ARUL ANANDAR COLLEGE (AUTONOMOUS), KARUMATHUR – 625 514

DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY

(Outcome based syllabus under CBCS structure for the students admitted from the academic year 2022 - 2023)

PROGRAMME SPECIFIC OUTCOME (PSO)

PSO1: Imparting knowledge on the field of Food Science, Nutrition, Food Engineering, Food Marketing and Food Technology.

PSO2: Proficiency in culinary skills and to describe role of ingredients in food during food preparation.

PSO3: Enables to understand food composition and its nutritional, chemical and microbiological aspects and effects of common food preparation methods and food storage conditions on survival and growth of microbial contaminants.

PSO4: Familiarize the students with the technology of pulses, oilseeds, spices, fruits, meat products processing and preservation.

PSO5: Emphasize the importance of food safety, food quality, food plant sanitation, food laws and regulations and food engineering.

ARUL ANANDAR COLLEGE (AUTONOMOUS), KARUMATHUR – 625 514
B.Sc., Food Science and Technology
(Under Choice-Based Credit System from the Academic year 2022-2023 onwards)

PART		PAPER	Hrs	Cr
I SEMESTER				
I	22UTML11/ 22UHNL11/ 22UFNL11	Tamil/ Hindi/ French	6	4
II	22UENB11	English through Prose & Short Story (Stream B)	5	4
III	22UFSC11	Core -1 Principles of Food and Nutrition	5	4
	22UFSC21	Core-2 Fundamentals of Food Science	4	4
	22UFSP11	Core Lab –I Food Science and Nutrition Lab	3	2
	22UFSA11	Allied -1 Principles of Food Production	3	3
	22UFSQ11	Allied Lab-1 Food Production Lab	2	1
IV	22UFCE11	FC-Personality Development	1	1
	22UCSH11	Communication Skills	1	
	22UBRC11	Bridge Course		1
V	22UNSS/NCC/ PED/YRC/ROT/ ACF/NCB12	Extension Activities NSS / NCC / Phy.Edn. / YRC / ROTARACT / AICUF / Nature Club		-
		Total	**30**	**24**
II SEMESTER				
I	22UTML22/ 22UHNL22/ 22UFNL22	Tamil/ Hindi/ French	6	4
II	22UENB22	English through Prose & Poetry (Stream B)	5	4
III	22UFSC32	Core -3 Nutritional Biochemistry	5	4
	22UFSC42	Core-4 Fundamentals of Food Technology	4	3
	22UFSP22	Core Lab-2 Nutritional Biochemistry & Food Technology Lab	3	2
	22UFSA22	Allied – 2 Fast Foods and Snacks Technology	3	3
	22UFSQ22	Allied Lab -2 Fast Foods and Snacks Technology Lab	2	1
IV	22UFCH22	FC – Social Responsibility and Global Citizenship	1	1
	22UCSH12	Communication Skills	1	1
V	22UNSS/NCC/ PED/YRC/ROT/ ACF/NCB12	Extension Activities NSS / NCC / Phy.Edn. / YRC / ROTARACT / AICUF / Nature Club	---	1
		Total	**30**	**24**
III SEMESTER				
III	22UFSC53	Core -5 Food Engineering	5	4
	22UFSC63	Core-6 Technology of Cereals, Pulses and Oilseeds	5	4
	22UFSP33	Core Lab-3 Food Engineering & Technology Cereals , Pulses and Oilseeds and Food safety Lab	4	2
	22UFSC73	Core-7 Food safety and Toxicology	4	3
	22UFSA33	Allied- 3 Bakery and Confectionary Products	3	3

	22UFSQ33	Allied Lab -3 Bakery and Confectionary Lab	2	1
IV	22USBZ13	Skill Based Elective- 1 Fundamentals of Computer, Internet and Office Automation	1	1
	22USBY13	Fundamentals of Computer, Internet and Office Automation- Practical	2	1
	22UFSN13	Basic Tamil/Advanced Tamil/Non-Major Elective : Basics of Food Science	3	2
	22UFCE33	FC-Environmental Studies	1	1
V	22UNSS/NCC/ PED/YRC/ROT/ ACF/NCB24	Extension Activities NSS / NCC /Phy.Edn./ YRC / ROTARACT / AICUF / Nature Club	-	-
	22UARE14	ARISE		
		Total	**30**	**22**
IV SEMESTER				
PART		PAPER	Hrs	Cr
III	22UFSC84	Core -8 Food Processing and Engineering	5	4
	22UFSC94	Core- 9 Technology of Fruits, Vegetable and Plantation Crops	5	4
	22UFSD04	Core-10 Dairy Technology	4	3
	22UFSP44	Core Lab-4 Food Processing and Engineering, Technology of Fruits, Veg. and Dairy Lab	4	2
	22UFSA44	Allied- 4 Food Microbiology	3	3
	22UFSQ44	Allied Lab -4 Food Microbiology Lab	2	1
IV	22USBZ24	Skill-Based Elective- 2 Web Design	1	1
	22USBY24	Web Design- Practical	2	1
	22UFSN24	Basic Tamil/Advanced Tamil/Non-Major Elective - Basics of Nutrition	3	2
	22UFCH44	FC- Religious Literacy and Peace Ethics	1	1
V	22UNSS/NCC/ PED/YRC/ROT/ ACF/NCB24	Extension Activities NSS / NCC / Phy.Edn. / YRC / ROTARACT / AICUF / Nature Club	-	1
	22UARE14	ARISE		1
		Total	**30**	**24**
V SEMESTER				
III	22UFSD15	Core -11 Technology of Meat and Poultry	6	6
	22UFSD25	Core-12 Research Methodology and Statistics	5	5
	22UFSP55	Core Lab -5 Technology of Meat, Poultry & Food safety Lab	4	2
	22UFSD35	Core-13 Food Quality Testing and Evaluation	6	6
	22UFSP65	Core Lab -6 Food Quality Testing Lab	3	2
	22UFSE15	Core Elective 1– Food Quality Management/ / Food Laws and Regulations	4	3
IV	22USSI16	Soft Skill	2	
		Total	**30**	**24**

VI SEMESTER				
III	22UFSD46	Core 14 Technology of Sea Foods	6	6
	22UFSP76	Core Lab -7 Technology of Sea Foods Lab	3	2
	22UFSD56	Core 15- Project management and Entrepreneurship	5	5
	22UFSD66	Core 16 -Project Work / In-Plant Training	10	8
	22UFSE26	Core Elective – 2 Food Product Development & Marketing/ Food Packaging and Labelling	4	3
IV	22USSI16	Soft Skill	2	2
		Total	**30**	**26**

Self Learning Courses

Sem	Sub. Code	Title of the Paper	Credits
III	22UFSSL3	Basics of Food Preparation	3
IV	22UFSSL4	Food Preservation	3
V	22UFSSL5	Food Processing	3
VI	22UFSSL6	Food Laws and Regulations	3

Course Code & Title	Principles of Food and Nutrition (22UFSC11)		
Class	I –FST	Semester- I	Credit– 4
Course Objectives	The Course aims • Able to overview the major macro and micronutrients relevant to human health.		

Unit	Content	No. of Hours
I	Concept and definition - Nutrition, Nutrients, Malnutrition – Under nutrition, over nutrition, and Health. Scope of Nutrition. Relationship between Food nutrition and Health Functions of food - physiological, psychological and social. Balanced Diet- definition and importance.	15
II	Food Groups, Food Guide Pyramid. Meal Planning - Definition and Principles. Food Exchange List and Diet planning using food exchange list. RDA for different age groups. Calorific value of various foods.	15
III	Carbohydrates - classification, function, sources, deficiency, digestion and absorption. Proteins - classification, sources, function, deficiency, digestion and absorption. Fat - classification, sources, function, deficiency, digestion and absorption. Dietary Fibre- Classification and Health benefits.	15
IV	Classification, function, sources and deficiency: Vitamins: Fat soluble vitamins- A, D, E and K. Water soluble vitamins - Thiamin, Riboflavin, Niacin, Pyridoxine, Folate, Vitamin B12 and Vitamin C. Minerals: Macro minerals –Calcium, Magnesium, Phosphorous, Potassium, Sodium. Trace elements- Iron, Iodine, Fluorine and Selenium.	15
V	Energy: Definition, sources, units of measurements. Energy Estimation – Direct and Indirect method, Factors affecting energy expenditure for physical work. BMR- Definition and Factors affecting BMR. BMI- Definition and Assessment.	15

Books for Study	• Srilakshmi.B (2018), Food Science, New Age International Publishers (India), 7th edition. • Shakuntala Manay.N, Shadaksharaswamy.M (2020), Foods: Facts and Principles, New Age International Publishers (India), 4th edition. • Sunetra Roday (2018), Food Science and Nutrition, **Oxford University Press**, 3rd edition.
Books for Reference	• NIN, ICMR (1990), Nutritive Value of Indian Foods. • Raina U, Kashyap S, Narula V, Thomas S, Suvira, Vir S, Chopra S (2010), Basics Food Preparation: A Complete Manual, Orient Black Swan Ltd, 4th edition. • Seth V, Singh K (2005), Diet planning through the Life Cycle: Part 1. Normal Nutrition. A Practical Manual, Elite Publishing House Pvt. Ltd, 4th edition. • Seema Puri (2019), Food Exchange List: A Tool for Meal Planning, Elite Publication House.

Course Outcome

After completion of the course, students should be able to do

Sl. No.	COURSE OUTCOME	KNOWLEDGE LEVEL (Bloom's Taxonomy)
CO_1	Identify the food sources and functions of nutrients.	**K4**
CO_2	Apply knowledge of the role of nutrition and healthy eating for disease prevention and wellness.	**K2**
CO_3	Explain the structure and components of food systems and analyse the relationships between nutritional health and food selection.	**K4**
CO_4	Explain the chemistry underlying the properties of various food components.	**K3**
CO_5	Apply principles from the various facts of food science and related disciplines to solve practical, real-world problems.	**K3**

K1= Remembering, K2= Understanding, K3 = Application, K4= Analysis and K_5= Synthesis

Mapping of COs with PSOs & POs:

	PO								PSO					Sum of Cos with PSOs & POs
	1	2	3	4	5	6	7	8	1	2	3	4	5	
CO1	3	3	2		3	2	1	2	3	3	3	3		28
CO2	3	3	2	1	3	2	1	2	3	2	3	2	1	28
CO3	3	3	2		3	2	2	2	3	3	3	2	1	29
CO4	3	3	2	1	3	2	2	2	3	3	3	2	1	30
CO5	3	3	2		3	2	2	2	3	3	3	2	1	29
Grand total of COs with PSOs and POs														144
Grand Total of COs with PSOs and POs **Mean Value of COs with PSO and POs = ---------- = (144 /61) Number of COs relating with PSOs and POs**														2.36

Strong – 3, Medium – 2 & Low – 1

Course Code & Title	Food Science and Nutrition Lab (22UFSP11)		
Class	I –FST	**Semester**- I	Credit – 2
Course Objectives	**The Course aims** • Able to prepare diet chart and analyses the nutritional quality of food.		

Food and Nutrition Laboratory

1. Food groups: calculation of mean energy, carbohydrates, protein, fat and fiber content of foods using ICMR tables.
2. Menu Planning
3. Assessment of weight and height by using Body Composition Analyser.

Food Science Laboratory

1. Determination of moisture using Hot Air Oven
2. Determination of Acidity and pH.
3. Qualitative tests for Carbohydrates
4. Qualitative tests for Proteins.
5. Estimation of Ascorbic acid.
6. Estimation of Ash content of foods
7. Estimation of Protein by Kjeldhal analysis - Demo
8. Estimation of Fat- Demo
9. Estimation of Food energy using Bomb calorimeter- Demo

Course Code & Title	Fundamentals of Food Science (22UFSC21)		
Class	I –FST	**Semester**- I	**Credit**– 4
Course Objectives	**The Course aims** • Able to develop skill and techniques in food preparation with the conservation of nutrients and palatability using cooking methods generally employed.		

UNIT	Content	No. of Hours
I	Cereals and Millets: Rice and Wheat -Composition & Nutritive value and Structure. Ragi, Sorghum, Maize- Composition and Nutritive value. Starch – types , sources, nature and effect of cooking	12
II	Pulses & Legumes: Composition, Nutritive value, Anti-nutritional factors, Changes during cooking, Factors affecting cooking time. Germination -Changes during germination. Nuts& Oilseeds (Soya bean, coconut, ground nut and sesame) -Composition, Nutritive value.	12
III	Animal Foods: Meat- Structure, Composition and Nutritive value. Poultry- Classification, Composition and Nutritive value. Egg- Structure, Composition and Nutritive value, Grading, Changes during storage. Fish- Composition, Nutritive value and Classification Factors to be considered in the selection and preparation of meat, poultry and fish.	12
IV	Fruits - Composition, Nutritive value, Classification, Changes during cooking - pigments and colour changes, Role of Cookery, Browning reaction and its prevention. Vegetables - Composition, Nutritive value, Classification, Changes during cooking - pigments and colour changes, Role of Cookery.	12
V	Spices: Definition, Classification and uses of spices. Functional foods- Sources and functional components. Prebiotics and Probiotics- Definition and Health Benefits Nutraceuticals, Organic Foods and GM foods- Definition	12
Books for Study	• Srilakshmi.B (2018), Food Science, New Age International Publishers (India), 7th edition. • Shakuntala Manay.N, Shadaksharaswamy.M (2020), Foods: Facts and Principles, New Age International Publishers (India), 4th edition. • Norman.N.Potter (2017), Food Science, CBS Publishers & Distributors Pvt Ltd, India,(5th edition).	
Books for Reference	• Swaminathan.M (2003), Food science, Chemistry & Experimental Foods, BAPPCO, 2nd edition. • HosahalliS.Ramasamy (2015) Post Harvest Technologies of fruits and vegetables, DES tech Publications, Inc. • Dipiti Sharma (2020) Textbook on Food Science and Nutrition, Daya Publication House.	

Course Outcome

After completion of the course, students should be able to do

SL.NO	COURSE OUTCOME	KNOWLEDGE LEVEL (Bloom's Taxonomy)
CO_1	Gain knowledge on the basic principles of Food Science and to study the composition and nutritive value of plant and animal foods.	K3
CO_2	Understand the importance of functional foods and its awareness.	K2
CO_3	Know about the nutritive value and changes during cooking of fruits and vegetables.	K4
CO_4	Understand about the nutritive value and composition of meat and egg	K2
CO_5	Create awareness on different types of foods like Prebiotics, Probiotics, Nutraceuticals and their importance in our day to day life.	K3

K1= Remembering, K2= Understanding, K3 = Application, K4= Analysis and K_5= Synthesis

Mapping of COs with PSOs & POs:

	PO								PSO					Sum of Cos with PSOs &POs
	1	2	3	4	5	6	7	8	1	2	3	4	5	
CO1	3	3	2		3	2	1	2	3	3		2		24
CO2	3	3	2	1	3	2	1	2	2	3		3		25
CO3	3	3	2		3	2	2	2	3	3	2	2		27
CO4	3	3	2	1	3	2	2	2	1	3	2	2		26
CO5	3	3	2		3	2	2	2	2	3		2	2	26
Grand Total of COs with PSOs and POs														128
Grand Total of COs with PSOs and POs Mean Value of COs with PSO and POs = ---------- = (128/35) Number of COs relating with PSOs and POs														2.32

Strong – 3, Medium – 2 & Low – 1

Course Code & Title	Principles of Food Production (22UFSA11)		
Class	I –FST	**Semester**- I	Credit – 3
Course Objectives	**The Course aims** • Able to develop scientific and technical methods of food production involving traditional and modern preparation methods.		

UNIT	Content	No. of Hours
I	**Introduction to Professional Cookery:** Cooking: Aims & Objectives. Hierarchy and Staffing and their responsibilities: Kitchen Classical Brigade, Staffing in Various Category, Role of Executive Chef, Duties. Equipment &Fuel and Tools: Various fuels, equipments and tools used in food production	9
II	**Commodities:** Shortenings: Role, Types, Advantages and Disadvantages. Raising agent: Classification and Role. Sugar: Importance, Types, Role of sugar cookery. Milk, Cream, Butter and Cheese: Types and uses. Fruits and Vegetable cookery: Different cuts, Pigments and colour changes, Uses of fruit in cookery.	9
III	**Cooking Methods:** Pre Preparation of Cooking: Preparation of Ingredients - Washing, peeling, scrapping, cutting of vegetables, method of mixing foods. Methods: Roasting, Grilling, Frying, Baking, Broiling, Poaching, Boiling, Steaming, Stewing and Braising. Salads & Salad dressings. Flaws and Remedies in Indian Household Adulterant Management: Pink book, orange book and DART- Detect Adulteration with Rapid Test. Definition and Basic Principles.	9
IV	**Meat cookery:** Introduction, Cuts of beef/veal, Cuts of lamb/muttons, Cuts of pork, Meat Varieties. Definition of Steak, Bacon, ham and gammon. **Egg cookery:** Introduction, Selection of egg, Role of egg in cookery, Methods of cooking. **Fish cookery:** Introduction, Classification of fish with examples, Cuts of fish, Selection of fish and shell fish, Cooking Methods.	9
V	**Basic Indian Cookery:** Condiments & Spices: Role of Spices in Indian Cookery. Masalas: Different Masalas used in Indian Cookery. Thickening agent: Role & Types. Stock: Definition, Classification, types and Recipe of different stocks. Soups: Definition, Classification and Preparation methods. Sauces: Definition, types, Uses, importance and Recipe.	9
Books for Study	• Srilakshmi B (2018), Food science. New Age International Publishers (India), 7th edition. • Philip E. Thangam (2015), Modern Cookery for teaching and the Trade, Orient longman, 6th edition .	

	• Sharma.A, (2019), Textbook of Food Science and Technology, CBS Publications, 3rd edition.
Books for Reference	• Dipiti Sharma (2020), Textbook on Food Science and Nutrition, Daya Publication House. • Auguste Escoffier, Heineman (2000), The Complete Guide to the Art of Modern Cookery, John Wiley & Sons.

Course Outcome

After completion of the course, students should be able to do

SL.NO	COURSE OUTCOME	KNOWLEDGE LEVEL (Bloom's Taxonomy)
CO_1	Gain the knowledge of history, principles and fundamentals of professional cookery.	K2
CO_2	Recognize the role, types, advantages and disadvantages of various commodities including Sugar, Milk, Fruits, Vegetables in cookery.	K3
CO_3	Perform ingredient preparations pertaining to several Veg cooking methods	K3
CO_4	Perform meat preparations pertaining to several Non-Veg cooking methods	K3
CO_5	Interpret the Indian masalas and spices for stock and soup preparation	K2

K1= Remembering, K2= Understanding, K3 = Application, K4= Analysis and K_5= Synthesis

Mapping of COs with PSOs & POs:

	PO								PSO					Sum of Cos with PSOs & POs
	1	2	3	4	5	6	7	8	1	2	3	4	5	
CO1	3	3	2		3	3	1	2	3	3	2	2	1	28
CO2	3	3	2	1	3	3	1	1	2	3	2	3		27
CO3	3	3	2		3	3	2	1	2	3	2	2	1	27
CO4	3	3	2	1	3	3	2	1	1	3	2	2		26
CO5	3	3	2		3	3	2	2	2	3	1	2	2	28
Grand total of COs with PSOs and POs														136
Grand Total of COs with PSOs and POs / **Mean Value of COs with PSO and POs** / **Number of COs relating with PSOs and POs** = (136/60)														2.26

Strong – 3, Medium – 2 & Low – 1

Course Code & Title	Food Production Laboratory (22UFSQ11)		
Class	I –FST	Semester- I	Credit – 1
Course Objectives	The Course aims • Able to perform culinary techniques with innovative approach.		

Experiment No.1

- Identification, Cutting & Blanching Vegetables
- Identification of Various Types of Vegetables
- Classification of Vegetables
- Cuts of Vegetables
- Blanching of Tomatoes & Capsicum

Experiment No. 2

Methods of Cooking Vegetables

- Boiling (potatoes, beans)
- Frying (potatoes)
- Steaming (Cabbage)
- Baking (potatoes)
- Braising (onion, cabbage)

Experiment No. 3

Preparation of Stocks and Sauces

- Demonstration and preparation of Stocks.
- Demonstration and preparation of Sauces & Soups.

Experiment No.4

Identification of Fish, Poultry and Meat

- Identification of Fish
- Demonstration of Cuts of Fish
- Identification of Various Cuts of Poultry
- Identification of Various Cuts of Meat

Experiment No. 5

Preparation of Soups and Pasta

- Demonstration and Preparation of Various types Soups
- Demonstration and Preparation of Various Pasta Dish

Experiment No. 6

Indian Cookery Demonstration and Preparation of various Indian Masalas

- Briyani Masala
- Sambar Masala
- Garam Masala
- Gravy Masala

Course Code & Title	NUTRITIONAL BIO-CHEMISTRY (22UFSC32)		
Class	I –FST	**Semester**- I	Credit – 4
Course Objectives	**The Course aims** • Able to understand the structural and functional aspects of food and their role in food processing.		

UNIT	Content	No. of Hours
I	**Introduction to food chemistry:** Definitions – Food, nutrients, principle components of foods, functions of foods, classification of foods, properties of foods, physical, chemical, functional and kinetic properties.	15
II	**Carbohydrates**- Classification and Metabolism Carbohydrates –Classification- Structure and properties Metabolism: Glycolysis, TCA cycle.(Tri carboxylic Acid) Lipids-Classification and Metabolism. Fatty acids – saturated, unsaturated fatty acids, EFA (Essential Fatty Acid)	15
III	**Proteins –** classification Amino acids- Classification, Structure and Catabolism Aminoacids –Classification (Essential and nonessential). Peptide bond- iso electric point, Zwitter ion. Separation and purification of proteins. The urea cycle and other possibilities of detoxification of ammonia.	15
IV	**Enzymes**- Classification and its importance Coenzymes – cofactors – prosthetic groups of enzymes (TPP, NAD, NADP, FAD, ATP). Enzymes important to foods. **Nucleic acids:** Nucleosides and nucleotides. Nucleic acids. Biosynthesis of DNA. Classification of RNA.	15
V	**Thermal, Biochemical Reactions in food:** Heat transfer operations in foods – conduction, convection, radiation, gelatinization, retro gradation, dextrinisation of starches, enzymatic and non enzymatic browning reaction in foods, rancidity – types and prevention.	15
Books for Study	• Stephen N.M (2019), Textbook on Food Chemistry, CBS Publishers & Distributors Pvt Ltd, India, 2nd edition. • Swaminathan.M (2003), Food science, Chemistry & Experimental Foods, BAPPCO, 2nd edition. • Norman.N.Potter (2017), Food Science, CBS Publishers & Distributors Pvt Ltd, India,(5th edition).	
Books for Reference	• Philip E. Thangam (2015), Modern Cookery for teaching and the Trade, Orient longman, 6th edition . • Sharma.A, (2019), Textbook of Food Science and Technology, CBS Publications, 3rd edition. • Shakuntala Manay.N, Shadaksharaswamy.M (2020), Foods: Facts and Principles, New Age International Publishers (India), 4th edition.	

Course Outcome

After completion of the course, students should be able to do

SL.NO	COURSE OUTCOME	KNOWLEDGE LEVEL (Bloom's Taxonomy)
CO_1	Gain the knowledge of principles and Fundamentals of food chemistry	K2
CO_2	Recognize the role, types, advantages and disadvantages of Carbohydrates in food	K3
CO_3	Explain different Amino Acids and Protein in food	K3
CO_4	Provide different role and function of Enzyme and nucleotides in foods	K3
CO_5	Explain different thermal and Biochemical properties in food	K3

K1= Remembering, K2= Understanding, K3 = Application, K4= Analysis and K_5= Synthesis

Mapping of COs with PSOs & POs:

	PO								PSO					Sum of Cos with PSOs & POs
	1	2	3	4	5	6	7	8	1	2	3	4	5	
CO1	3	3	2		3	1	1	2	3		3		1	22
CO2	3	3	2	1	3	1	1	2	3		3			23
CO3	3	3	2		3	1	2	2	3		3		2	24
CO4	3	3	2	1	3	1	2	2	3		3			23
CO5	3	3	2		3	1	2	2	3		3	2	1	25
Grand total of COs with PSOs and POs														117
Grand Total of COs with PSOs and POs Mean Value of COs with PSO and POs ---------- = (117/ 51) Number of COs relating with PSOs and POs														2.29

Strong – 3, Medium – 2 & Low – 1

Course Code & Title	Nutritional Biochemistry and Food Technology Lab (22UFSP22)		
Class	I -FST	**Semester**- II	Credit - 2
Course Objectives	**The Course aims** • Able to analyze the different properties of nutrients in food.		

Food Chemistry Laboratory

1. Separation of bio molecules by electrophoresis (Demo)
2. Verification of Beer's law
3. Quantitative estimation of protein using spectrophotometer.
4. Estimation of Lipids- Iodine value
5. Estimation of Saponification value
6. Estimation of Peroxide value
7. Estimation of glucose in a given sample.
8. Experiments on identification of amino-acids.
9. Experiments on properties of proteins

Food Technology Laboratory

1. Adulteration tests for different foods:
   a. Pulses **b.** Tea and coffee. **c.** Spices and condiments
2. Find the keeping quality of foods- Fresh and processed
3. To Perform blanching of fruits and vegetables
4. Experiment of Browning reactions- types and prevention
5. Observing the changes in pigments during cooking.
6. Eggs- Fresh and stale, Effect of extent of boiling.

Course Code & Title	Fundamentals to Food Technology (22UFSC42)		
Class	I –FST	**Semester**- II	Credit –3
Course Objectives :	**Course out come** • To enable the students to understand the various technology in food processing sector.		

UNIT	Content	No. of Hours
I	Historical development of food science and technology. Evolution of Food Processing from prehistoric times till date. Introduction about various branches in Food Science and Technology.	12
II	Technological aspects of foods: Cereals- milling, Gelatinization, malting and dextrinisation of starch. Rice- Composition of Rice. Rice Parboiling- Process, advantages and disadvantages.	12
III	Fats and Oils – Definition, Functions, and Types of fatty acids - saturated fatty acids, unsaturated fatty acids, essential fatty acids, trans fatty acids. Refining of oil- bleaching, neutralization, deodorization, hydrogenation, and winterisation. Rancidity - hydrolytic and oxidative rancidity and its prevention. Definition - margarine, butter, hydrogenated vegetable oil, lard.	12
IV	Fruits and vegetables- enzymatic browning, Post harvest changes, Climacteric rise, Horticultural maturity, and physiological maturity. Storage of fruits and vegetables. physiological maturity, physiological , physical , chemical, pathological changes.	12
V	Meat - Definition of carcass, red meat and white meat, composition of meat, marbling, post mortem changes in meat- rigor mortis, tenderization of meat, ageing of meat. Fish - characteristics of fresh fish, spoilage of fish (microbiological, physiological, biochemical). Poultry – composition, characteristics of fresh egg, deterioration of egg quality, difference between broiler and layers. Milk-constituents, processing of milk, pasteurization, homogenization. Ttypes of market milk and milk products	12
Books for Study	• Shakuntala Manay.N, Shadaksharaswamy.M (2020), Foods: Facts and Principles, New Age International Publishers (India), 4th edition. • Sharma. A, (2019) Text book of Food Science and Technology, CBS Publishers. • Reddy S.M, (2015), Basics of Food Science and Technology, New Age International Publishers.	
Books for Reference	• Bawa A.S, O.P Chauhan etal (2013), Food Science. New India Publishing agency.	

	• Sunetra Roday (2018), Food Science and Nutrition, **Oxford University Press**, 3rd edition.

Course Outcome

After completion of the course, students should be able to do

SL.NO	COURSE OUTCOME	KNOWLEDGE LEVEL (Bloom's Taxonomy)
CO_1	To know the different technological aspects of food technology.	**K3**
CO_2	To understand technology aspects of cereals	**K2**
CO_3	To learn about functions, types and refining of fats and oils	**K3**
CO_4	Detail about analyse and study the food commodities their conversion to a food product and to understand the Post Harvest changes and their reasons.	**K4**
CO_5	Understands about the characteristics of meat and fish.	**K2**

K1= Remembering, K2= Understanding, K3 = Application, K4= Analysis and K_5= Synthesis

Mapping of COs with PSOs & POs:

	PO								PSO					Sum of Cos with PSOs & POs
	1	2	3	4	5	6	7	8	1	2	3	4	5	
CO1	3	3	2		3	3	1	2	3			3	1	24
CO2	3	3	2	1	3	3	1	1	3	1	1	3	1	26
CO3	3	3	2		3	3	2	1	3			3	1	24
CO4	3	3	2	1	3	3	2	1	3	1	1	3	1	27
CO5	3	3	2		3	3	2	2	3		1	3	1	26
Grand total of COs with PSOs and POs														127
Grand Total of COs with PSOs and POs / Number of COs relating with PSOs and POs = Mean Value of COs with PSO and POs (127/57)														2.22

Strong – 3, Medium – 2 & Low

Course Code & Title	Fast Foods and Snacks Technology (22UFSA22)		
Class	I –FST	**Semester**- II	Credit –3
Course Objectives	**Course out come** • To enable the students to understand the science behind the confectionary technology.		

UNIT	Content	No. of Hours
I	Fast Food- Concepts, types, trends and general cooking methods, Preparation of raw materials. South Indian and North Indian fast foods and Preparation, Vegetarian and non-vegetarian gravies. General Indian Flavourings. Kadai preparations and tawa preparations.	9
II	Continental cookery - cooking methods. Ingredients used. Continental fast foods - Pizza, Burgers, French fries, Cutlets, Bread preparations and Pastas. Role of wine in continental cookery. Fast foods - Nutritional aspects.	9
III	Snacks Technology- Introduction, definition, Indian Snacks- North and South; Snack food ingredients- cereals products, dairy products, emulsifiers, antioxidants, sweeteners, nuts and fruits, vegetable ingredients, flavours and colours.	9
IV	Snacks Products and process- meat based snacks, Puffed snacks, Popped snacks, Baked snacks, Nut based snacks, Potato Chips; Snacks as nutritional supplements,	9
V	Equipments- extruding equipment, equipment for frying, baking and drying, equipment for popcorn processing, equipment for potato chips processing; packaging materials.	9
Books for Study	• Dr.Himadri.Panda (2013), The Complete Technology Book on Snack Foods, NIIR Project Consultansy services. • Edmund W.Lusas and Lioyd W.Rooney (2010) Snacks Foods Processing, CRC Press. • S.C.Dubey (2002), Basic Baking- Source of Indian Bakers, New Delhi, 4th edition.	
Books for Reference	• Sergio O.Serna- Saldivar (2012), Industrial Manufacture of Snack Foods, Kennedy's Books Ltd. • Modern Packaging Technology for processed Food, bakery and snacks foods (2014), Eiri Board publishers Pvt Ltd.	

Course Outcome

After completion of the course, students should be able to do

SL.NO	COURSE OUTCOME	KNOWLEDGE LEVEL (Bloom's Taxonomy)
CO_1	Gain knowledge about history and properties in field of confectionary	**K3**
CO_2	Understand the agents involved in confectionary products.	**K2**
CO_3	Different confectionary products and basic differences are enlisted	**K3**

CO_4	Distinguish the preparation of fondant, fudge and tarts.	**K4**
CO_5	Have in depth knowledge about quality aspects of confectionary sector.	**K2**

K1= Remembering, K2= Understanding, K3 = Application, K4= Analysis and K_5= Synthesis

Mapping of COs with PSOs & POs:

	PO								PSO					Sum of Cos with PSOs & Pos
	1	2	3	4	5	6	7	8	1	2	3	4	5	
CO1	3	3	1		3	3	1	2	3	3		3		25
CO2	3	3	1	2	3	3		1	3	3	1	3	1	27
CO3	3	3		2	3	3	1	1	3	3		3	1	26
CO4	3	3		2	3	3		1	3	3		3	1	25
CO5	3	3		2	3	3	1	2	3	3		3	2	28
Grand total of COs with PSOs and POs														**131**
Grand Total of COs with PSOs and Pos **Mean Value of COs with PSO and POs =** **---------- = (131 / 54)** **Number of COs relating with PSOs and POs**														**2.42**

Strong – 3, Medium – 2 & Low - 1

ARUL ANANDAR COLLEGE (AUTONOMOUS), KARUMATHUR
DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY

Class	: B.Sc., Food Science and Technology	Part III	: Allied Lab - 3
Semester	: II	Hours	: 30
Subject Code	: 22UFSQ33	Credits	: 1

Fast Foods and Snacks Technology Laboratory

Course Educational Objectives	The course aims to enable the students to • Able to prepare the confectionary products with innovative productive methods.

- Preparation of Pasta
- Preparation of Burger
- Preparation of Pizza
- Preparation of French fries
- Preparation of groundnut chikki
- Preparation of Popcorn
- Preparation of Cutlets
- Preparation of North Indian snacks-Samosa, Pav bhaji, Panipuri, Bhelpuri, Momos
- Preparation of south Indian snacks- Vada, Bajii, Chips, Boondi, Pakvada
- Preparation of Non-alcoholic Beverages
- Preparation of Chinese and Continental Fast Foods

ARUL ANANDAR COLLEGE (AUTONOMOUS), KARUMATHUR – 625 514
B.Sc., Food Science and Technology
(Under Choice-Based Credit System from the Academic year 2019-2020 onwards)

III SEMESTER				
PART		**PAPER**	**Hrs**	**Cr**
III	19UFSC53	Core -5 Food Engineering	5	4
	19UFSC63	Core-6 Technology of Cereals, Pulses and Oilseeds	4	4
	19UFSP33	Core Lab-3 Food Engineering & Technology Cereals , Pulses and Oilseeds Lab	4	2
	19UFSC73	Core-7 Mathematical Statistics	4	3
	19UFSA33	Allied – 3 Bakery and Confectionary Products	3	3
	19UFSQ33	Allied Lab -3 Bakery and Confectionary Lab	2	1
IV	19USBZ13	Skill Based Elective – 1 Fundamentals of Computer, Internet and Office Automation	1	1
	19USBY13	Fundamentals of Computer, Internet and Office Automation – Practical	2	1
	19UFSN13	Basic Tamil/Advanced Tamil/Non-Major Elective **: Basics of Food Science for Arts**	3	2
	19UFCE33	FC-Environmental Studies	1	1
	19USSI16	Soft Skill	1	
V	19UNCC/NSS/ PED/YRC/ROT/ ACF/NCB24	Extension Activities NSS / NCC / PHY. EDN. / YRC / ROTARACT / AICUF / NATURE CLUB	-	-
	19UARE14	ARISE		
		Total	**30**	**22**
IV SEMESTER				
PART		**PAPER**	**Hrs**	**Cr**
III	19UFSC84	Core -8 Food Processing and Engineering	5	4
	19UFSC94	Core- 9 Technology of Fruits, Vegetable and Plantation Crops	4	3
	19UFSD04	Core-10 Dairy Technology	4	4
	19UFSP44	Core Lab-4 Food Processing and Engineering, Technology of Fruits, Veg. and Dairy Lab	4	2
	19UFSA44	Allied – 4 Food Microbiology	3	3
	19UFSQ44	Allied Lab -4 Food Microbiology Lab	2	1
IV	19USBZ24	Skill-Based Elective – 2 Web Design	1	1
	19USBY24	Web Design – Practical	2	1
	19UFSN24	Basic Tamil/Advanced Tamil/Non-Major Elective - Basics of Food Science for Science	3	2
	19UFCH44	FC- Religious Literacy and Peace Ethics	1	1
	19USSI16	Soft Skill	1	
V	19UNCC/NSS/ PED/YRC/ROT/ ACF/NCB24	Extension Activities NCC / NSS / PHY.EDN. / YRC / ROTARACT / AICUF / NATURE CLUB	-	1

	19UARE14	ARISE		1
		Total	**30**	**24**
V SEMESTER				
III	19UFSD15	Core -11 Technology of Meat and Poultry	6	6
	19UFSD25	Core-12 Food safety and Toxicology	6	5
	19UFSP55	Core Lab -5 Technology of Meat, Poultry & Food safety Lab	4	2
	19UFSD35	Core-13 Food Quality Testing and Evaluation	6	6
	19UFSP65	Core Lab -6 Food Quality Testing Lab	3	2
	19UFSE15	Core Elective 1– Food Quality Management/ Food Product Development	4	3
	19USSI16	Soft Skill	1	
		Total	**30**	**24**
VI SEMESTER				
III	19UFSD46	Core 14 Technology of Sea Foods	6	5
	19UFSP76	Core Lab -7 Technology of Sea Foods Lab	3	2
	19UFSD56	Core 15- Project management and Entrepreneurship	6	5
	19UFSD66	Core 16 -Project Work / In-Plant Training	10	8
	19UFSE26	Core Elective – 2 Food Marketing/ Food Packaging	4	3
	19USSI16	Soft Skill	1	2
		Total	**30**	**25**

Semester	I	II	III	IV	V	VI	Total
Credits	24	25	22	24	24	25	144*

*** 144 credits from 2018-19 onwards; 142 credits upto 2016-17 batches.**

Part – I **08 Credits**

Part – II **08 Credits**

Part – III

Core	90
Allied	16
Core Electives	06
Total	**112 Credits**

Part –IV

Non –major Elective	04
Skill Based Elective	04
Foundation Courses	04
Total	**12 Credits**

Part – V **02**

Bridge Course	01
Arise	01

SELF LEARNING COURSES

SEM	SUB.CODE	TITLE OF THE PAPER	CREDIT
III	19UFSSL3	Basics of Food Preparation	3
IV	19UFSSL4	Food Preservation	3
V	19UFSSL5	Food Laws and Regulations	3
VI	19UFSSL6	Food Processing	3

ARUL ANANDAR COLLEGE (AUTONOMOUS), KARUMATHUR – 625 514
B.Sc., Food Science and Technology

PROGRAMME SPECIFIC OUTCOME (PSO)

PSO1: Imparting knowledge on the field of Food Science, Nutrition, Food Engineering, Food Marketing and Food Technology.

PSO2: Proficiency in culinary skills and to describe role of ingredients in food during food preparation.

PSO3: Enables to understand food composition and its nutritional, chemical and microbiological aspects and effects of common food preparation methods and food storage conditions on survival and growth of microbial contaminants.

PSO4: Familiarize the students with the technology of pulses, oilseeds, spices, fruits, meat products processing and preservation.

PSO5: Emphasize the importance of food safety, food quality, food plant sanitation, food laws and regulations and food engineering.

ARUL ANANDAR COLLEGE (AUTONOMOUS), KARUMATHUR
DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY

Course Code & Title	**Food Engineering (19UFSC53)**		
Class : II FST	**Semester III**	**Hours - 75**	**Credit - 4**
Course Educational Objectives	The course aims to enable the students to • Learn the basic concepts of unit operation and food plant layout. • Understand the transport processes and unit operations in food processing as demonstrated both conceptually and in practical laboratory settings. • Know about the concepts of refrigeration and freezing • Use the mass and energy balances for a given food process. • Study about psychometrics and basic drying process.		

Unit	Content	No. of Hours
I	Introduction - Concept of Unit operation - Units and dimensions, Unit conversions, dimensional analysis, Mass and Energy Balance. Design of food plant - Important considerations for designing of food plants - Construction and design - Types of layout. Grinding and mixing - Principle and equipment used in food industry.	15
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 – Properties. Flow characteristics, Reynolds Number, Bernoulli's Equation. Principles of Flow Measurement devices.	15
III	Refrigeration and Freezing- Concept and selection of a refrigerant. Description of a Refrigeration cycle. Pressure Enthalpy charts and Tables. Mathematical expressions useful in analysis of vapour compression refrigeration Cycle. Frozen food storage.	15
IV	Heat and Mass Transfer. Systems for heating and cooling food products. Thermal Properties of Food- Modes of heat transfer. Application of steady state heat transfer, over all heat transfer coefficient and, design of tubular heat exchanger.	15
V	Psychrometrics - Properties of Dry Air, water vapour. Psychrometric Chart. Steam, Evaporation and Dehydration - Generation of steam. Construction and functions of fire tube and water tube boilers. Boiling point elevation. Types of evaporations. Design of single effect evaporators. Basic Drying Process -Moisture content on wet basis and dry basis. Dehydrationsystems. Dehydration system Design.	15
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. 3. Robert E. Treybal, 1979, Mass Transfer Operations.Published by McGraw-Hill Inc.,US; 3rd Revised edition.	

Books for Reference	1. Rao, C. G.2006. Essentials of Food Process Engineering. B S Publications. 2. Fellow, P. 1988. Food Processing Technology. VCH Ellis Harwood Publications. 3. Jorge E.Lozano, 2000. Cristina Anon, Efren Parada-Arias, Gustavo V.BarbosaCanovas, Trends in Food Engineering, published by CRC Press. 4. 4. Frank P.Incropera, David P.DeWitt, Theodore L.Bergman, Adrienne S.Lavine, 2006 Fundamentals of Heat and Mass Transfer, Published by Wiley;6th Edition.

Course Outcome

SL.NO	COURSE OUTCOME (After completion of the course, students should be able to)	KNOWLEDGE LEVEL (Bloom's Taxonomy)
CO_1	Understand and explain the various food plants and basic Unit Operations in various Food Industries	K2
CO_2	Have In-depth knowledge about the fluid properties and its application in food Industry	K3
CO_3	Explain about Refrigeration cycles and its derivations with application in Food Industry	K4
CO_4	Correlate about mode and nature of heat transfer and its application in food Industry.	K3
CO_5	Understand about water vapour mixture and how it has been used in Food Industries.	K2

K1= Remembering, K2= Understanding, K3 = Application, K4= Analysis and K_5= Synthesis

Mapping of COs with PSOs & POs:

	PO								PSO					Sum of COs with PSOs & POs
	1	2	3	4	5	6	7	8	1	2	3	4	5	
CO1	3	3		2	3	1	3	2	3			3	2	25
CO2	3	3		`1	3	3	3	1	3	3		1	1	25
CO3	3	3			3	3	3		3		1	1	2	22
CO4	3	3		1	3	3	3	2	3		1	2	2	26
CO5	3	3		`1	3	1	3		3	3		2	2	24
Grand total of COs with PSOs and POs														122
Grand Total of COs with PSOs and POs **Mean Value of COs with PSO and POs = ---------- = (122/51) Number of COs relating with PSOs and POs**														2.4

Strong – 3, Medium – 2 & Low – 1

Mapping Scale	1	2	3
Relation	0.01 to 1.0	1.01 to 2.0	2.01 to 3.0
Quality	Low	Medium	Strong
Mean Value of COs with PSOs and POs			2.4
Observation	**COs of Food Engineering related to a strongly extent with PSOs and POS**		

ARUL ANANDAR COLLEGE (AUTONOMOUS), KARUMATHUR
DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY

Course Code & Title	**Technology of Cereals, Pulses and Oilseeds (19UFSC63)**		
Class : II UG	**Semester III**	**Hours - 60**	**Credit - 4**
Course Educational Objectives	The course aims to enable the students to • Learn about the concepts of refrigeration and freezing. • Use the mass and energy balances for a given food process. • Know about the quality analysis of cereals, pulses and oilseeds. • Study about technology and quality analysis of oilseeds. • Understand about various technologies involved in packaging of cereals, pulses and oilseeds.		

Unit	**Content**	**No. of Hours**
I	Technology of Cereals: Wheat -Types, milling, flour grade, flour treatments -bleaching, maturing, types of flour for baking, technology of dough development, Macroni products. Rice -Physicochemical properties, milling - mechanical & solvent extraction, parboiling, Rice products and utilization of by-products.	**12**
II	Technology of Cereals (Cont.): Corn - Milling (wet and dry), cornflakes. Barley- Milling, Malting, Processing of beer. Oats - Milling (oatmeal, oatflour& oat flakes). Sorghum, Pearl Millet, finger millet – Milling.	**12**
III	Technology of Pulses: Red gram, Green gram, Black gram - Milling (Dry & wet), Improved milling method.Anti nutritional factors in pulses.	**12**
IV	Technology of Oilseeds: Oil Extraction methods, Refining of Oil, Rancidity of oil. Soya Products - Defatted flour, Protein concentrates and isolates, protein texturization and fibre spinning.	**12**
V	Storage of cereals, Pulses and Oilseeds: Packaging materials and methods of packaging, Different types of storage structure, biochemical changes during storage, losses due to insects and rodents.	**12**
Books for Study	1. Kent, Technology of Cereal, 5th Ed. Pergamon Press, 2003. 2. Chakraborty., Post-Harvest Technology of Cereals, Pulses and Oilseeds, revised ed., Oxford & IBH Publishing Co. Pvt Ltd, 2008. 3. B. Srilakshmi. Food Science.2012.4th Edition. New Age International Publishers 4. Manay, S. &Shadaksharaswami, M., Foods: Facts and Principles, New Age Publishers, 2004.	
Books for Reference	1. Marshall, Rice Science and Technology, Wadsworth Ed., Marcel Dekker, New York, 1994. 2. Gavin Owens, Cereal Processing Technology, CRC Press, 2001. 3. Karel Kulp and J.Ponte, Hand Book of Cerela Science and Technology, CRC Press, 2000.	

Course Outcome

SL.NO	COURSE OUTCOME (After completion of the course, students should be able to)	KNOWLEDGE LEVEL (Bloom's Taxonomy)
CO_1	Understand and learn about various Processing technologies in cereals.	**K2**
CO_2	Equip with knowledge in the milling process and products of millets.	**K1**
CO_3	Explain about Technology of Pulses.	**K2**
CO_4	Correlate the Technology of Oilseeds and Oil Extraction methods	**K2**
CO_5	Learn about the Storage of Cereals, Pulses and Oilseeds.	**K2**

K1= Remembering, K2= Understanding, K3 = Application, K4= Analysis and K_5= Synthesis

Mapping of COs with PSOs & POs:

	PO								PSO					Sum of COs with PSOs & POs
	1	2	3	4	5	6	7	8	1	2	3	4	5	
CO1	3	3	2		3		1		3		1	3	2	21
CO2	3	3	1	3	3		2	3	3		1	3	3	28
CO3	3	3		2	3	3		3	3		2	3	2	27
CO4	3	3		3	3	3	3		3		3	3	2	29
CO5	3	3		2	1	3			3		2	3	2	22
Grand total of COs with PSOs and POs														127
Grand Total of COs with PSOs and POs **Mean Value of COs with PSO and POs** **= ---------- = (127/ 48)** **Number of COs relating with PSOs and POs**														2.6

Strong – 3, Medium – 2 & Low - 1

Mapping Scale	1	2	3
Relation	0.01 to 1.0	1.01 to 2.0	2.01 to 3.0
Quality	Low	Medium	Strong
Mean Value of COs with PSOs and POs			2.6
Observation	**COs of Technology of Cereals Pulses and Oilseeds related to a strongly extent with PSOs and POS**		

ARUL ANANDAR COLLEGE (AUTONOMOUS), KARUMATHUR
DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY

Course Code & Title	**Food Engineering & Technology of Cereals, Pulses Lab (19UFSP33)**		
Class : II UG	**Semester III**	**Hours - 60**	**Credit - 2**
Course Educational Objectives	The course aims to enable the students to • Learn about the various processing technologies in cereals and Pulses. • Know about the milling process and products of cereals, millets, pulses and Oilseeds. • Specify about the quality analysis of cereals, pulses and oilseeds. • Study about technology and quality analysis of oilseeds. • To learn about various technologies involved in packaging of cereals, pulses and oilseeds.		

S.No.	**Content**	
	Food Engineering Laboratory 1. Food processing plant layout design. 2. Determination of viscosity of Newtonian and non-Newtonian fluids. 3. Effect of temperature on viscosity of food samples. 4. Determination of freezing characteristics in food samples. **Cereals , Pulses and oil seeds Laboratory** 1. Determination of refractive index of fats and oils (i) Groundnut oil (ii) Butter (ii) Gingelly oil (iv) Coconut oil (v) Ghee (vi) Olive oil 2. Determination of smoke point of different fats and reused oils. (i) Groundnut oil (ii) Coconut oil (ii) Gingelly oil (iv) Vanaspathi (v) Ghee (vi) Butter 3. Physical characteristics of Cereal grains. (i)Rice (ii) Wheat (iii) Maize 4. Moisture content of Cereals, Pulses and Oil seeds (i) Rice, Wheat, Maize, Oats (ii) Red gram, Green gram, Black gram (iii) Gingelly seeds, Sunflower seeds, Mustard seeds 5. Estimation of gluten content of different types of flour. (i) Whole wheat flour (ii) Refined wheat flour	

Course Outcome

SL.NO	**COURSE OUTCOME (After completion of the course, students should be able to)**	**KNOWLEDGE LEVEL (Bloom's Taxonomy)**
CO_1	Understand and learning the importance food processing layout	**K2**
CO_2	Determining the refractive index of fats and oils	**K3**
CO_3	Explain about smoking point of oil	**K2**
CO_4	Estimation of moisture content of cereals,	**K4**

	pulses and oilseeds.	
CO_5	Learn about physical characteristics of cereals, pulses and oilseeds	**K2**

K1= Remembering, K2= Understanding, K3 = Application, K4= Analysis and K_5= Synthesis

Mapping of COs with PSOs & POs:

	PO								PSO					Sum of COs with PSOs & POs
	1	2	3	4	5	6	7	8	1	2	3	4	5	
CO1	3	3	2		3	3	1		3		1	3	2	24
CO2	3	3		3	3		2	3	3		1	3	3	27
CO3	3	3	2	2	3		3	3	3	2	2	3	2	31
CO4	3	3		3	3	3	3		3	2	3	3	2	31
CO5	3	3		2	1	3	1	1	3	1	2	3	2	25
Grand total of COs with PSOs and POs														**138**
Grand Total of COs with PSOs and POs **Mean Value of COs with PSO and POs** **= ---------- = (138/ 55)** **Number of COs relating with PSOs and POs**														**2.5**

Strong – 3, Medium – 2 & Low - 1

Mapping Scale	1	2	3
Relation	0.01 to 1.0	1.01 to 2.0	2.01 to 3.0
Quality	Low	Medium	Strong
Mean Value of COs with PSOs and POs			2.5
Observation	**COs of Technology of Cereals Pulses and Oilseeds related to a strongly extent with PSOs and POS**		

ARUL ANANDAR COLLEGE (AUTONOMOUS), KARUMATHUR – 625 514
DEPARTMENT OF MATHEMATICS

Course Code & Title	**Mathematical Statistics(19UFSC73)**		
Class : II UG	**Semester III**	**Hours - 60**	**Credit - 3**
Course Educational Objectives	The course aims to enable the students to • Acquire intense knowledge of matrices • Comprehend the concepts of determinants • Solve problems based on differentiation and integration • Gain efficiency in finding the measures of tendency • Calculate the measures of dispersion		

Unit	**Content**	**No. of Hours**
I	Matrices – basic concepts – types of matrices – operations on matrices – transpose of a matrix	12
II	Determinants and their properties – rank of a matrix – minors and cofactors – inverse of a matrix – solving a system of linear equations – Cramer's rule	12
III	Differentiability – derivatives of some standard functions – chain rule for differentiation – some simple integrals – method of substitution	12
IV	Measures of central tendency – arithmetic mean, mean, median and mode	12
V	Measures of dispersion – range – quartile deviation – standard deviatio	12
Text Books:	01. Bose D., "An introduction to Mathematical Methods", Himalaya Publishing House, 1999 Unit 1 and 4: Chapter 9 02. Arumugam, S., "Calculus Vol I", New Gamma Publishing House, Palayamkottai, 2007 Unit 3: Chapters 3.3, 3.4, 3.5 03. Arumugam, S., "Calculus Vol II", New Gamma Publishing House, Palayamkottai, 2007 Unit 3: Chapters 2.1, 2.2 04. Arumugam, S., "Statistics", New Gamma Publishing House, Palayamkottai, 2007 Unit 4: Chapter 2.1 – 2.3 Unit 5: Chapter 3.1 except mean deviation	

Teaching Learning Methods:

- Lecture Method, ICT, Assignment, Quiz, Group Discussion

Course Outcomes (CO):

On completion of this course the students will be able to

Course Outcome No.	Course Outcome	Knowledge Level Upto
CO1	Summarize the concepts of matrices with illustrations and find the transpose of the matrix.	**K3**
CO2	Solve the system of equations by applying Cramers's rule	**K3**
CO3	Compute derivatives and integrals of the functions	**K3**
CO4	Find the various of measures of tendency for the given data	**K3**
CO5	Calculate the different measures of tendency for the given data	**K3**

	PO								PSO					Sum of COs with PSOs & POs
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	
CO1	**3**	**3**				**2**					**2**			**10**
CO2	**3**	**3**				**2**					**2**			**10**
CO3	**3**	**3**				**2**					**2**			**10**
CO4	**3**	**3**				**2**					**2**			**10**
CO5	**3**	**3**				**2**					**2**			**10**
Grand total of COs with PSOs and POs														**50**
Grand Total of COs with PSOs and POs / **Mean Value of COs with PSO and POs** = ---------- = **(50 / 20)** / **Number of COs relating with PSOs and POs**														**2.5**

Strong – 3, Medium – 2, Low - 1

Mapping Scale	1	2	3
Relation	0.01 to 1.0	1.01 to 2.0	2.01 to 3.0
Quality	Low	Medium	Strong
Mean Value of COs with PSOs and POs			2.5
Observation	**COs of Mathematical Statistics is strongly related with PSOs and POS**		

ARUL ANANDAR COLLEGE (AUTONOMOUS), KARUMATHUR
DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY

Course Code & Title	**Bakery and Confectionary Products (19UFSA33)**		
Class : II UG	**Semester : III**	**Hours: 45**	**Credit : 3**
Course Educational Objectives	The course aims to enable the students to • Learn the basic principles involved in Bakery. • Study about the methods of making Bakery products. • Know the basic techniques in processing of Confectionary Products • Practical knowledge on complete decoration methods in Bakery. • Identify the various types of Bakery and confectionary Products		

Unit	**Content**	**No. of Hours**
I	Basic principles of baking. Bakery organization structure. Bakery equipment and their uses. Bakery terms. Raw materials used in Bakery. The Baking process – Formation and expansion of gases. Trapping of gases in air cells. Coagulation of proteins, gelatinization of starches, evaporation of water. Melting of shortenings. Browning of sugar and crust formation. Staling – Protecting the product from air. Adding moisture retainer to the formula. Freezing.	9
II	Breads, dough and fillings. Bread types. Mixing methods – straight dough, modified straight dough method for rich dough, sponge method- Steps in dough production. Dough formulas and techniques-hard rolls, soft bread, French bread, white pan bread, rye bread & rolls, brioche, sweet roll dough. Danish pastry, croissant. Fillings & toppings for sweet dough products Make-up techniques-Hard rolls & breads, soft roll dough, sweet dough products, rolled in dough products.	9
III	Cakes and Cake decoration. Sponges: Preparation methods, types Icings: Types (Fondant, butter creams, foam. Flat, fudge, royal icing, marzipan, meringues, glazes, fillings). Assembling and icing cakes: Selection of icing, procedure for assembling layer cakes, small cakes and sheet cakes. Cake decoration: Color, design, templates, texture, equipment, casting molds, lettering, monogram, stencils.	9
IV	Cookies, Pies and Tarts. Cookies: Characteristics & causes, mixing methods, types & make-up, panning, baking and cooling, formulas for bar cookies, macaroons, lace cookies, sandwich cookies. Pies: Types, mixing pie dough, pie crust, procedure for making small fruit tarts, assembling, baking & filling, common problems in fruit pies. Tarts & tartlets: Preparation and types	9
V	Puff Pastry and Chocolates. Puff pastry; Preparation and types. Sweet meat: Truffles, fondant, glazed petit fours. Chocolate: Manufacture & processing of chocolate, types & uses of chocolate, cocoa butter, white chocolate, liquor chocolates, fondant chocolates & toffees.	9

Books for Study	1. Yogambal. A, Theory of Bakery and Confectionary, PHI Pvt Ltd. 2009. 2. Talbot, G. Technology of Coated and Filled Chocolate, Confectionery and Bakery Products, CRC Press, 2009. 3. S.C.Dubey, Basic Baking- Source of Indian Bakers, New Delhi.
Books for Reference	1. Thangam E.Philip, Modern Cookery for teaching and Trade, Vol-I and II, Orient Black Swan Publications. 2. 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.

Course Outcome

SL.NO	COURSE OUTCOME (After completion of the course, students should be able to)	KNOWLEDGE LEVEL (Bloom's Taxonomy)
CO_1	Gain knowledge about basic methods used in bakery	K1
CO_2	Understand the techniques involved in bread making	K2
CO_3	Organize the steps in cake preparation and cake decoration	K3
CO_4	Distinguish the preparation of cookies, pies and tarts.	K3
CO_5	Have in depth knowledge about puff pastry and chocolate manufacture	K1

K1= Remembering, K2= Understanding, K3 = Application, K4= Analysis and K_5= Synthesis

Mapping of Cos with PSOs & POs:

	PO								PSO					Sum of COs with PSOs & POs
	1	2	3	4	5	6	7	8	1	2	3	4	5	
CO1	3	3	1		3				3	3				15
CO2	3	3	1	2	3	2			3	3	1	2	1	24
CO3	3	3		2	3	3			3	3		2	1	23
CO4	3	3		2	3	3			3	3		2	1	23
CO5	3	3		2	3	3	1	1	3	3		2	2	26
Grand total of COs with PSOs and POs														111
Grand Total of COs with PSOs and POs = Mean Value of COs with PSO and POs / Number of COs relating with PSOs and POs = (54/46)														2.4

Strong – 3, Medium – 2 & Low – 1

Mapping Scale	1	2	3
Relation	0.01 to 1.0	1.01 to 2.0	2.01 to 3.0
Quality	Low	Medium	Strong
Mean Value of COs with PSOs and POs			2.4
Observation	**COs of Bakery and Confectionary Products related to a strongly extent with PSOs and POS**		

ARUL ANANDAR COLLEGE (AUTONOMOUS), KARUMATHUR
DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY

Course Code & Title	**Bakery and Confectionary Products Laboratory (19UFSQ33)**		
Class : II UG	**Semester III**	**Hours - 30**	**Credit - 1**
Course Educational Objectives	The course aims to enable the students to • Learn the basic preparations involved in Bakery. • Study about the methods of preparing variety of Bakery products • Know the basic techniques in Confectionary Products • Practical knowledge on different decoration methods in Bakery. • Identify the various types of Bakery and confectionary Products available in different countries		

S.No.	**Content**
	Formulate 10 sets of bakery dishes consisting of 2 items from the below for each practical: • Bread varieties • Muffins • Pizza • Croissant • Danish pastry • Biscuits(any two varieties) • Doughnuts • Brownies • Cream horns • Jam buns • Black forest cake • Christmas cake • Cheese straws • Melting moments • Marshmallows • Cherry cake

Course Outcome

SL.NO	**COURSE OUTCOME (After completion of the course, students should be able to)**	**KNOWLEDGE LEVEL (Bloom's Taxonomy)**
CO_1	Gain knowledge about methods used in baking	**K1**
CO_2	Understand the techniques involved in bread making	**K2**
CO_3	Organize the steps in cake preparation and cake decoration	**K3**
CO_4	Distinguish the preparation of cookies, pies and tarts.	**K3**
CO_5	Have in depth knowledge about puff pastry and chocolate manufacture	**K1**

K1= Remembering, K2= Understanding, K3 = Application, K4= Analysis and K_5= Synthesis

Mapping of COs with PSOs & POs:

	PO								PSO					Sum of COs with PSOs & POs
	1	2	3	4	5	6	7	8	1	2	3	4	5	
CO1	3	3	1		3				3	3				16
CO2	3	3	1	2	3	2	1		3	3	1	2	1	25
CO3	3	3		2	3	3	1	1	3	3		3	3	28
CO4	3	3		2	3	3			3	3		2	3	25
CO5	3	3		2	3	3	1	1	3	3		2	2	26
Grand total of COs with PSOs and POs														120
Grand Total of COs with PSOs and POs **Mean Value of COs with PSO and POs** **= ---------- = (120/ 49)** **Number of COs relating with PSOs and POs**														2.4

Mapping Scale	1	2	3
Relation	0.01 to 1.0	1.01 to 2.0	2.01 to 3.0
Quality	Low	Medium	Strong
Mean Value of COs with PSOs and POs			2.4
Observation	**COs of Bakery and Confectionary Products related to a strongly extent with PSOs and POS**		

Strong – 3, Medium – 2 & Low – 1

ARUL ANANDAR COLLEGE (AUTONOMOUS), KARUMATHUR
DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY

Course Code & Title	**Non Major Elective: Basics of Food Science (19UFSN13)**		
Class : II BA History, Economics, Philosophy	**Semester - III**	**Hours - 45**	**Credits - 2**
Course Educational Objectives	The course aims to enable the students to • Learn about the basic functions of Foods. • Study about the various nutrients and its effects on health. • Gain knowledge composition and functions of cereals and pulses. • Know the composition and functions of fruits and vegetables. • Know the composition and functions of milk and flesh foods.		

UNIT	**Content**	**No. of Hours**
I	Food - Functions and Classification of Foods based on sources and functions- Basic Five Food Groups – Food Guide Pyramid.	9
II	Nutrients - Types- Major nutrient (Carbohydrates, Proteins and Fat) and micro nutrients (Vitamins A, D, E, K and Vitamin B&C and Minerals-Ca, Na, K, Mg, Mn) - Functions and Sources.	9
III	Cereals and Millets - Rice, Wheat, Maize, Ragi, Bajra - composition and uses. Pulses - composition and functions.	9
IV	Fruits and Vegetables - classification based on pigments - botanical classification - Selection of fruits and vegetables- role of vegetables and fruits in cookery.	9
V	Milk and Milk products - composition and function. Flesh foods- Meat, Fish, Egg, Poultry - composition and function. Sugar and Jaggery - Uses.	9
Books for Study	• B. Srilakshmi, 2018, Food Science, New Age Publishers, 2018.	
Books for Reference	• Manay, S. &Shadaksharaswami, M., Foods: Facts and Principles, New Age Publishers, 2004.	

Course Outcome

SL.NO	**COURSE OUTCOME (After completion of the course, students should be able to)**	**KNOWLEDGE LEVEL (Bloom's Taxonomy)**
CO_1	Have knowledge about the basics of food Science	**K1**
CO_2	Know the Nutrients and their Deficiency Disorders in food	**K1**
CO_3	Correlate the different food products and their functions	**K2**

CO_4	Understand the role of fruits and vegetables	**K2**
CO_5	Get knowledge about the role of Milk and their By-Products	**K1**

K1= Remembering, K2= Understanding, K3 = Application, K4= Analysis and K_5= Synthesis

Mapping of COs with PSOs & POs:

	PO								PSO					Sum of Cos with PSOs & POs
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**	**5**	
CO1	**3**	**3**	**1**		**3**				**3**		**2**	**1**		**16**
CO2	**3**	**3**	**3**		**3**				**3**		**2**	**3**		**20**
CO3	**3**	**3**	**1**		**3**	**3**	**2**		**3**		**1**	**2**	**3**	**24**
CO4	**3**	**3**	**2**	**1**	**3**	**3**			**3**	**1**	**2**	**3**	**1**	**25**
CO5	**3**	**3**	**2**		**3**	**3**		**1**	**3**		**3**	**2**	**2**	**25**
Grand total of COs with PSOs and POs														**110**
Grand Total of COs with PSOs and POs **Mean Value of COs with PSO and POs** **= ---------- = (110 / 45)** **Number of COs relating with PSOs and POs**														**2.4**

Strong – 3, Medium – 2 & Low – 1

Mapping Scale	1	2	3
Relation	0.01 to 1.0	1.01 to 2.0	2.01 to 3.0
Quality	Low	Medium	Strong
Mean Value of COs with PSOs and POs			2.4
Observation	**COs of** Basics of Food Science **Products related to a strongly extent with PSOs and POS**		

Course Code & Title	BASICS OF FOOD PREPARATION (19UFSSL3)		
Class	III-FST	**Semester**	**III**
Cognitive Level	**K-1** Knowledge **K-2** Understanding **K-3** Application		
Course Objectives	• To study about the basics about food and its preparation methods. • To know about different cooking methods. • To learn the role of different food groups in cookery. • To know about the bakery and confectionary process. • To get awareness regarding food handling.		

UNIT	Content
I	**Food Preparation**- Food-Definition, Functions, Basic 5 food group. Preliminary preparations, Methods of mixing foods, Standard Vegetable Cuts.
II	**Methods of cooking food**- Cooking-Definition & Objectives, Dry heat and Moist heat cooking methods.
III	**Basic Cookery** - Cereals, Pulses, Milk & Milk Products, Fruits &Vegetables. Stocks, Soups, Sauces-Thickening Agents.
IV	**Bakery & Confectionary**- Baking Process .Pies, Pastries, and Cookies. Cakes and Frosting. Quick Bread, Yeast Bread. Chocolates & candies- Types and Methods.
V	**Safe Food Handling** - Kitchen Fire Prevention Tools and Equipment, Identification and Use of Common Kitchen Tools and Equipment. Manners/Etiquette-Table Setting, Serving Food, Table Manners for Dining
Books for Reference	1. B. Srilakshmi, Food science, New Age Publishers, 2002. 2. Thangam.E.Philip, Modern Cookery,OrientBlackSwan, Sixth edition (2010).
Course Outcomes	On completion of the course, students should be able to **CO1:** Understand the basics about food and its preparation methods. **CO2:** Know about various methods of cooking. **CO3:** Learn about basics of cookery from different food groups. **CO4:** Get in depth knowledge about bakery and confectionary process. **CO5:** Know the required safety in food handling.

Mapping of COs with PSOs &POs:

	PO								PSO					Sum of COs with PSOs & POs
	1	2	3	4	5	6	7	8	1	2	3	4	5	
CO1	3	3	1		2	3	3		3		3	3	1	24
CO2	3	3		2	2	3	3	2	3		3	3	1	28
CO3	3	3		2	3	3	3		3	2	3	3		28
CO4	3	3		1	1	3	3	2	3	2	3	3	2	30
CO5	3	3		1	1	3	3	2	3	1	3	3	1	27

Grand total of COs with PSOs and POs	137
Grand Total of COs with PSOs and POs **Mean Value of COs with PSO and POs** **= _____ = (137/ 55)** **Number of COs relating with PSOs and POs**	**2.49**

Strong – 3, Medium – 2 & Low – 1

Mapping Scale	1	2	3
Relation	0.01 to 1.0	1.01 to 2.0	2.01 to 3.0
Quality	Low	Medium	Strong
Mean Value of COs with PSOs and POs			2.49

ARUL ANANDAR COLLEGE (AUTONOMOUS), KARUMATHUR
DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY

Course Code & Title	**Food Processing and Engineering (19UFSC84)**		
Class : II UG	**Semester IV**	**Hours - 75**	**Credit - 4**
Cognitive Level	**K-1** Knowledge **K-2** Understanding **K-3** Application		
Course Objectives	• To understand the principles and techniques in thermal processing. • To know about drying and irradiation process. • To learn the process of freezing and types of freezing method. • To understand the source and variability of raw food material and their impact on food processing operations. • To obtain technical skills on principles, applications and management of quality systems in the food sector industry		

Unit	Content	No. of Hours
I	Thermal Processing - Thermal Processing Principles & application– Blanching, Pasteurization, Sterilization, Ultra high temp sterilization, Aseptic processing, Canning and bottling.	15
II	Drying- Significance: Natural drying- Solar drying, Artificial drying- Hot air drying, Drum drying, Spray drying, Dehydro freezing, Freeze drying Pretreatments blanching, sulphuring. Irradiation - Source of ionization irradiation, Dose &Dosimetry, Mode of action, Scope of irradiation.	15
III	Freezing - Freezing Refrigeration, Effect of low temperature on Fresh Fruits, Vegetables, Meat & Fish products, Chill injury. Freezing, freezing rate. Quick freezing. Slow freezing. Air blast freezing, Contact freezing, Immersion freezing, Cryogenic freezing Quality of frozen foods- Retrogradation, Protein denaturation, Freezer burn.	15
IV	Chemical Preservation: Types of Preservatives, Class I and Class II Preservatives , Chemical preservatives- Sulphur dioxide, Benzoic acid, Sorbic acid. Antioxidants. Fermentation - Principles, Types of fermentation, Types of fermented foods, Advantages of fermentation	15
V	Recent trends in Processing of Food and Food Products-Pulsed electric fields, High pressure technology, Ohmic heating, Microwave heating, Hurdle technology.	15
Books for Study	1. Da-Wen Sun, 2005, Emerging Technologies for Food Processing, Published by Academic Press. 2. Hosahalli S. Ramaswamy , Michele Marcotte, 2005. 1st Edition, Food Processing: Principles and Applications, Published by CRC Press. 3. VijayaKhader.Textbook on Food Storage and Preservation. 1999. 1st Ed, Kalyani Publishers.	

Books for Reference	1. Desrosier. Food Preservation. 4th edition. 1977. AVI Publication. 2. Fennema. Physical Principles of Food Preservation. 2nd Volume. 1975. M. Dekker Publisher. 3. Novel Food Processing Technologies, Ed., Barbosa-Canovas, G.V.; Tapia M.S.:Pilar Can M.Pub.Routledge(Taylor and Francis Group), USA.2004.ISBN:978-0-8247-5333-7(hardback) 978-0-203-99727-7 (electronic)

Course Outcome

After completion of the course, students should be able to do

SL.NO	COURSE OUTCOME	KNOWLEDGE LEVEL (Bloom's Taxonomy)
CO_1	Explain the various thermal processing Methods	**K2**
CO_2	Understand the various drying process and its application in Food Industry	**K2**
CO_3	Describe the various freezing techniques used in Food Industry.	**K3**
CO_4	Interpret the preservation and fermentation methods.	**K2**
CO_5	Outline the emerging thermal processing methods used in Food Industry	**K3**

K1= Remembering, K2= Understanding, K3 = Application, K4= Analysis and K_5= Synthesis

Mapping of Cos with PSOs & POs:

	PO								PSO					Sum of COs with PSOs & POs
	1	2	3	4	5	6	7	8	1	2	3	4	5	
CO1	3			3	1		1	2	2		1	3	2	18
CO2	2			2	1		1	2	2		1	3	2	16
CO3	2			3	2	1	2	2	2		2	2	2	20
CO4	2			3	1		1	2	1		1	2	2	15
CO5	3			3	1		1	2	1		2	3	2	18
Grand total of COs with PSOs and POs														**87**
Grand Total of COs with PSOs and POs **Mean Value of COs with PSO and POs** **= ---------- = (87 / 46)** **Number of COs relating with PSOs and POs**														**1.89**

Strong – 3, Medium – 2 & Low - 1

Mapping Scale	1	2	3
Relation	0.01 to 1.0	1.01 to 2.0	2.01 to 3.0
Quality	Low	Medium	Strong
Mean Value of COs with PSOs and POs		1.89	
Observation	**COs of Food Processing and Engineering related to a medium extent with PSOs and POS**		

ARUL ANANDAR COLLEGE (AUTONOMOUS), KARUMATHUR
DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY

Course Code & Title	**Technology of Fruits, Vegetables and Plantation Crops (19UFSC94)**		
Class : II UG	**Semester IV**	**Hours - 60**	**Credit - 3**
Course Objectives	• To know about the various processes, products and spoilage of fruits, vegetables and plantation crops. • To learn about processing of fruit beverages and quality analysis of fruits, vegetables and plantation crops. • To gain knowledge on processing of jam and jelly • Understand the dehydration of fruits and vegetables. • To learn about various technologies involved in processing and packaging tea, coffee and chocolate		

UNIT	**Content**	**No. of Hours**
I	Food Preservation - Definition, Principles and Methods of Preservation – Preservation by High temperature, Low temperature, Chemicals, Drying, Carbonation, Fermentation, Antibiotics, Irradiation, Canning and Natural Preservatives. Food Spoilage – Definition and Causes- Microbial Spoilage, Enzymatic Spoilage, Spoilage by insects and rodents, Characteristics and Storage conditions of food and Spoilage by Mechanical damage.	**12**
II	Fruits Beverages -Processing of Fruit juices. Preservation of Fruit juices - Pasteurization, Chemical preservation, Freezing, Drying, Tetra-packing and Carbonation. Processing of Squash, Cordial, Nectar, Concentrates and Powder. Tomato products: Processing of tomato juice, Tomato Puree, Paste, Ketchup, Sauce and Soup.	**12**
III	Jam - constituents, selection of fruits and processing technology. Jelly - Essential constituents, Role of pectin, Determination of pectin, Defects in jelly. Marmalade - Types, processing & technology, defects.	**12**
IV	Dehydration of fruits and vegetables -Sun drying of different fruits, Mechanical dehydration- process variation of fruits and vegetables. Packing and Storage – Heat treatment and Fumigation.	**12**
V	Technology of Plantation Products - Spices -Processing of major and minor spices, Essential oils & Oleoresins. Tea Processing- Black tea, Green tea, Oolong tea. Coffee Processing , Coffee Making - Percolator coffee, Vacuum coffee, Drip Coffee, Steeped coffee, Espresso coffee, Iced coffee. Cocoa Processing & Chocolate.	**12**
Books for Study	1. Srivastava.R.P. & Sanjeev Kumar, Fruits & Vegetables Preservation – Principles and Practices, 3rd edition, 2002. 2. SahuntalaManay, S. &Shadaksharaswami, M., Foods: Facts and Principles, New Age Publishers, 2004. 3. Modern Technology of Food Processing and Agro based Industries. NIIR Board of Technologists. nNIIR, Delhi, 2000.	

Books for Reference	1. W. B.Crusess. Commercial Unit and Vegetable Products, W.V. Special Indian Edition, Pub: Agrobios, India. 2. Girdharilal, Siddappaa, G.S and Tandon, G.L., Preservation of fruits & Vegetables, ICAR, New Delhi, 1998.

Course Outcome

After completion of the course, students should be able to do

SL.NO	COURSE OUTCOME	KNOWLEDGE LEVEL (Bloom's Taxonomy)
CO_1	Understand Food Preservation and Food Spoilage	**K2**
CO_2	Have In-depth knowledge about the Processing of Fruit Beverages and Tomato products.	**K4**
CO_3	Explain about the types, processing & technology involved in the preparation of Jam, Jelly and Marmalade	**K3**
CO_4	Correlate the Dehydration of fruits and vegetables and its Packing and Storage	**K3**
CO_5	Understand about the Technology of Plantation Products- Spices, tea, coffee and cocoa.	**K2**

K1= Remembering, K2= Understanding, K3 = Application, K4= Analysis and K_5= Synthesis

Mapping of COs with PSOs & POs:

	PO								PSO					Sum of COs with PSOs & POs
	1	2	3	4	5	6	7	8	1	2	3	4	5	
CO1	**2**	**1**	**2**					**2**	**2**		**1**	**3**	**2**	**15**
CO2			**1**	**3**			**3**	**1**	**2**		**1**	**3**	**2**	**16**
CO3	**1**			**2**	**2**			**1**	**2**		**2**	**2**	**2**	**14**
CO4		**2**		**3**	**1**		**3**	**1**	**1**		**1**	**2**	**2**	**16**
CO5		**3**		**2**	**1**	**2**		**1**	**1**		**2**	**3**	**2**	**17**
Grand total of COs with PSOs and POs														**78**
Grand Total of COs with PSOs and POs = **Mean Value of COs with PSO and POs** / **Number of COs relating with PSOs and POs** = **(78/42)**														**1.85**

Strong – 3, Medium – 2 & Low - 1

Mapping Scale	1	2	3
Relation	0.01 to 1.0	1.01 to 2.0	2.01 to 3.0
Quality	Low	Medium	Strong
Mean Value of COs with PSOs and POs		1.85	
Observation	**COs of Technology of Fruits Vegetables and Plantation Crops related to a medium extent with PSOs and POS**		

ARUL ANANDAR COLLEGE (AUTONOMOUS), KARUMATHUR
DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY

Course Code & Title	**Dairy Technology (19UFSD04)**		
Class : II UG	**Semester IV**	**Hours - 60**	**Credit - 4**
Course Objectives	• To know about the composition, characteristics and quality of milk. • To gain knowledge on market milk. • To learn about various milk processing techniques. • To understand the quality and nutrient composition of Dairy products. • To understand the quality and nutrient composition of ice cream and indigenous milk products.		

Unit	**Content**	**No. of Hours**
I	Milk - Definition, composition of milk, important characteristics of major constituents of milk i.e. milk fat, milk proteins, lactose and minerals and minor constituents of milk. Factors affecting the quality and quantity of milk produced by milk animals. Physical, chemical and nutritive properties of milk.	12
II	Market Milk**:** Brief introduction to Standard milk, Toned milk, Double toned milk, flavored milk, Vitamin enriched milk, Reconstituted milk and Recombined milk. Legal and ISI standards of milk. Adulterations of milk and its detection. Common preservatives used in milk and their detection. Collection, transportation and distribution of milk. Clean milk production.	12
III	Milk Processing: Processes of straining, Filtration and clarification. Standardization**:** Definition of standardization, purpose and uses of standardization process. Use of pearson's square method to solve the standardization problems in dairy industry. Homogenization**:** Definition, Effect of homogenization of milk. Uses of homogenization and Checking the effectiveness of homogenization. Pasteurization in milk: Purposes and objects of pasteurization – LTLT, HTST &UHT processes of pasteurization.	12
IV	Milk Products: Cream-Different types, Composition and Preparation. Cheese – Classification, Commercial Preparation methods of cheddar cheese. Processing of Paneer, Khoa, Butter and Ghee	12
V	Ice cream: Different types of ice creams and their composition. Ingredients used and their role in processing. Defects in ice cream. Indigenous milk products – Preparation of Kulfi, Srikhand&Lassi.	12
Books for Study	1. Sukumar De ., Outlines of Dairy Technology, 1980, Oxford University Press, UK 2. Milk & Milk Products by Eckles, Combs , Henry C and Willes C, 1997,Tata McGraw Hill Publishers, USA.	
Books for Reference	1. Principles of Dairy Processing by Warner JN, 1976, Wiley Science Publishers, USA.	

Course Outcome

After completion of the course, students should be able to do

SL.NO	COURSE OUTCOME	KNOWLEDGE LEVEL (Bloom's Taxonomy)
CO_1	Have Knowledge on basics of dairy technology.	K2
CO_2	Distinguish types of market milk with preservatives and adulterants.	K3
CO_3	Explain standardization, Homogenization, and pasteurization of milk	K4
CO_4	Have knowledge on the processing of cheese, butter, and ghee	K2
CO_5	Outline the steps in the preparation of various types of ice cream.	K3

K1= Remembering, K2= Understanding, K3 = Application, K4= Analysis and K_5= Synthesis

Mapping of Cos with PSOs & POs:

	PO								PSO					Sum of COs with PSOs & POs
	1	2	3	4	5	6	7	8	1	2	3	4	5	
CO1	2	1	2						1		2			8
CO2			1	3	1				1	1	1	2	1	11
CO3	1			2	2		2		1	2	2	2	2	16
CO4		2		3	1			2	1	2	2	2	2	17
CO5		3		2	1	2			1	2	2	2	2	17
Grand total of COs with PSOs and POs														69
Grand Total of COs with PSOs and POs = $\frac{\text{Mean Value of COs with PSO and POs}}{\text{Number of COs relating with PSOs and POs}}$ = (69 / 40)														1.72

Strong – 3, Medium – 2 & Low – 1

Mapping Scale	1	2	3
Relation	0.01 to 1.0	1.01 to 2.0	2.01 to 3.0
Quality	Low	Medium	Strong
Mean Value of COs with PSOs and POs		1.72	
Observation	**COs of Dairy Technology related to a medium extent with PSOs and POs**		

ARUL ANANDAR COLLEGE (AUTONOMOUS), KARUMATHUR
DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY

Course Code & Title	**Food Processing & Engineering, Technology of Fruits, Veg. and Dairy Lab (19UFSP44)**		
Class : II UG	**Semester IV**	**Hours - 60**	**Credit -2**
Course Objectives	• To gain knowledge on processing of jam and jelly • Understand the dehydration of fruits and vegetables. • To learn about various milk processing techniques. • To learn the process of freezing and types of freezing method. • To understand the quality and nutrient composition of ice cream and indigenous milk products.		

Content

Food Processing and Engineering Laboratory

1. Comparison of conventional and microwave processing of food.
2. Osmotic dehydration.
3. Drying of food using Hot air oven.

Technology of Fruits, Vegetables and Plantation Crops Laboratory

1. Estimation of pH and acidity of products
2. Estimation of brix: acidity ratio
3. Estimation of ascorbic acid and vitamin A in different fruits.
4. Estimation of Pectin in fruits.
5. Adulteration of spices – pepper, turmeric and chilly.
6. Dehydration of fruits and vegetables.

Dairy Technology Laboratory

1. Analysis of milk – acidity, COB, MBRT, SNF, specific gravity
2. Estimation of milk protein
3. Estimation of milk fat by Gerber method.
4. To prepare casein and calculation of yield.
5. Processing of Milk Pasteurization and Homogenization.
6. Preparation of Paneer

ARUL ANANDAR COLLEGE (AUTONOMOUS), KARUMATHUR
DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY

Course Code & Title	**Food Microbiology (19UFSA44)**		
Class : II UG	**Semester IV**	**Hours - 45**	**Credit - 3**
Cognitive Level	**K-1** Knowledge **K-2** Understanding **K-3** Application		
Course Objectives	• To gain knowledge in history and Scope of Food Microbiology. • To understand the basic characteristics of various microorganisms. • To know about the various types of microbial food spoilage. • To identify the causes and measures of food borne disease • To know the recent advances in Food Microbiology		

Unit	Content	No. of Hours
I	History and Development of Food Microbiology -Definition and Scope of food microbiology, Inter-relationship of microbiology with other sciences.	9
II	Types of microorganisms, Classification and Nomenclature, Morphology, Structure, Reproduction &Importance of bacteria, fungi, viruses and protozoans. Identification of bacteria by Gram Staining Technique. Bacterial growth curve, Factors affecting the growth of microorganisms in food.	9
III	Microbial Food Spoilage. Sources of Microorganisms in foods. Some important food spoilage bacteria, mould, yeast. Spoilage of specific food groups- Cereal and cereal products, Milk and dairy products, Meat, poultry and sea foods, Fruits and vegetables and Canned products.	9
IV	Foodborne Diseases - Types – food borne infections, food borne intoxications - Origin, symptoms and prevention. Control measures-sterilization- definition and its types, Disinfection – definition, disinfectant used.	9
V	Trends in Food Microbiology- Rapid Methods of Microbes Detection. Single Cell Protein (SCP), Single Cell Oil (SCO), Probiotics, Prebiotics &Synbiotics. Genetically Modified Foods –Concept and Benefits.	9
Books for Study	1. Frazier William C and Westhoff, Dennis C. Food Microbiology, TMH, New Delhi, 2004. 2. Garbutt& John. Essentials of Food Microbiology, Arnold, London, 1997. 3. Gaurav Bharadwaj., Food Microbiology, Sonali Publications, New Delhi.	
Books for Reference	1. Pelczar MJ, Chan E.C.S and Krieg, Noel R. Microbiology, 5th Ed., TMH, New Delhi, 1993. 2. Jay, James M. Modern Food Microbiology, CBS Publication, New Delhi, 2000.	
Course Outcomes	On completion of the course, students should be able to **CO1:** Understand the basics of food microbiology **CO2:** Have knowledge about microorganisms present in food. **CO3:** Understand the role of microbes in food spoilage.	

	CO4: Correlate microbes with food borne diseases. **CO5:** Know the recent trends in food microbiology.

Course Outcome

After completion of the course, students should be able to do

SL.NO	COURSE OUTCOME	KNOWLEDGE LEVEL (Bloom's Taxonomy)
CO_1	Understand the basics of food microbiology	**K2**
CO_2	Have knowledge about microorganisms present in food	**K1**
CO_3	Understand the role of microbes in food spoilage.	**K2**
CO_4	Correlate microbes with food borne diseases.	**K3**
CO_5	Know the recent trends in food microbiology.	**K1**

K1= Remembering, K2= Understanding, K3 = Application, K4= Analysis and K_5= Synthesis

Mapping of Cos with PSOs & POs:

	PO								PSO					Sum of COs with PSOs & POs
	1	2	3	4	5	6	7	8	1	2	3	4	5	
CO1	2	1							1	1				5
CO2		3	2						2	1	1			9
CO3	1	2	2						1	1	2		1	10
CO4	1		1	1			2				1		1	7
CO5					1			2		2		3	1	9
Grand total of COs with PSOs and POs														40
Grand Total of COs with PSOs and POs = $\frac{\text{Mean Value of COs with PSO and POs}}{\text{Number of COs relating with PSOs and POs}}$ = (40/27)														1.4

Strong - 3, Medium - 2 & Low – 1

Mapping Scale	1	2	3
Relation	0.01 to 1.0	1.01 to 2.0	2.01 to 3.0
Quality	Low	Medium	Strong
Mean Value of COs with PSOs and POs		1.4	
Observation	**COs of Food Microbiology related to a medium extent with PSOs and POS**		

ARUL ANANDAR COLLEGE (AUTONOMOUS), KARUMATHUR
DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY

Class	: B.Sc., Food Science and Technology	Part III	: Allied Lab - 4
Semester	: IV	Hours	: 30
Subject Code	: 19UFSQ44	Credit	: 1

Food Microbiology Laboratory

Course Objectives	• To handle different microbiological equipments. • To understand the basic characteristics of various microorganisms. • To know about the various types of microbial food spoilage. • To identify the microbial load. • To know the recent advances in Food Microbiology

Content

1. Lab Rules and Regulations
2. Handling Techniques
   - Microscope
   - Autoclave
   - Laminar Air Flow
   - Incubator
   - Hot Air Oven
   - Micro pipettes
   - Petriplates
   - Inoculation loop
   - L-Rod
   - Preparation of cotton plug
3. Experiments
   - Gram Staining Techniques
   - Plating Techniques
   - Streaking Techniques

ARUL ANANDAR COLLEGE (AUTONOMOUS), KARUMATHUR
DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY

Course Code & Title	**Non Major Elective: Basics of Food Science (19UFSN24)**		
Class - II B.Sc., Physics, Maths and RDS	**Semester IV**	**Hours - 45**	**Credits- 2**
Course Objectives	• To learn about the basic functions of foods. • To study about the various nutrients and its effects on health. • To know the composition and nutritive value of cereals millets and itsbyproducts. • To know the composition and nutritive value of fruits and vegetables • To know the importance of composition and functions of milk, flesh and sugars		

UNIT	**Content**	**No. of Hours**
I	Food - Functions and Classification of Foods based on sources and functions- Basic Five Food Groups - Food Guide Pyramid.	9
II	Nutrients - Vitamins - Fat and Water soluble, functions, sources, deficiency. Minerals - classification, functions, sources, deficiency.	9
III	Cereals and millets, pulses, and its by-products - Rice, Wheat, Maize, Ragi, Bajra - composition, nutritive value, role of Cereals& Pulses in cookery.	9
IV	Fruits and Vegetables - composition, nutritive value and classification. Selection of fruits and vegetables-role of vegetables and fruits in cookery. Spices - Types and its role in cookery.	9
V	Milk and Milk products - composition and function. Flesh foods - Meat, Fish, Egg, Poultry - composition and function. Sugar and Jaggery - Uses.	9
Books for Study	1. B. Srilakshmi, 2018, Food science, New Age Publishers.	
Books for Reference	1. Manay, S. &Shadaksharaswami, M., Foods: Facts and Principles, New Age Publishers, 2004.	

Course Outcome

SL.NO	**COURSE OUTCOME**	**KNOWLEDGE LEVEL (Bloom's Taxonomy)**
CO_1	about the basics of food science	**K2**
CO_2	Detect the Nutrients and their Deficiency Disorders in food	**K2**
CO_3	Correlate the different food products and their functions	**K2**

CO_4	Understand the Role and functions of fruits and vegetables	**K2**
CO_5	Knowledge about the role and functions of Milk and their By-Products	**K3**

K1= Remembering, K2= Understanding, K3 = Application, K4= Analysis and K_5= Synthesis

Mapping of COs with PSOs & POs:

	PO								**PSO**					**Sum of COs with PSOs & POs**
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**	**5**	
CO1	**3**		**1**						**1**		**2**	**1**		**8**
CO2	**2**	**1**	**2**		**1**				**1**	**1**	**2**	**1**		**11**
CO3	**3**	**1**	**1**				**2**		**1**		**1**	**2**		**11**
CO4	**3**	**2**	**2**	**1**						**1**	**2**	**3**	**1**	**15**
CO5	**2**	**1**	**2**		**1**			**2**	**2**		**3**	**2**		**15**
Grand total of COs with PSOs and POs														**60**
Grand Total of COs with PSOs and POs **= Mean Value of COs with PSO and POs / Number of COs relating with PSOs and POs = (60 / 36)**														**1.66**

Strong – 3, Medium – 2 & Low – 1

Mapping Scale	1	2	3
Relation	0.01 to 1.0	1.01 to 2.0	2.01 to 3.0
Quality	Low	Medium	Strong
Mean Value of COs with PSOs and POs		1.66	
Observation	**COs of Basics of Food Science related to a medium extent with PSOs and POS**		

Course Code & Title	PRINCIPLES OF FOOD PRESERVATION (19UFSSL4)		
Class	III-FST	Semester	IV
Cognitive Level	**K-1** Knowledge **K-2** Understanding **K-3** Application		
Course Objectives	• To study about basics of food preservation. • To know about different preservation methods at different methods. • To get awareness regarding usage of preservatives.		

UNIT	Content
I	**Introduction to food preservation**- Objectives and techniques of food preservation- Principles of Preservation methods-Definition of food spoilage and food preservation- Importance of Food preservation.
II	**Preservation by low temperature**- Refrigeration, freezing and freeze-drying, cold storage , Introduction to thawing, changes during thawing and its effect on food.
III	**Preservation by high temperature**- Drying, Dehydration, Canning, Pasteurization, Sterilization, Blanching.
IV	**Preservation by preservatives**- Objectives, Principles, Types of preservatives, Natural & Chemical Preservatives. Chemical preservatives- Safety in use and certification levels.
V	**Preservation by high osmotic pressure**- Pickling, Salting, Curing - Principles. High Concentration of sugar- Jams, Jellies, Squash.
Books for Reference	. B. Srilakshmi, Food science, New Age Publishers,2002 2. Meyer, Food Chemistry, New Age,2004 3. Frazier WC and Westhoff DC, Food Microbiology, TMH Publication, New Delhi, 2004 4. Potter, Food Science,Springer International Publishing AG.
Course Outcomes	On completion of the course, students should be able to **CO1:** Understand the objectives and techniques of food preservation. **CO2:** Know about techniques involved in low temperature preservation. **CO3:** Learn about high temperature preservation. **CO4:** Get in depth knowledge on usage preservatives. **CO5:** Know the trends used in high osmotic pressure.

Mapping of COs with PSOs &POs:

	PO								PSO					Sum of COs with PSOs & POs
	1	2	3	4	5	6	7	8	1	2	3	4	5	
CO1	3	3	1		2	3	2		2	1	3	2		22
CO2	3	3		2	2	3	3	2	3		3	3	1	29
CO3	3	3			3	3	3		3	2	3	3		26
CO4	3	3		2	1	3	2	2	3	2	3	3	2	27

CO5	**3**	**3**		**1**	**1**	**3**	**3**	**2**	**1**	**1**	**3**			**23**
Grand total of COs with PSOs and POs														**132**
Grand Total of COs with PSOs and POs $= \frac{\text{Mean Value of COs with PSO and POs}}{\text{Number of COs relating with PSOs and POs}} = (132/52)$														**2.53**

Strong – 3, Medium – 2 & Low – 1

Mapping Scale	1	2	3
Relation	0.01 to 1.0	1.01 to 2.0	2.01 to 3.0
Quality	Low	Medium	Strong
Mean Value of Cos with PSOs and POs			2.53

Course Code & Title	Technology of Meat and Poultry (19UFSD15)			
Class	III-FST	Semester V	Hours: 90	Credit - 6
Cognitive Level	**K-1** Knowledge **K-2** Understanding **K-3** Application			
Course Educational Objectives	The course aims to enable the students to • Learn about various meat and its abnormalities. • Gain the knowledge on slaughter process of different meat. • Study about meat quality and products. • Specify the methods used in meat preservation • Know about the complete processing, preservation and quality analysis of egg.			

UNIT	Content	No. of Hours
I	**Meat:** Introduction- Definition, composition, classification & characteristics of various meat. Development of meat and poultry industry in India and its need in nation's economy. **Abnormalities of meat**. Psychological and pathological abnormalities. Dark Firm Dry (DFD), Pale Soft Exudate (PSE). Difference between DFD & PSE. Meat freshness. Quality control assessments.	18
II	**Slaughter process:** Slaughter, inspection and grading, Anti-mortem examination of meat animals, slaughter of buffalo, sheep/ goat, poultry, pig. A Generic HACCP model, dressing of carcasses, post-mortem examination of meat, different cuts of pork, beef, mutton, chicken.	18
III	**Meat and Poultry: Quality & Products** **Quality**: Effects of feed, breed and environment on production of meat animals and their Quality. Meat Quality-color, flavor, texture, Water-Holding Capacity (WHC), Emulsification capacity of meat. Sensory quality of processed meat and chicken. **Products**: Thermal Processing, Ham, Sausages, Bacon, Fermented Meat production. Processed Pork Meat flavors.	18
IV	**Meat Preservation:** Refrigeration and freezing, thermal processing-canning of meat, retort pouch, dehydration, irradiation, and RTE. Dressing of chicken, carcasses, and packaging methods of meat.	18
V	**Egg: Industry and Production Practices** Broiler Coordination Committee (BCC), Egg Coordination Committee (ECC) Preservation of eggs - Refrigeration and freezing, thermal processing, dehydration, coating. Quality identification and defects of shell eggs. Factors affecting egg quality and measures of egg quality**.** Processed Egg products – egg powder, egg white isolates**.**	18
Books for Reference	1) Lawrie R A, Lawrie's Meat Science, 5th Ed, Wood head Publisher, England, 1998 2) Parkhurst&Mountney, Poultry Meat and Egg Production, CBS Publication, New Delhi, 1997	

	3) Pearson & Gillet Processed Meats,3 Ed, CBS Publication, New Delhi, 1997 4) Desrosier, N.W and James.N, Technology of food preservation, AVI Publisher. 5) Stadelman W.J, Owen J Cotterill, Egg Science and Technology, 4th Ed. CBS Publication New Delhi, 2002. 6) Hagstad, H.V and Hubbert, W.T, Food quality Control, Foods of Animal Origin, Lawa state, University Press, AMES.

Course Outcome

SL.NO	COURSE OUTCOME (After completion of the course, students should be able to)	KNOWLEDGE LEVEL (Bloom's Taxonomy)
CO_1	Explain the physiological and pathological abnormalities in meat and also know about the development of meat and poultry industry in India	K3
CO_2	Apply various slaughter processes	K3
CO_3	Determine various meat and poultry products and analyse quality management techniques	K4
CO_4	Attributes to the knowledge about techniques in preservation of meat	K3
CO_5	Know about various methods of preservation and quality management and processing of eggs	K3

K1= Remember, K2= Understand, K3 = Apply, K4= Analyze, K5= Synthesis

Mapping of COs with PSOs & POs:

	PO								PSO					Sum of COs with PSOs & POs
	1	2	3	4	5	6	7	8	1	2	3	4	5	
CO1	3	3	3	3	3	1	3	2	3		2	3		29
CO2	3	3	2	1	3	3	3	2	3			3		26
CO3	3	3	1	2	3	3	3	1	3	3	3	3	3	32
CO4	3	3	1	3	3	3	3	1	3	3	3	3	3	35
CO5	3	3	2	3	3	3	3	3	3	3	3	3	3	38
Grand total of COs with PSOs and POs														160
Grand Total of COs with PSOs and POs = Mean Value of COs with PSO and POs / Number of COs relating with PSOs and POs = (160/60)														2.67

Strong – 3, Medium – 2, Low – 1

Mapping Scale	1	2	3
Relation	0.01 to 1.0	1.01 to 2.0	2.01 to 3.0
Quality	Low	Medium	Strong
Mean Value of COs with PSOs and POs			2.67
Observation	**COs of Technology of Meat and Poultry related to a strong extent with PSOs and POS**		

Course Code & Title	Food Safety and Toxicology (19UFSD25)			
Class	III-FST	Semester V	Hours - 90	Credit - 6
Cognitive Level	**K-1** Knowledge **K-2** Understanding **K-3** Application			
Course Educational Objectives	The course aims to enable the students to • Know about the Food safety and various hazards involved in food. • Study about the biological hazards of food. • Ensure the microbial analysis of food. • Understand the Management of Hazards and hygienic conditions of food. • The Recent developments in food safety, food storage and food preservation.			

UNIT	Content	No. of Hours
I	**Food Safety:** Introduction and Definition, Factors affecting Food Safety. Importance of Safe Foods. **Food Hazards**- Definition and Types of Food Hazards- Physical, Chemical and Biological. Impact on health. Control measures.	18
II	**Biological Hazards:** Introduction. Indicator Organisms. Food borne pathogens: bacteria, viruses, eukaryotes, parasites and mycotoxins. Basic steps in detection of food borne pathogens. Water Analysis.	18
III	**Microbiological Criteria** –Microbial Risk Assessment (MRA). Sampling techniques of Microbial analysis. Microbiological standards and limits (processed food, water). Microbiological Assessment of various categories of food- Meat and Meat Products, Dairy, Fruits and Vegetables. Assessment of Surface.	18
IV	**Management of Hazards:** Need, Control Parameters – pH, water, Air, Temperature control. Hygiene and Sanitation in Food Service Establishments -Sources of contamination. Personal Hygiene. Hazard Control methods using physical and chemical agents. Waste Disposal. Pest and Rodent Control. Food Safety Measures.	18
V	**Food Storage, preservation and safety**: Preservation process and food storage. Recent developments in food safety- RTE, RTS, food storage and food preservation aspects. Recent outbreaks in food products.	18
Books for Reference	1. Marriott, Norman G. Principles of Food Sanitation, 5th ed., AVI, New York, 2006. 2. William Helferich, Carl K. Winter, Food Toxicology, CRC Publications, 2010. 3. Lawley, R., Curtis L. and Davis, J. The Food Safety Hazard Guidebook , RSC publishing, 2004 4. Forsythe, S J. Microbiology of Safe Food, Blackwell Science, USA, 2002.	

Course Outcome

SL.NO	COURSE OUTCOME (After completion of the course, students should be able to)	KNOWLEDGE LEVEL (Bloom's Taxonomy)
CO_1	Learn and Interpret about the basics of food Safety and Hazards	**K3**
CO_2	Detect various Biological Hazard and disease pathogens in food	**K4**
CO_3	Attributes to Hazard Analysis in detail	**K3**
CO_4	Apply knowledge about Safety and Hygiene Measures in food industry	**K3**
CO_5	Detect the recent outbreaks in food safety and food laws	**K4**

K1= Remember, K2= Understand, K3 = Apply, K4= Analyze and K_5= Synthesis

Mapping of COs with PSOs & POs:

	PO								PSO					Sum of COs with PSOs & POs
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**	**5**	
CO1	3	3	3	3	3	3	3	1	3		3	1	3	32
CO2	3	3	1	3	3	3	3		3		3	1	3	29
CO3	3	3	1	3	3	3	3		3		3		3	28
CO4	3	3	2	3	3	3	3		3	3	1	1	3	31
CO5	3	3	3	3	3	3	3	3	3		1		3	31
Grand total of COs with PSOs and POs														151
Grand Total of COs with PSOs and POs = $\frac{\text{Mean Value of COs with PSO and POs}}{\text{Number of COs relating with PSOs and POs}}$ = (151/56)														2.7

Strong – 3, Medium – 2, Low – 1

Mapping Scale	1	2	3
Relation	0.01 to 1.0	1.01 to 2.0	2.01 to 3.0
Quality	Low	Medium	Strong
Mean Value of COs with PSOs and POs			2.7
Observation	**COs of Food Safety and Toxicology related to a strong extent with PSOs and POS**		

Course Code & Title	Technology of Meat and Food Safety Laboratory (19UFSP55)			
Class	III-FST	Semester V	Hours - 60	Credit - 2
Course Educational Objectives	The course aims to enable the students to • Learn about various meat and its abnormalities. • Know about the slaughter process of different meat. • Study about meat quality and products. • Analyze the biological hazards of food. • Determine the microbial analysis of food.			
S.No	Content			
	Poultry and Meat Laboratory			
1.	Estimation of moisture content of meat.			
2.	Cutout analyses of canned meat/retort pouches			
3.	Estimation of protein content of meat			
4.	Analysis of frozen meat/meat emulsion products			
5.	To study shelf-life of eggs by different methods of preservation.			
6.	Evaluation of eggs for quality parameters.- market eggs and branded eggs.			
7.	To perform freezing of yolk/albumen			
8.	Canning of meat/meat product formulation.			
9.	Estimation of PH, WHC and ERV of fresh and spoiled meat.			
	Food safety Laboratory			
1.	Microbiological examination of different food samples. Bacteriological analysis of water.			
2.	Biochemical tests for identification of bacteria.			

Course Outcome

SL.NO	COURSE OUTCOME (After completion of the course, students should be able to)	KNOWLEDGE LEVEL (Bloom's Taxonomy)
CO_1	Interpret the knowledge on moisture and nutrient content of the meat product	**K3**
CO_2	Analyse the canned and frozen meat	**K4**
CO_3	Perform quality parameters, shelf-life and freezing of eggs	**K3**
CO_4	Estimation of freshness and effects of meat	**K3**
CO_5	Evaluate the microbiological and biochemical assessment of food	**K5**

K1= Remember, K2= Understand, K3 = Apply, K4= Analyze and K_5= Synthesis

Mapping of COs with PSOs &POs:

	PO								PSO					Sum of COs with PSOs &POs
	1	2	3	4	5	6	7	8	1	2	3	4	5	
CO1	3	3			2	3	3		3		3	3		29
CO2	3	3			2	3	3		3		3	3		29
CO3	3	3			2	3	3		3	2	3	3		31
CO4	3	3			2	3	3		3		3	3		29
CO5	3	3			2	3	3		3		3	3		29
Grand total of COs with PSOs and POs														147
Grand Total of COs with PSOs and POs = Mean Value of COs with PSO and POs / Number of COs relating with PSOs and POs = (147/41)														3.59

Strong – 3, Medium – 2 & Low – 1

Mapping Scale	1	2	3
Relation	0.01 to 1.0	1.01 to 2.0	2.01 to 3.0
Quality	Low	Medium	Strong
Mean Value of COs with PSOs and POs			3.59
Observation	**COs of Principles of Food Production related to a strong extent with PSOs and POS**		

Course Code & Title	Food Quality Testing and Evaluation (19UFSD35)			
Class	III-FST	Semester V	Hours - 90	Credit - 6
Course Educational Objectives	The course aims to enable the students to • Study about the various quality attributes & Food Appearance in food. • Learn about the organs involved in taste perception and their chemical dimensions. • Know about Olfaction and the effectiveness of various Olfactometer. • Determine the colours to be incorporated in the food. • Enumerate about rheological models and texture analysis of food.			

UNIT	Content	No. of Hours
I	Introduction to quality attributes - Appearance, flavour, taste, textural factors and additional quality factors. **Appearance –** Concept and Importance of Food Appearance, Sensory Assessment of Appearance- panel selection, screening and training; Physical requirement for food appearance, types of sensory test, Appearance Scales.	18
II	**Taste -**Introduction, Organs involved in taste perception- tongue, papillae, taste buds, salivary glands mechanism of taste perception. Chemicals responsible for sweet, salt, sour, and bitter taste their structure and chemical dimensions. Factors affecting taste quality, reaction time and factors affecting it. Absolute and recognition threshold taste abnormalities.	18
III	**Olfaction** - Introduction and definition, anatomy of nose, mechanism of odour perception. Prerequisites for odour perception, odour classification, chemical specificity of odour. measurement of odour using different techniques primitive, double tube olfactometer, Elseberg techniques, Wenzel's olfactometer, sniffing, merits and demerits of each methods, olfactory abnormalities.	18
IV	**Colour -** Introduction to natural and synthetic colours. Functions of colour in foods. Optical aspect of colour, perception of colour, objective evaluation, colour measurement using different systems- Munsell colour system, CIE colour system, qualitative and quantitative analysis of colour, reflectance spectrophotometry and Colorimetry.	18
V	**Texture -** Introduction, Definition and classification of texture profile. Subjective evaluation, phases of oral processing. Objective analysis, rheological methods of texture measurement including rheological models. Measurement of texture in various food groups viz. cereals, dairy, fruits and vegetables, fish, meat and meat products.	18
Books for Reference	1. Pomeranz.Y and Meloan, C.E.1996, Food Analysis: Theory and Practicw, CBS Pulishers and Distributors, New Delhi.. 2. DeMan, 3rd edition, Principles of Food Chemistry, Springer, 2007. 3. Meilgard, Sensory Evaluation Techniques, 3rd ed. CRC Press LLC, 2010.	

	4.Harry T. Lawless and HildegradeHeyman (1999); Sensory Evaluation of Food, Principles and practices, Springer Science and Business media, LLC. 5. John B. Hutchings, Food Colour& Appearance, 2nded; Springer Publications, 2010.

Course Outcome

SL.NO	COURSE OUTCOME (After completion of the course, students should be able to)	KNOWLEDGE LEVEL (Bloom's Taxonomy)
CO_1	Determine the basics of quality attributes in food and analyse the appearance in food	K3
CO_2	Explain theorgans involved in taste perception and their chemical dimensions.	K4
CO_3	Recognise the techniques involved in Olfaction	K3
CO_4	Gain knowledge about colour in food	K3
CO_5	Measurement of the texture in various foods	K4

K1= Remember, K2= Understand, K3 = Apply, K4= Analyze and K_5= Synthesis

Mapping of Cos with PSOs & POs:

	PO								PSO					Sum of COs with PSOs & POs
	1	2	3	4	5	6	7	8	1	2	3	4	5	
CO1	3	3			3	3			3	1		1	3	26
CO2	3	3			3	3			3			1	2	18
CO3	3	3			3	3	2		3	1			1	19
CO4	3	3			3	3		3	3			1	1	25
CO5	3	3			3	3		3	3	1			3	28
Grand total of COs with PSOs and POs														116
Grand Total of COs with PSOs and POs **Mean Value of COs with PSO and POs** **= ----------= (116/39)** **Number of COs relating with PSOs and POs**														3.0

Strong – 3, Medium – 2, Low – 1

Mapping Scale	1	2	3
Relation	0.01 to 1.0	1.01 to 2.0	2.01 to 3.0
Quality	Low	Medium	Strong
Mean Value of COs with PSOs and POs			3.0

Course Title	Food Quality Testing and Evaluation Laboratory			
Course Code	(19UFSP65)			
Class	III-FST	Semester V	Hours - 60	Credit - 2
S.No	Content			
	Food Quality Testing Laboratory			
1.	Training of sensory panel for flavor perception.			
2.	To perform sensitivity tests for four basic tests.			
3.	Sensory Evaluation of milk and detection of various favour defects.			
4.	Extraction of pigments from various fruits and vegetables and influence of heating time and pH.			
5.	Sensory evaluation of biscuit samples for textural properties.			
6	Textural evaluation of various food products using texturometer,			
7.	Simple tests for detection of common adulterants – formaldehyde, starch, cane sugar, hydrogen peroxide, sodium bicarbonate in milk.			
8.	Colour estimation by tintometer.			
9.	Estimation of pesticide residues in food/water			
10.	Estimation of benzoic acid in foods.			
11.	Estimation of residual sulphur dioxide in beverages.			
Books for Reference	1. Pomeranz and Cliffton, Food Analysis. Theory and Practice.I ed. CBS Publisher.New Delhi, 2002.			

Course Outcome:

SL.NO	COURSE OUTCOME (After completion of the course, students should be able to)	KNOWLEDGE LEVEL (Bloom's Taxonomy)
CO_1	Gain the knowledge about the different food evaluation techniques.	**K4**
CO_2	Recognize the changes involved through different detection techniques	**K3**
CO_3	Methods to find different adulterants present in food	**K4**
CO_4	Detection techniques for pesticides and other chemicals	**K3**
CO_5	Interpret the residual levels of adulterants in food	**K3**

K1= Remember, K2= Understand, K3 = Apply, K4= Analyze and K_5= Synthesis

Mapping of COs with PSOs &POs:

	PO								PSO					Sum of COs with PSOs &POs
	1	2	3	4	5	6	7	8	1	2	3	4	5	
CO1	3	3			3	3			3	2		1	3	27
CO2	3	3			3	3			3			2	2	19

CO3	**3**	**3**			**3**	**3**	2		**3**	2			1	20
CO4	**3**	**3**			**3**	**3**	2	3	**3**			2	2	24
CO5	**3**	**3**			**3**	**3**		3	**3**	2			3	23
Grand total of COs with PSOs and POs														**113**
Grand Total of COs with PSOs and POs = **Mean Value of COs with PSO and POs** / **Number of COs relating with PSOs and POs** = **(113/40)**														**2.8**

Strong – 3, Medium – 2 & Low – 1

Mapping Scale	1	2	3
Relation	0.01 to 1.0	1.01 to 2.0	2.01 to 3.0
Quality	Low	Medium	Strong
Mean Value of COs with PSOs and POs			2.8
Observation	**COs of Principles of Food Production related to a strong extent with PSOs and POS**		

Course Code & Title	Food Quality Management (19UFSE15)			
Class	III-FST	Semester V	Hours - 60	Credit - 3
Course Educational Objectives	The course aims to enable the students to • Introduce the concept of Food Quality Management system • Learn about food contaminations • Create awareness on food additives • Know about the permissible limits according to government standards and their hazards • Study about Food Laws, Standards and Food regulations in national and international areas.			

UNIT	Content	No. of Hours
I	**Food Quality**: Introduction to food quality management - Definition, quality concepts, quality perception, quality attributes, safety, health, sensory, shelf life, convenience, extrinsic attributes, factors affecting food quality. Total food quality management functions.	12
II	**Food contamination**: Contamination in Food- : Physical, Natural toxins, chemical, heavy metals, antibiotics, dioxins, environmental pollutants. Contaminants formed during processing nitrosamines, acrylamide, contaminants form packaging materials.	12
III	**Food Additives**: Meaning, Need, Classification, Characteristics and classification of food additives.Antimicrobial agents – Nitrites, sulphides, sulphur di oxide, sodium chloride, hydrogen peroxide.Antioxidants - Introduction, mechanism of action, natural and synthetic anti-oxidants, technological aspect of antioxidants.Sweeteners- Introduction, importance, classification- natural and artificial.Colors- Importance, classification- natural, artificial colors.	14
IV	**Food standards:** GRAS (Generally Recognized as Safe). Permissible limit for Food additives. ADI, LD50. Food labelling. Technical Barriers in Trade, Tinned foods -Standards of Identity, Standards of Quality.	10
V	**Food Laws and regulations**: National and International Food laws & regulations: FSSAI, FPO, PFA, AGMARK, BIS, ISI, HACCP, USFDA, EU, CodexAlimantarious. World Trade Organization- Sanitary and Phyto Sanitary agreement.	12
Books for Reference	1. Shalton , Principles and Practices for the Safe processing of Foods. 2.Pieternel A, Luning, Willem J. Marcelis, Food Quality Management Technological and Managerial principles and practices, Wageningen,2009. 3. Brannen and etal,Food Additives, Marcel Dekker, New York,1990 4. DeMan, 3rd edition, Principles of Food Chemistry, Springer, 2007. 5. Early, R.(1995), Gude to Quality Management Systems for the Food industry, Blackie, Academic and Professional, London.	

Course Outcome:

SL.NO	COURSE OUTCOME (After completion of the course, students should be able to)	KNOWLEDGE LEVEL (Bloom's Taxonomy)
CO_1	Learn the concepts in food quality management	**K3**
CO_2	Detect and differentiate the existence of different types of food contaminations	**K4**
CO_3	Describe the significance of food additives in varieties	**K3**
CO_4	Gain depth knowledge about Food Standards, permissible limits and labelling of food products	**K3**
CO_5	Identification of available national and international food laws and regulations	**K4**

K1= Remember, K2= Understand, K3 = Apply, K4= Analyze and K_5= Synthesis

Mapping of COs with PSOs & POs:

	PO								PSO					Sum of COs with PSOs & POs
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**	**5**	
CO1	**3**	**3**			**3**		**3**		**3**		2	1		18
CO2	**3**	**3**			**3**	**2**	**3**		**3**		2	2	1	22
CO3	**3**	**3**			**3**		**3**		**3**		2	2	3	22
CO4	**3**	**3**	**3**	**2**	**3**	**3**	**3**	3	**3**		3		3	32
CO5	**3**	**3**	**3**	**2**	**3**	**3**	**3**		**3**		2		3	28
Grand total of COs with PSOs and POs														122
Grand Total of COs with PSOs and POs **Mean Value of COs with PSO and POs** **= ---------- =(122/45)** **Number of COs relating with PSOs and POs**														2.7

Strong – 3, Medium – 2, Low - 1

Mapping Scale	1	2	3
Relation	0.01 to 1.0	1.01 to 2.0	2.01 to 3.0
Quality	Low	Medium	Strong
Mean Value of COs with PSOs and POs			2.7
Observation	**COs of Food Quality Managementrelated strongly with PSOs and POS**		

Course Code & Title	FOOD PRODUCT DEVELOPMENT (19UFSE15)			
Class	III-FST	Semester V	Hours -60	Credit - 3
Course Educational Objectives	• To understand various aspects of development of a food product • To acquire knowledge on the importance of Consumer Research, Finance and Communication • To appraise the main features and trends of a specific food product within an appropriate market setting • To understand the development cycle of the food product. • To develop and justify technical specifications for the new product			

UNIT	Content	Hours
I	**Food Products development**- Definition, classification, characterization, Phases, factors influencing new product development – social concerns, health concerns, impact of technology and market place influence.	**10**
II	**Generation of New Product Ideas:** Internal sources of idea, External sources of ideas and market place analysis.	**12**
III	**Screening of the ideas:** Team approach and involvement of various departments, objectives of screening, criteria for screening ideas. Sensory Evaluation: Descriptive, thershold and acceptance test. Shelf life testing- types of shelf life testing mode of food deterioration. Technical development – recipe development and scale up. Product integrity and conformance to standards.	**14**
IV	**Newer food stabilizing systems :** Thermal processing, ohmic heating, stabilizing with high pressure, other non-thermal stabilizing systems, controlled / modified atmosphere packaging, irradiation, hurdle technology, low temperature stabilization -Use of various new ingredients to suit product functions, Packaging, graphic designing and labeling.	**12**
V	**Test Marketing:** Evaluating results and analyzing. Entrepreneurship: Plant location, investment, financing the project .	**12**
Books for Reference	1. Fuller G W (1994) New Food Product Development : From Concept to Market place CRC Press, New York 2. Man C M D and Jomes A A (1994) Shelf life Evaluation of Foods. Blackie Academic and Professional, London 3. Olickle, J K (1990) New Product Development and value added. Food Development Division, Agriculture, Canada 4. Graf E and Saguy I S (1991), Food Product Development : From concept to the Market Place, Van Nostrand Reinhold New York	

Course Outcome

After completion of the course, students should be able to do

SL.NO	COURSE OUTCOME	KNOWLEDGE LEVEL (Bloom's Taxonomy)
CO_1	Determines the Concept of Packaging in food	K2
CO_2	Analyse the importance of Consumer Research, Finance and Communication	K1
CO_3	Detect the main features and trends of a specific food product within an appropriate market setting	K1
CO_4	Knowledge about the development cycle of the food product	K2
CO_5	Explain about justify technical specifications for the new product	K2

K1= Remembering, K2= Understanding, K3 = Application, K4= Analysis and K_5= Synthesis

Mapping of Cos with PSOs & POs:

	PO								PSO					Sum of COs with PSOs & POs
	1	2	3	4	5	6	7	8	1	2	3	4	5	
CO1														
CO2			2			1				1	2	1		7
CO3					1		1							2
CO4	1		1		1						1			4
CO5								1						1
Grand total of COs with PSOs and POs														14
Grand Total of COs with PSOs and POs = $\frac{\text{Mean Value of COs with PSO and POs}}{\text{Number of COs relating with PSOs and POs}}$ = (14 / 12)														1.16

Strong – 3, Medium – 2, Low – 1

Mapping Scale	1	2	3
Relation	0.01 to 1.0	1.01 to 2.0	2.01 to 3.0
Quality	Low	Medium	Strong
Mean Value of COs with PSOs and POs		1.16	
Observation	**COs of Food Product Developmentrelated to a medium extent with PSOs and POS**		

Course Code & Title	FOOD LAWS AND REGULATIONS (19UFSSL5)			
Class	III-FST	Semester V	Hours -	Credit : 3
Course Educational Objectives	• To study about the laws involved in maintaining the standards of the food. • To learn about the National Laws. • To get awareness regarding International Laws and certification marks for different products. • To know about the Packing and labelling requirements. • To study about food adulteration in detail.			

UNIT	Content
I	**Introduction to Laws and Regulations** Objective of Food Laws, Major Food Laws and Regulations of India and Regulation of Food Sanitation.
II	**National laws** Prevention of food Adulteration Act (PFA), Fruit Product Order (FPO), Meat Product Order (MPO), Agmark, Bureau of Indian Standards (BIS), Food Safety and Standards Authority of India (FSSAI).
III	**International Laws** Certification of HACCP, ISO, Codex Alimentarius, FDA, USDA, CARE.
IV	**Laws affecting Food Labeling and Packaging in Food Industry** Packaging – Functions, Classifications, Material used for packing and laws related to packaging. Labeling – Nutrition Labeling, Labeling provisions in existing food laws.
V	**Food Adulteration** Definition – Methods to detect adulterant of various foods.
Books for Reference	1. B. Srilakshmi, Food Science, New Age Publishers, 2002. 2. Potter, Food Science, Springer International Publishing AG.

Course Outcome

After completion of the course, students should be able to do

SL.NO	COURSE OUTCOME	KNOWLEDGE LEVEL (Bloom's Taxonomy)
CO_1	Elucidation of various food laws and regulations.	K2
CO_2	Identification of about various food laws in India.	K2
CO_3	Interpretation of various International laws.	K2
CO_4	Get in depth knowledge about food labelling and packing requirements	K2
CO_5	Outlining of various food adulterations.	K1

K1= Remembering, K2= Understanding, K3 = Application, K4= Analysis and K_5= Synthesis

Mapping of COs with PSOs & POs:

	PO								PSO					Sum of COs with PSOs & POs
	1	2	3	4	5	6	7	8	1	2	3	4	5	
CO1			1		1	1		1					2	6
CO2				1	2			1			1		3	8
CO3				2	1		1	1			1		3	9
CO4				1	2			1			1		3	8
CO5	1		3		1			1	1	1	1		2	11
Grand total of COs with PSOs and POs														42
Grand Total of COs with PSOs and POs **= Mean Value of COs with PSO and POs / Number of COs relating with PSOs and POs =(42/29)**														1.44

Strong – 3, Medium 2, Low – 1

Mapping Scale	1	2	3
Relation	0.01 to 1.0	1.01 to 2.0	2.01 to 3.0
Quality	Low	Medium	Strong
Mean Value of COs with PSOs and POs		1.44	
Observation	**COs of Food Laws and Regulations related to a medium extent with PSOs and POs**		

Course Code & Title	Technology of Sea Foods (19UFSD25)			
Class	III-FST	Semester VI	Hours: 90	Credit- 6
Course Educational Objectives	The course aims to enable the students to • Learn about sea foods and quality control inspection of sea food industry • Study about Sea foods preservation methods • Equip knowledge on the Fish Canning process • Gain insight about different fishery by products • Understand the processing of other sea foods			

UNIT	Content	No. of Hours
I	**Sea Foods:** Introduction, Types of Sea Foods. Fish-Classification, Composition and Nutritional value of different types of fish, Characteristics and selection of fresh fish. Quality Control Inspection of Sea food Industry.	18
II	**Sea Foods 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.	18
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, spoilage of fish – methods of controlling spoilage (Drying and salting of fish- salting process, salting methods, preservation by smoking). Cannery operations for specific canned products.(Tuna).	18
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). Fermented fish, Fish sauce, Fish pickles and Fish Paste.	18
V	**Processing of other Sea foods** - Crabs, lobsters, prawns, shrimps & squid. Packaging – Suitable packaging for Sea foods and its products. (LDPE, HDPE, vacuum packaging, MAP, bottling and canning).	18
Books for Reference	1. Sen DP, Advances in Fish Processing Technology, Allied Publishers Pvt. Limited 2005. 2. Hall GM, Fish Processing Technology, VCH Publishers Inc., NY, 1992. 3. Shahidi F and Botta JR, Seafoods: Chemistry, Processing, Technology and Quality, Blackie Academic & Professional, London, 1994.	

Course Outcome

SL.NO	COURSE OUTCOME (After completion of the course, students should be able to)	KNOWLEDGE LEVEL (Bloom's Taxonomy)
CO_1	Explain the classification, characteristic and the Quality Control Inspection of Sea food Industry.	K3

CO_2	Apply the various preservation methods of fishes	**K3**
CO_3	Determine the principles and importance of canning of fishes	**K3**
CO_4	Attributes to know about various fishery byproducts	**K2**
CO_5	Provides an in depth knowledge on processing of different sea foods	**K4**

K1= Remember, K2= Understand, K3 = Apply, K4= Analyze and K_5= Synthesis

Mapping of COs with PSOs & POs:

	PO								**PSO**					**Sum of COs with PSOs & POs**
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**	**5**	
CO1	3	3	2	3	3	3	3		3	3	3	3	3	35
CO2	3	3	2	3	3	3	3		3	3	1	3	3	33
CO3	3	3	2	3	3	3	3	3	3	2	1	3	3	35
CO4	3	3			3	3		3	3	3	3	3	3	30
CO5	3	3	2	1	3	3	3	3	3	3	1	3		31
Grand total of COs with PSOs and POs														164
Grand Total of COs with PSOs and POs **Mean Value of COs with PSO and POs** **= ---------- =(164/59)** **Number of COs relating with PSOs and POs**														2.8

Strong – 3, medium – 2, Low - 1

Mapping Scale	1	2	3
Relation	0.01 to 1.0	1.01 to 2.0	2.01 to 3.0
Quality	Low	Medium	Strong
Mean Value of COs with PSOs and POs			2.8
Observation	**COs of Technology of Sea Foods related to a strongly extent with PSOs and POS**		

Course Title	Technology of Sea Foods Laboratory			
Course Code	(19UFSP76)			
Class	III-FST	**Semester** VI	**Hours -45**	**Credit - 2**
Course Educational Objectives	The course aims to enable the students to • Learn about sea foods and Quality control inspection of sea foods. • Study about the Sea foods preservation methods. • Know different Fish Canning process and characteristic assessment. • Get insight on different fishery by products. • Equip knowledge on different cleaning of different sea foods.			
S.No	**Content**			
1. 2. 3. 4. 5.	**Sea Food Laboratory** Quality evaluation of Fish Quality evaluation of Prawn Subjective evaluation of fresh fish. Cut out examination of canned fish (i) Sardine (ii) Tuna (iii) Mackerel. Fish product formulation/ canning			

Course Outcome

SL.NO	COURSE OUTCOME (After completion of the course, students should be able to)	KNOWLEDGE LEVEL (Bloom's Taxonomy)
CO_1	Gain the knowledge in types of sea foods	K3
CO_2	Recognize the types and difference between each sea food	K5
CO_3	Principles of cleaning required is known	K3
CO_4	Perform the structural disintegration of the product	K3
CO_5	Interpret the structural differences involved in each one	K5

K1= Remember, K2= Understand, K3 = Apply, K4= Analyze, K5= Evaluate.

Mapping of COs with PSOs &POs:

	PO								PSO					Sum of COs with PSOs &POs
	1	2	3	4	5	6	7	8	1	2	3	4	5	
CO1	3	3		3	3	3	1	1	3	3	3	3		29
CO2	3	3	3	3	3	3			3	2		3		26
CO3	3	3	3	3	3		3	3	3	1		3		28
CO4	3	3	3	3	3		3	3	3	3		3		30
CO5	3	3		3	3	3	3	3	3	3	3	3	3	36
Grand total of COs with PSOs and POs														149
Grand Total of COs with PSOs and POs = Mean Value of COs with PSO and POs / Number of COs relating with PSOs and POs = (149/52)														2.9

Strong – 3, Medium – 2 & Low – 1

Mapping Scale	1	2	3
Relation	0.01 to 1.0	1.01 to 2.0	2.01 to 3.0
Quality	Low	Medium	Strong
Mean Value of COs with PSOs and POs			2.9
Observation	**COs of Principles of Food Production related to a strongly extent with PSOs and POS**		

Course Code & Title	Project Management and Entrepreneurship (19UFSD56)			
Class	III-FST	Semester VI	Hours- 90	Credit - 5
Course Educational Objectives	The course aims to enable the students to • Learn about the principle and concept of entrepreneurship • Study about the small business and Forms of Business Organization • Interpret about the Project Identification, Screening and Appraisal • Know about the importance of various financial institutions and banks in supporting entrepreneurs. • Understand about the project management and global business			

UNIT	Content	No. of Hours
I	**Entrepreneurship:** Concept and Definition. The Conceptual model of Entrepreneurship given by John Kao. Views given by Schumpeter Walker &Drucker on Entrepreneurship and Entrepreneur, Entrepreneur and Manager , Enterprise and Entrepreneur, Types of Entrepreneurship, Women Entrepreneur, Growth, prospects and problems.	18
II	**Small Scale Business and Forms of Business Organization:** Small Business: Definition, Composition and Economic Contribution. Forms of Ownership: Sole Proprietorship, Partnership & Corporation form of Organization -Advantages and Disadvantages.	18
III	**Project Appraisal:** Project - definition, features, types, Project Identification, Project screening, Feasibility study. Project Appraisal - technical appraisal, marketing appraisal, legal and environment appraisal, financial appraisal- evaluating project using pay-back and NPV, Detailed project report.	18
IV	**Industrial Finance:** Arrangement of funds: Traditional sources of financing – Equity shares, preference shares, Debentures/bonds, loan from financial institutions- Venture capital / Incubation fund. Role played by various Financial Institutions like IDBI, SIDBI and Commercial Banks.	18
V	**Project Management:** Global tender and Project insurance. Global Business: Branches, Licensing Arrangements, Subsidiaries, Franchising, Joint venture and turnkey projects.	18
Books for Reference	1. Scarborough &Zimmerer, Effective Small Business Management, 2008, CBS Publishers, New Delhi 2.Gupta&Srinivasan, Entrepreneurial Development, 2004, CRC Press LLP, Mumbai. 3. P.Gopalkrishnan& V.E. Ramamoorthy, Text book of Project management, 2000, VCH Publishers, NY. 4. B.M. Patel , Project management ,2000, Vikas Publishers, New Delhi.	

Course Outcome

SL.NO	COURSE OUTCOME (After completion of the course, students should be able to)	KNOWLEDGE LEVEL (Bloom's Taxonomy)
CO_1	Explain the entire concept of entrepreneurship	**K3**
CO_2	Analyse about small business and forms of business organization	**K3**
CO_3	Detect and determine the detailed structure of projects and its appraisals	**K4**
CO_4	Recognize an in-depth knowledge on roles of different agencies in industrial financing	**K2**
CO_5	Knows about project management for sustained local to global business	**K2**

K1= Remembering, K2= Understanding, K3 = Application, K4= Analysis and K_5= Synthesis

Mapping of COs with PSOs & POs:

	PO								PSO					Sum of COs with PSOs & POs
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**	**5**	
CO1	3	3		1	3	3			3			3		19
CO2	3	3			3	3	2		3		2	3		22
CO3	3	3	3	2	3	3			3	2			3	25
CO4	3	3	3		3	3			3		2		2	22
CO5	3	3	1	2	3	3		2	3	1	2		2	25
Grand total of COs with PSOs and POs														113
Grand Total of COs with PSOs and POs **Mean Value of COs with PSO and POs = ---------- =(113/43) Number of COs relating with PSOs and POs**														2.6

Strong – 3, Medium – 2, Low – 1

Mapping Scale	1	2	3
Relation	0.01 to 1.0	1.01 to 2.0	2.01 to 3.0
Quality	Low	Medium	Strong
Mean Value of COs with PSOs and POs			2.6
Observation	**COs of Project Management and Entrepreneurship related to a strongly extent with PSOs and POS**		

Course Code & Title	Food Marketing (19UFSE26)			
Class	III-FST	Semester VI	Hours - 60	Credit - 3
Course Educational Objectives	The course aims to enable the students to • Know about Food Marketing and Consumer behaviour • Learn about global Market Status • Study about market segmentation, Retail and Wholesale Markets. • Understand about the Marketing and sales management • Enumerate about the role of advertisements and technologies in marketing.			

UNIT	Content	No. of Hours
I	**Food Marketing and Consumer Behaviour**: Introduction, Definition, Classification of consumers – domestic-foreign-residents of urban area, cosmopolitan and rural area. Their liking towards products.	12
II	**Global market status**: Export potential. Selected Indian food products for global market. Role of export promoting agencies, Product Mix. Marketing more than one product. Product development. Innovation. Product multiplication – value addition.	12
III	**Market segmentation**: Domestic, Export, retail, wholesale markets. Market for processed foods. Vegetarian and non-vegetarian foods. Consumer needs- decision on size and quality. Quantity- brand-preservation and packaging.	12
IV	**Marketing and Sales Management:** Market survey techniques. Nature of products. Market strategy. Packaging, advertisement, after-sales service, costing and pricing. Consumer evaluation. Development of schedule. Analysis of data. Importance and role of different research and development departments. Formulation of new food products. Infants, adolescents, old age, therapeutic uses, sports persons and armed service personnel.	12
V	**Advertisement and Sales Promoters:** Role of advertisements and technologies in promotion of new products. Market promotion and positioning of food products.	12
Books for Reference	1. Acharya, Agricultural Marketing, 2006, Tata Mc Graw hill Publisher, USA 2. 2. Sherieker, Marketing Management, 2002, Wood head Publishers, England. 3. Vandevan, Marketing Research management, 1998, CRC Press, Kolkata. 4.Schaffner,David.J, Food Marketing Management: An International Perspective (1997), Macgraw Hills College.	

Course Outcome

SL.NO	COURSE OUTCOME (After completion of the course, students should be able to)	KNOWLEDGE LEVEL (Bloom's Taxonomy)
CO_1	Gain knowledge about marketing and consumer behaviours	**K3**
CO_2	Indian food products in Global market	**K2**
CO_3	Analyze the market segmentation, Retail and Wholesale Markets	**K4**
CO_4	Develop the skill on Marketing and Sales Management	**K4**
CO_5	Determine the role of advertisements and technologies in marketing	**K3**

K1= Remembering, K2= Understanding, K3 = Application, K4= Analysis and K_5= Synthesis

Mapping of COs with PSOs & POs:

	PO								PSO					Sum of COs with PSOs & POs
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**	**5**	
CO1	3	3			3	3	1		3					16
CO2	3	3	2	3	3	3	1		3			1	3	25
CO3	3	3	2		3	3	1	3	3		3		3	27
CO4	3	3	2		3	3	1	3	3		3		3	30
CO5	3	3	3	3	3	3	1		3		2		2	26
Grand total of COs with PSOs and POs														124
Grand Total of COs with PSOs and POs / Mean Value of COs with PSO and POs = ——— = (124/46) / Number of COs relating with PSOs and POs														2.7

Strong – 3, Medium – 2, Low – 1

Mapping Scale	1	2	3
Relation	0.01 to 1.0	1.01 to 2.0	2.01 to 3.0
Quality	Low	Medium	Strong
Mean Value of COs with PSOs and POs			2.7
Observation	**COs of Food Marketing related to a strongly extent with PSOs and POS**		

Course Code & Title	Food Packaging (19UFSE26)			
Class	III-FST	Semester VI	Hours-60	Credit-3
Course Educational Objectives	• Gain knowledge about concept of packaging and Package design. • To learn about various packaging Materials • To study about packaging methods and system • Understand packaging of different food products Attain insight into the aspects of labelling, testing and evaluation of packaged foods.			

UNIT	Content	No. of Hours
I	**Concept of Packaging and package design** Introduction and History of Packaging, Principles and Functions of Packaging Classification, Application, Evaluation Packaging Operations, Packaging Terminology Design of Packages, Package Design Requirements	**12**
II	**Packaging Materials** Basic Packaging Materials – Paper, Wood, Plastics, Glass, Metals Containers Packaging Films – Polyethylene, Cellophane, Aluminium foil, Laminates, Etc. New Polymeric Packaging Films, BOPP, Shrink Film, Cling and Wrap Film, Edible Film Testing of Packaging materials	**12**
III	**Packaging Methods and Systems** Traditional Food Packaging, Retortable, Lined Cartons, Bag in Box Aseptic, Modified Atmosphere Packaging, Controlled Atmosphere packaging, Vacuum and Gas Packaging, Bio Based Packaging Eco-friendly and Safe Packaging for Exports, Nano Packaging Ovenable Packages, Transport Packages Packaging Equipments – Filling , Cartoning, Vacuum packaging, Conveyors, Sealing, Coding and Marking	**13**
IV	**Packaging of Food Products** Bakery Products, Dairy Products, Fats and Oils, Fresh Foods, Beverages, Processed Foods Meat and Sea Foods	**10**
V	**Storage, Handling and Distribution of Packages** Testing of Packaged Foods- Shelf life, Physical and Chemical Labelling – Definition, Purpose, Types, Materials, Adhesives Barcode and Universal Product code Food and Nutritional Labelling- Packaging and labeling Regulations and Specifications - FSSAI International Food Package Related to Food Safety, Quality and Trade	**13**
Books for Reference	1. Potter, N.M., Food Science, The AVI Publishing Company Inc., West Post, Connecticut, USA 2015, 2. Daise, Frank, A. (Ed.) 2015, Modern Processing, Packaging and Distribution System for Food, Blackie, Glasgow andLondon. 3. Food Packaging Technology Handbook, 2013, NIIR Board of Consultants and Engineers, National Institute of Research, NewDelhi.	

	4. Modern Packaging Industries, 2014, NIIR Board of Consultants and Engineers, National Institute of Industrial Research, New Delhi.	

Course Outcome

SL.NO	COURSE OUTCOME (After completion of the course, students should be able to)	KNOWLEDGE LEVEL (Bloom's Taxonomy)
CO_1	Explain the Concept of Packaging in food	**K2**
CO_2	Find about Materials used in Packaging	**K3**
CO_3	Analysis of the Packaging methods used.	**K3**
CO_4	Explain about the different types of Food Products with suitable Packaging material	**K2**
CO_5	Determines the importance of storage of packed foods	**K3**

K1= Remember, K2= Understand, K3 = Apply, K4= Analyze and K_5= Synthesis

Mapping of Cos with PSOs & POs:

	PO								PSO					Sum of COs with PSOs & POs
	1	2	3	4	5	6	7	8	1	2	3	4	5	
CO1	1			1										2
CO2				2			2				1		1	6
CO3	1		1	2		2	3		1		1		1	12
CO4		3		3	1	2			1	2	2	2	1	17
CO5	1		1		1			3			1			7
Grand total of COs with PSOs and POs														44
Grand Total of COs with PSOs and POs = $\frac{\text{Mean Value of COs with PSO and POs}}{\text{Number of COs relating with PSOs and POs}}$ = (44 / 28)														

Strong – 3, Medium – 2, Low – 1

Mapping Scale	1	2	3
Relation	0.01 to 1.0	1.01 to 2.0	2.01 to 3.0
Quality	Low	Medium	Strong
Mean Value of COs with PSOs and POs		1.57	
Observation	**COs of Food Packagingrelated to a medium extent with PSOs and POS**		

Course Code & Title	Food Processing (19UFSSL6)			
Class	III-FST	Semester VI	Hours -	Credit - 3
Course Educational Objectives	• To study about processing techniques used in various types of food. • To know about preparation of various products through processing. • To gain an understanding about importance of processing various food groups. • To provide positive outcomes from new processing technologies. • To find better method for processing different food by reducing the characteristic losses.			

UNIT	Content
I	**Principles in processing** Principles underlying food processing operations – Thermal, radiation, Refrigeration, Freezing and dehydration
II	**Cereals & Pulses Processing** Rice milling, Parboiling, Conventional Process, Wheat milling, Maize processing, Pulses milling, Oil extraction.
III	**Meat & fish processing** Ageing, Curing and Tenderization of meat, Pickling, Salting and Drying, Canning, Chilling, Freezing, Smoking.
IV	**Dairy Processing** Milk Processing - Curd, Butter, Ghee, Cheese, Paneer and Ice cream.
V	**Beverages Processing** Processing of Coffee, Types of Tea, Processing of cocoa and chocolate, vegetable juices, Carbonated Non Alcoholic Beverages and Alcoholic Beverages.
Books for Reference	1. B. Srilakshmi, Food science, New Age Publishers, 2002. 2. Thangam.E.Philip, Modern Cookery, OrientBlackSwan, Sixth edition (2010).

Course Outcome

After completion of the course, students should be able to do

SL.NO	COURSE OUTCOME	KNOWLEDGE LEVEL (Bloom's Taxonomy)
CO_1	Explain about the basic processing principles.	K2
CO_2	Determine cereals and pulses processing.	K2
CO_3	Outline the techniques involved in processing of meat and fish.	K3
CO_4	Get in depth knowledge on processing of milk and milk products.	K2
CO_5	Know various processing techniques of beverage preparation.	K2

K1= Remembering, K2= Understanding, K3 = Application, K4= Analysis and K_5= Synthesis

Mapping of Cos with PSOs & POs:

	PO								PSO					Sum of COs with PSOs & POs
	1	2	3		4	5	6	7	8	1	2	3	4	5	
CO1	2				3		1			2				1	9
CO2			2		2		1		2	2	1		3	1	14
CO3	2		2		2	1	1	3	2	2	1	1	3	1	21
CO4	1	2	2		2	1	1	3		2	1	1	3	1	20
CO5	1	2	2		2	1	1		1	2	1		3	1	17
Grand total of COs with PSOs and POs															81
Grand Total of COs with PSOs and POs **Mean Value of COs with PSO and POs** **= ---------- = (81 / 48)** **Number of COs relating with PSOs and POs**															1.68

Strong - 3, Medium – 2 & Low – 1

Mapping Scale	1	2	3
Relation	0.01 to 1.0	1.01 to 2.0	2.01 to 3.0
Quality	Low	Medium	Strong
Mean Value of COs with PSOs and POs		1.68	
Observation	**COs of Food Processing related to a medium extent with PSOs and POS**		