Course Title	FOOD PROCESSING AND PRESERVATION TECHNOLOGY				
Type of Course	**Major**				
Semester	4				
Academic Level	200				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understanding of thermal processes, their industrial, and ability to apply this knowledge in various contexts.	U	C	▪ Quiz / Assignment/ Discussion / Seminar ▪ Midterm Exam ▪ Final Exam
CO2	Apply knowledge and skills related to preserving products at low temperature. Practical skills in implementing and optimizing low temperature preservation methods, along with an awareness of safety measures and quality control.	AP	P	
CO3	Apply knowledge of the biological processes and chemical methods of preservation.	AP	M	
CO4	Demonstrate knowledge of innovative preservation methods and also gain insights into sustainable practices, quality control and regulatory considerations with in the dynamic field of food science.	Ap	F	
CO5	Equip individual with the knowledge and skill to develop new product in market	Ap	C	
CO6	Create basic knowledge on recent trends in food preservation.	C	M	

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**THERMAL PROCESSING**		**12**
	1	Introduction: Basic principles of food preservation, methods of preservation.	2
	2	Thermal processing: blanching, pasteurization, sterilization, UHT sterilization, Aseptic processing, cooking, frying, baking, grilling, smoking	2
	3	Canning: principle, steps involved in canning, types of containers used, heat penetration into containers, pH classification of foods,, corrosion of cans.	3
	4	Drying and dehydration: Heat and mass transfer, factors affecting drying process, drying curve, evaporation, application of evaporation in food industry, drying pre-treatments, natural and Mechanical drying, merits and demerits.	3
	5	Driers in food industry: drum, spray, fluidized bed, air drier, vacuum drier, tunnel drier. Dehydrofreezing, freeze drying.	2
II	**LOW TEMPERATURE TECHNIQUES**		**7**
	6	Preservation by chilling: Low temperature preservation of fresh fruits, vegetables, meat and fish products. Chilling injury. Changes during refrigeration.	3
	7	Prservation by freezing: Principle, freezing rate, freezing methods, quick freezing, slow freezing, Quality of frozen food – Retrogradation, protein denaturation, freezer burn. Common spoilage occurs during freezing. Preservation by controlling water activity. IQF	3
	8	Thawing: Effects on food, changes during thawing, types.	1
III	**FERMENTATION AND PRESERVATIVES**		**11**
	9	Preservation by fermentation: Alcoholic, acetic acid and lactic acid fermentation, applications in food processing.	3
	10	Natural preservatives: sugar, salt, vinegar, spices, mode of action	1
	11	Chemical preservatives: Sulphur dioxide, benzoic acid, sorbates , propionates , acetic acid, mode of action , FSSAI regulations for various food products.	3
	12	Food additives: Antioxidants, Antibiotics.	2
	13	Preservation by controlling water activity: High sugar products, IMF, curing and effect of salt of food preservation.	2
IV	**RECENT TRENDS AND NPD**		**15**

	14	Non thermal technologies: Microfiltration , bactofugation , ultra high voltage electric field, Pulsed electric field	2
	15	High pressure processing : Principles applications and advantages.	1
	16	Microwave processing: Principles applications and advantages.	2
	17	Alternate thermal technologies: ohmic heating, dielectric heating infrared and induction heating.	2
	18	Nanotechnology: Principle, application and advantages.	1
	19	Hurdle technology: Principles, applications and advantages.	1
	20	Irradiation: Sources of ionization radiation, Dose and Dosimetry, Mode of action, scope of irradiation.	2
	21	NPD: Food needs, consumer preference, and market survey, Steps in new product development.	2
	22	Subjective analysis: Sensory evaluation, panel selection various methods and its relevance in new product development.	2
V	**Practical**		**30**
		Blanching of Vegetables.	2
		Dehydration of Vegetables using Cabinet drier.	3
		Determination of Moisture content	3
		Dehydration of fruits in sugar syrup	3
		Qualitative Determination of Benzoic acid & SO2	3
		Sensory Evaluation	4
		Industrial Visit to Food Processing Unit	12

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	2	1	3	-	-	2	-	2	1	3	-	-
CO 2	1	2	1	2	1	-	-	1	2	1	2	1
CO 3	2	1	1	-	-	2	1	2	1	1	-	-
CO 4	2	1	3	-	-	2	2	1	3	-	-	2
CO 5	1	2	1	2	1	-	1	2	1	2	1	-
CO 6	2	1	1	-	-	2	2	1	1	-	-	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4	✓	✓	✓	✓
CO 5	✓	✓	✓	✓
CO 6	✓	✓	✓	✓

Course Title	CEREALS, PULSES AND OIL SEEDS TECHNOLOGY				
Type of Course	**Major**				
Semester	4				
Academic Level	200				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Memorise details of millet chemistry	U	C	▪ Quiz / Assignment/Discussion / Seminar ▪ Midterm Exam ▪ Final Exam
CO2	Understand the processing method of pulses, nuts and oilseeds	Ap	P	
CO3	Distinguish the baking technologies of bread, cake, biscuits and confectionary	Ap	M	
CO4	Interpret various processing technologies related to rice, wheat, millets, pulses, nuts and oil seeds	Ap	F	
CO5	Create Knowledge on processing of cereals, pulses and oil seeds	C	F	

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
# - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Technology of Wheat and Rice**	**12**
	1	Wheat: Structure, composition and verities	2
	2	Milling of wheat: unit operations and equipments	2
	3	Products and By-products of Wheat	2
	4	Rice: structure, composition and varieties Rice Quality--Physical, chemical and cooking	2
	5	Parboiling of Rice- Process, Types, advantages and disadvantages Milling of rice: Steps in Milling and factors affecting milling quality	4

		Products and By-products of rice	
II		**Bakery and Confectionary**	**12**
	6	Baking: principle of baking, classification of baked foods, baking additives	2
	7	Bread: bread making- role of ingredients, bread faults and remedies, staling of bread	2
	8	Cake: cake making, role of ingredients, types of making, cake faults and remedies	2
	9	Biscuits: Biscuits and Cookies, Crackers and Wafers Technology of Biscuit, Faults and Remedies	2
	10	FSSAI specification of Biscuit, bread, cake, and pasta goods,	2
	11	**Confectionary:** raw materials, hard candy, toffee, caramel	2
III		**Millets, Oats and Barley**	**4**
	12	Composition and types of millets, oats, corn and barley	2
	13	Important Millets and General Processing of Millets	2
IV		**Pulses, Nuts and Oil Seeds**	**17**
	Pulses		
	14	Composition and types	1
	15	Processing- soaking, germination, decortications, cooking and fermentation	2
	16	Changes during germination, Anti nutritional factors, factors affecting cooking time	3
	17	Traditional and commercial milling method	1
	18	Pre conditioning, dry milling, wet milling	2
	Nuts and Oil Seeds		
	19	Source, composition, processing of oil seeds- soyabean, coconut	1
	20	Hydrogenation, refining of fats and oils, bleaching and deodorizing, hydroxylation, shortening, margarine, protein isolates, tartarised vegetable proteins	3
	21	Milling of oil seeds: mechanical expression, super critical fluid extraction, screw press, hydrolytic press, solvent extraction methods	2
	22	Pre conditioning of oil seeds, refining of oil seeds, stabilization of rice bran, by product utilization.	2
V		**PRACTICALS**	**30**
	1	Determination of moisture	3
	2	Determination of ash	3
	3	Sedimentation value	2
	4	Determination of alcoholic acidity	2
	5	Estimation of gluten	2
	6	Determination of water absorption power	2
	7	Qualitative analysis of gluten- pelshenke value	3
	8	Determination of falling number	2
	9	Preparation of bread	3
	10	Preparation of biscuits & Cookies	3
	11	Preparation of cake	3
	12	Determination of physical parameters of wheat and rice	2

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PS O5	PSO 6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	-	1	1	-	-	1	-	-	1	1	-
CO 2	2	3	2	2	-	-	2	3	-	-	2	3
CO 3	-	-	1	-	1	-	2	-	-	1	-	-
CO 4	3	-	2	3	2	3	-	-	2	2	3	1
CO 5	-	1	-	-	-	-	-	1	-	-	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓		✓	✓
CO 4		✓	✓	✓
CO 5	✓	✓		✓

Course Title	Spices and Plantation Crops				
Type of Course	**Major**				
Semester	4				
Academic Level	200				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understanding of various processing technology in spices.	U	P	▪ Quiz / Assignment/Discussion / Seminar ▪ Midterm Exam ▪ Final Exam
CO2	Analyzing Quality attributes of spices	An	F	
CO3	Create knowledge about Chemical Composition of spices and Manufacturing technology of spice oil and oleoresin	C	P	
CO4	Evaluate proximate composition of different spices	E	C	
CO5	Understand processing of plantation crops	U	M	
CO6	Create Practical Knowledge in spice technology	C	F	
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**Introduction to Spices**		**10**
	1	Spices :Definition, Classification ,Chemical composition and uses, Post harvest technology	2
	2	Quality control of spices, Standards and FSSAI specifications of Major Spices	3

	3	Therapeutic value of Major Spices and value addition in Spices, unit operations in Spices	3
	4	Spice oil and Oleoresins: Extraction Techniques	2
II		**Major Spices**	**10**
	5	**Pepper** :Refining and processing of Pepper, Pepper products:- White pepper, dehydrated green pepper, Pepper oil, Oleoresin.	3
	6	**Chilies** :Drying of chilies, quality attributes of Chilies and Paprika	2
	7	**Cardamom :** Composition, Drying of fruits, Bleaching, Grading, Cardamom products, Essential oil and Oleoresins	2
	8	**Ginger** :Curing, Bleaching, Grading Ginger Products, Ginger oils, Ginger Oleoresin, Dehydrated Ginger, Bleached Ginger **Turmeric** Curing, Grading, Turmeric powder, Essential oil, Oleoresin	3
III		**Minor spices**	**15**
	9	Processing and utilization of Minor spices-herbs, leaves and spartan seasonings	2
	10	Aniseed, Sweet basil-composition and its utilization.	2
	11	Caraway seed, cassia and cinnamon-composition and its utilization.	1
	12	Processing of Clove-stages of harvest-cleaning & drying	2
	13	Coriander-uses, harvesting, drying.	1
	14	Processing of cumin, dill seed -types, harvesting, drying. Processing of fennel seed	2
	15	Processing of Nutmeg and Mace.	1
	16	Processing of Mint-harvesting, drying, storage	1
	17	Processing of marjoram and rosemary, saffron-production flow chart.	3
IV		**Plantation crops**	**10**
	18	Plantation crops-classification-production & processing-Status and Exports.	1
	19	Processing of Tea-unit operation-flow chart and process	2
	20	Processing of coffee-Dry and wet processing-Green and cherry Coffee, Unit operation-flow charts-equipments and operation, Instant coffee powder-flow chart	3
	21	Processing of Cocoa-Important unit operation, Flow charts in Cocoa processing, Chocolate processing-flow charts.	2
	22	Processing of vanilla and Annatto-flowchart, utilization.	2
V		**PRATICALS**	**30**
		1. Determination of Moisture content in spices 2. Extraction of oil from Spices 3. Extraction of oleoresins from Spices 4.Determination of ash in spices 5. Determination of acid insoluble ash	30

		6. Determination of acid value in spices. 7. Determination of specific gravity of spices. 8. Packaging study of spices 9. Preparation of Spice Masala, Pickle Powder and Curry powders 10. Determination of Adulterants in Spices	
	2	• A visit to tea/coffee/ chocolate/ Spices and condiments industry	

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	-	2	3	-	2	-	2	1	-	2	-
CO 2	2	3	-	-	3	-	1	-	2	3	-	-
CO 3	-	-	1	-	-	1	-	1	-	1	-	1
CO 4	1	-	2	3	-	2	-	2	-	2	-	2
CO 5	2	1	-	-	1	-	1	-	1	-	1	-
CO 6	2	-	2	3	-	2	-	2	1	-	-	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓		✓	✓
CO 4	✓	✓	✓	✓
CO 5		✓	✓	✓
CO 6		✓		✓