after)

Course Name	**ENTREPRENEURSHIP DEVELOPMENT AND INDUSTRIAL CONSULTANCY**							
Course Code	**21UFDS61**					**L**	**P**	**C**
Category	**Skill**					2	-	2
Nature of course:	EMPLOYABILITY		SKILL ORIENTED		ENTREPRENURSHIP			✓

Course Objectives:

- To study the concepts used in Entrepreneurship
- To demonstrate the meaning, functions, types and roles of an entrepreneur
- To identify the most recognized sources of potential funding agency
- To analyze the environment setup relating to dairy industry
- To evaluate new techniques on marketing

Unit: I	**Introduction to Entrepreneurship**	**15**
Entrepreneur - Meaning - Importance - Qualities, Nature, Types, Traits, Culture. Differences between Entrepreneur and Intrapreneur. Role of Consultancy. Evolution of Entrepreneurs-Entrepreneurial Promotion: Training and Developing Motivation.		
Unit: II	**Role of Entrepreneur**	**15**
Concept of Entrepreneurship And Managerial Characteristics- Managingan Enterprise- Motivation and Entrepreneurship Development- Generation, Women Entrepreneurship		
Unit: III	**Supporting Agencies**	**15**
SIDCO, DIC,TIIC, NSIC, MSME- Objectives, Programmers', Financial assistance.		
Unit: IV	**Dairy entrepreneurship development scheme (DEDS)**	**15**
SWOT analysis for dairy industry.Dairy processing and infrastructure development fund (DIDF), National rural livelihoods mission (NRLM). Characteristics of Indian dairy industry.		
Unit: V	**Business policy**	**15**
System of milk procurement from rural milk producers. Pricing of milk and milk products. Marketing of milk and milk products. ISO/ HACCP certification for dairy plant.		
	Total Lecture Hours	**75 Hrs**

Books for Study:

1. Vasant Desai., Project Management and entrepreneurship, Himalaya Publishing House, New Delhi (2000).
2. Chunawalla S.A., Sales Management, Himalayan publishing House (1999), New Delhi.

Books for References:

1.Dr.N.Rajan Nair., Sajith R. Nair Marketing, Sutanchand and Sons, (2002), New Delhi.
2. David H. Moll., Entrepreneurship, prentice Hall of India, (1999), New Delhi.

Web Resources:

1. https://agrimoon.com/wp-content/uploads/Entrepreneurship-Development-and-Industrial-Consultancy.pdf

Course Outcomes		**K Level**
CO1:	To understand the process and procedures for entrepreneurial programmer's.	**K1**

CO2:	Explain various method used for Entrepreneurship Development	**K2**
CO3:	Apply knowledge on SWOT analysis	**K3**
CO4:	Analyze the role of Supporting Agencies	**K4**
CO5:	Discover the importance of certification in milk industry	**K3**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**2**	**2**	**2**	**3**	**1**	**2**
CO 2	**2**	**2**	**2**	**3**	**1**	**1**
CO 3	**2**	**1**	**1**	**1**	**1**	**1**
CO 4	**3**	**2**	**2**	**2**	**2**	**1**
CO 5	**2**	**1**	**1**	**2**	**1**	**1**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Entrepreneur - Meaning - Importance - Qualities, Nature, Types, Traits, Culture.Differences between Entrepreneur and Intrapreneur.Role of Consultancy. Evolution of Entrepreneurs- Entrepreneurial Promotion: Training and Developing Motivation.	**15**	**PPT, Chalk & Talk, e-learning tools**
II	Concept of Entrepreneurship And Managerial Characteristics-ManaginganEnterprise- Motivation and Entrepreneurship Development-Generation,Women Entrepreneurship.	**15**	**PPT, Chalk & Talk, Assignments, E-books**
III	SIDCO, DIC,TIIC, NSIC, MSME- Objectives, Programmers', Financial Assistance.	**15**	**PPT, Chalk & Talk, Seminar, e-learning tools**
IV	SWOT analysis for dairy industry.Dairy processing and infrastructure development fund (DIDF), National rural livelihoods mission (NRLM). Characteristics of Indian dairy industry.	**15**	**PPT, Chalk & Talk, Assignments, e-learning tools**
V	System of milk procurement from rural milk producers.Pricing of milk and milk products. Marketing of milk and milk products. ISO/ HACCP certification for dairy plant.	**15**	**PPT, Chalk & Talk, Seminar, E-books**

Course Designed by: **Ms. G.BHARATHI & Ms. P V GOPIMANIVANNAN**