FOOD TECHNOLOGY **Course Code : 315310**

Programme Name/s : Chemical Engineering
Programme Code : CH
Semester : Fifth
Course Title : FOOD TECHNOLOGY
Course Code : 315310

I. RATIONALE

This course offers a comprehensive understanding of food processing, covering key areas such as food and beverage processing principles, techniques for preserving fruits and vegetables, oil-seed technology, food additives, and food laws and regulations. This course is designed to comprehend in depth the fundamental concepts, essential techniques, and legal standards related to the food industry for preparing the standards for diverse roles in the food industry with a focus on the development of both technical skills and regulatory compliance.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

The course content should be taught, and the curriculum should be implemented with the aim of developing the required skills in the learners so that they are able to acquire the following competencies.
•Develop expertise in food processing, preservation techniques, oil-seed technology, additive use, and compliance with food laws and regulations in food processing industries.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 - Identify the causes of food spoilage and food poisoning and suggest preventive measures for the same.
- CO2 - Select the appropriate equipment for Fruit and Vegetable Processing as per requirements.
- CO3 - Apply the technologies and methods used in the lab scale production and processing of oils from seeds.
- CO4 - Select the relevant food additive so as to maintain the nutritional values and enhance the shelf life of the food products.
- CO5 - Follow the food laws and standards. FSSAI, FSSA 2006, AGMARK , BIS, and Codex.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme											
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TL				Based on SL		Total Marks
															Practical						
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
315310	FOOD TECHNOLOGY	FT	DSE	4	-	2	-	6	2	03	30	70	100	40	25	10	25#	10	-	-	150

Total IKS Hrs for Sem. : 0 Hrs
Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment
Legends: @ Internal Assessment, # External Assessment, *# On Line Examination , @$ Internal Online Examination
Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 10 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.
7. * Self learning includes micro project / assignment / other activities.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	TLO 1.1 Identify the specific food processing and preservation methods used in food production. TLO 1.2 Explain the types of beverages.	**Unit - I Food and Beverage Processing** 1.1 Food processing: 1.1.1 Introduction, Definition, Classification of Food and and its Constituents. 1.1.2 Food Processing Methods 1.1.3 Food Preservation Methods 1.1.4 Food spoilage - Causes of food spoilage, food poisoning 1.2 Beverages processing: 1.2.1 Introduction, Definition, Classification of beverages 1.2.2 History, importance of beverages 1.2.3 Types of Beverages: Fruit beverages, carbonated beverages, tea, coffee, plant extracts, etc	Video Demonstrations Model Demonstration Case Study

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
2	TLO 2.1 State process and preparation of fruit products. TLO 2.2 Prepare the fruit beverages, Jam, Jelly. TLO 2.3 Follow the regulations in production and preservation in the food industry.	**Unit - II Fruits and Vegetables Processing** 2.1 Fruit Processing: 2.1.1 Processing of fruit (selection, juice extraction, deaeration, straining, filtration, and clarification). 2.1.2 Preservation of fruit juices (pasteurization, use of chemical preservatives, preservation by sugars, freezing, drying, aseptic processing, and carbonation). 2.1.3 Preparation of fruit products such as Jam, Jellies etc.: Raw material (Orange, Pineapple etc.), Preparation and preservation methods . 2.2 Vegetable Processing 2.2.1 Preparation of vegetable products such as Chips, French fries from Potato and Sweet Potato etc. 2.2.2 Preparation of Ketchup from tomato, tamarind etc. 2.3 Economical scenario of production and processing of fruits and vegetables in India and the World.	Video Demonstrations Model Demonstration Presentations
3	TLO 3.1 Explain processing method of oil seeds. TLO 3.2 State the purification and oil processing techniques.	**Unit - III Oil-Seeds Processing** 3.1 Production of oil: 3.1.1. Introduction to oil seeds such as groundnut, Flaxseeds etc. 3.1.2 Processing method of oil seeds-Oil seed pressing, Solvent extraction, Purification (degumming, refining, bleaching, deodorization) 3.2 Oil Processing: 3.2.1 Hydrogenation, plasticizing, tempering, winterization.	Lecture Using Chalk-Board Presentations Case Study
4	TLO 4.1 Select the suitable food additives TLO 4.2 Maintain the nutritional value and shelf life of food products by using suitable preservatives.	**Unit - IV Food Additives** 4.1 Food Additives: 4.1.1 Introduction and purpose of additives , 4.1.2 Functions - Antioxidants, Colouring and Flavouring agents, Chelating agents, Curing agents, Stabilizers and Thickeners, Emulsifiers, Flour Improvers. 4.1.3 Required quantity of Additives 4.2 Humectants, Anticaking agents, Leavening Agents, Non-nutritive sweeteners, Preservatives such as sulphur dioxide and benzoic acid, Buffering agents.	Site/Industry Visit Case Study Presentations Video Demonstrations
5	TLO 5.1 Follow the various food laws and regulations. TLO 5.2 Apply the Food Safety and Standards Authority of India (FSSAI) act for various food products. TLO 5.3 State the significance of the Food Safety and Standards Act, 2006.	**Unit - V Food Laws and Regulations** 5.1 Food Laws and Regulations: Introduction, Need for food standards. 5.2 Food Safety and Standards Act, 2006 (FSSA) 5.3 Types of Standards 5.3.1 Regulatory Standards: Food Safety and Standards Authority of India (FSSAI) 5.3.2 Voluntary Standards: Agmark Standards (AGMARK), Codex Alimentarius Standards, Bureau of Indian Standards (BIS).	Site/Industry Visit Case Study Presentations

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES.

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 Estimate the moisture content in food materials. LLO 1.2 Determine moisture content of different food materials using different techniques such as tray drying, oven drying etc..	1	*Estimation of moisture content in different food material samples such as orange pulp, apple pomace etc.	2	CO1 CO2
LLO 2.1 Determine the pH values of different beverage samples such as fruit juices, carbonated drinks etc. LLO 2.2 Analyse and interpret the pH values obtained from the experiment to assess the quality and stability of fruit beverages.	2	*Determination of pH value for different beverage samples such as fruit juice, carbonated drink, packaged drinking water, etc. by using a pH meter.	2	CO1 CO2
LLO 3.1 Follow the procedure to prepare tomato ketchup by adding specific food preservatives to enhance the shelf life of the ketchup. LLO 3.2 Practice proper food hygiene throughout the preparation process to ensure the product is safe for consumption.	3	*Preparation of Tomato ketchup.	2	CO2
LLO 4.1 Follow the procedure to dry the vegetables by using a suitable dryer. LLO 4.2 Assess the quality of dried vegetables in terms of texture and color properties.	4	Processing of vegetables such as potatoes, onions, etc., by drying using dryers.	2	CO1 CO2
LLO 5.1 Measure the specific gravity of fruit juice using appropriate instruments such as a hydrometer or density meter. LLO 5.2 Measure the viscosity of fruit juice using a viscometer or similar equipment.	5	*Measurement of Specific gravity and viscosity of fruit juice sample.	2	CO2
LLO 6.1 Determine the iodine value of vegetable oil by titration. LLO 6.2 Interpret the iodine value to determine the level of unsaturation in the vegetable oil sample.	6	Determination of iodine value of vegetable oil.	2	CO3
LLO 7.1 Determine the saponification value of vegetable oil by titration. LLO 7.2 Interpret the saponification value to detect adulteration or contamination in vegetable oils.	7	*Determination of saponification value of vegetable oil.	2	CO3
LLO 8.1 Determination of acid value of vegetable oil using a titration method. LLO 8.2 Interpret the results to evaluate the quality and freshness of the vegetable oil.	8	Determination of acid value of vegetable oil.	2	CO3

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 9.1 Determine the quantity of Benzoic acid in soft drinks by using titration. LLO 9.2 Interpret test results to confirm the presence or absence of benzoic acid in the soft drink samples.	9	*Determination of the quantity of benzoic acid in soft drinks.	2	CO4
LLO 10.1 Select the food product as per the FSSAI standards. LLO 10.2 Analyse the labels for mandatory information such as nutritional facts, ingredients list, net weight, manufacturer details, FSSAI license number, and expiry date.	10	Compliance with ingredients listed on food labels matches FSSAI standards.	2	CO5

Note : Out of above suggestive LLOs -

- '*' Marked Practicals (LLOs) Are mandatory.
- Minimum 80% of above list of lab experiment are to be performed.
- Judicial mix of LLOs are to be performed to achieve desired outcomes.

VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)

Micro project

- Investigate different methods of preserving fruits through jams, jellies, and sauces. compare the preservation techniques (such as boiling, using preservatives, freezing), and their effects on taste, texture, and shelf life.
- Create a visual chart or digital presentation that classifies various food items based on their constituents (proteins, carbohydrates, fats, vitamins, minerals). Include examples and highlight their nutritional benefits.
- Compare different fruit beverages and carbonated beverages based on Ingredients, Sugar Content, Caloric Content, Nutritional Value, Acidity etc.
- Develop unique flavors of jams, jellies, and sauces using unconventional ingredients.Experiment with herbs, spices, or exotic fruits to create new flavor combinations. Conduct a survey to gauge consumer interest and acceptance of these new flavors.
- Design labels and packaging that comply with regulatory standards and appeal to consumers.Research FSSAI labeling requirements, design informative and attractive labels, and create packaging concepts that consider sustainability and branding.

Assignment

- Write the advantages, disadvantages, and typical applications of different food processing methods such as pasteurization, fermentation, drying, and freezing.
- Prepare a report on the role of food additives in enhancing food quality and safety.
- Prepare a chart on salient features of Food Safety and Standards Act, 2006.

Term Work

- Prepare journal for laboratory work

Note :

- Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.
- The faculty must allocate judicial mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.
- If a microproject is assigned, it is expected to be completed as a group activity.
- SLA marks shall be awarded as per the continuous assessment record.
- For courses with no SLA component the list of suggestive microprojects / assignments/ activities are optional, faculty may encourage students to perform these tasks for enhanced learning experiences.
- If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Weighing balance A weighing balance with a range of 0-5 kg is a suitable choice for laboratory settings.	1,3,4,5,6,7,8,9
2	Dryer Number of trays. 12 Trays ; Loading capacity. 30 kg ; External Dimension (cm). 137 X 531 X 94.	1,4
3	Digital pH meter A digital pH meter has a measurement range of 0-14 pH, with an accuracy of ±0.01 pH. Resolution and sensitivity are also important factors, with a resolution of 0.001 pH and a sensitivity of 1 mV/pH.	2
4	Crusher Hammer mill include a rotor diameter of 4-12 inches, a motor power of 1/4-1 HP, and a grinding capacity of 1-10 pounds per hour. The mill's speed can range from 1,000 to 5,000 RPM, and the screen size can vary from 1/16 to 1 inch.	3
5	Heating Bath Capacity: 3.4 L · Temperature Range: RT+5°C to 100°C · Temperature Resolution: ±0.5°C · Temperature Stability: ±1.0°C · Inner Dimension (WxDxH): 168x168x120 mm.	3
6	Specific gravity bottle and viscometer Specific gravity bottle:Capacity: 10 To 50 mL ; Size/Dimension. Standard ; Features. Standard ; Color. Transperent Viscometer :Main Body Size 360 × 350 × 590 mm (maximum) Weight approx. 9 kg Settable Rotational Speed 0.1 to 200 rpm (number of configurable stages 290) Viscosity Measurement Accuracy ±1.0??F.S.?	5
7	Titration set up Burette 10-50mL , Pipette 10 mL, Conical flask 250mL, Holding stand	6,7,8,9

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Food and Beverage Processing	CO1	8	4	4	4	12
2	II	Fruits and Vegetables Processing	CO2	12	8	8	2	18

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
3	III	Oil-Seeds Processing	CO3	6	2	4	6	12
4	IV	Food Additives	CO4	8	2	6	6	14
5	V	Food Laws and Regulations	CO5	6	4	4	6	14
Grand Total				**40**	**20**	**26**	**24**	**70**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Two class tests of 30 marks each, Term work assessment of 25 marks

Summative Assessment (Assessment of Learning)

- End-term theory examination, end-term practical examination

XI. SUGGESTED COS - POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	3		1	1	2		2			
CO2	3		1	2	2	1	2			
CO3	3		1	2	2	1	2			
CO4	3		1	1	2	1	2			
CO5	2		1		3	1	3			

Legends :- High:03, Medium:02,Low:01, No Mapping: -
*PSOs are to be formulated at institute level

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	P. J. Fellows	Food Processing Technology	Wood head Publishing Ltd., Cambridge ISBN: 978-1-84569-216-2
2	G. Subbulakshmi	Food Processing & Preservation	New Age International Publisher ISBN: 978-8122424854
3	Valentas Rotstein Singh	Handbook of Food Engineering Practical	CRC Press, New York ISBN: 978-1566763627
4	Maney Shakuntala	Food, Facts and Principles	New age international (P) Ltd., New Delhi ISBN: 978-8122414824

Sr.No	Author	Title	Publisher with ISBN Number
5	Jim Smith, Lily Hong–Shum	Food Additives Data Book	John Wiley & Sons. Second Edition.2011 ISBN: 978-1405133797
6	Sudhir Andrews	Food and Beverage Management	The Mc Graw-Hill Companies ISBN: 978-0070655737
7	R. Singaravelaran	Food and Beverage Service	Oxford University Press, New Delhi ISBN: 978-0195699625

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://nptel.ac.in/courses/103107088/33	Food Production Methods
2	https:// nptel.ac.in/courses/103103029/35	Food Processing Equipment
3	https://public.wsu.edu/~rasco/.../Intro%20to%20Food%20Processing82905.pdf	Fundamentals of food processing engineering
4	https://www.slideshare.net/shilleary/introduction-to-food-processing	Introduction to food processing
5	https://www.slideshare.net/.../oilseed-processing-for-smallscale-producers-9582940	Oil seed processing
6	https://www.fda.gov/Food/.../Food Additives Ingredients/default.htm	Food Additives
7	http://www.intechopen.com/books/food-industry/quality-management-important- aspects-for-the-food-industry	Introduction to food technology

Note :

- Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students