- Medical Diagnostics and Imaging: Clinical research associate, laboratory technologist, medical researcher.
- Government Agencies and Regulatory Bodies: Regulatory affairs specialist, policy analyst, inspector.
- Pharmaceutical Companies: Formulation scientist, pharmaceutical researcher, quality control analyst.
- Academia: Lecturer, academic researcher.
- Clinical Trials and Pharmacovigilance: Clinical research associate, pharmacovigilance specialist.
- Forensic Biotechnology: Forensic scientist, DNA analyst.

KU 1 DSC BTC 102: FOOD BIOTECHNOLOGY

Semester	Course Type	Course Level	Course Code	Credits		Total Hours / week
I	DSC	Foundation	KU 1 DSC BTC 102	Total	4	5
				Module 1-3	3	
				Module 4	1	

	Learning Approach (Hours/ Week)			Marks Distribution (%) Ratio			Duration of ESE (Hours)
	Lecture	Practical	Tutorial	CE	ESE	Total	
Modules 1, 2, and 3	3			30	70	100	2
Module 4		2		40	60	100	2

Course Description:

1. Food biotechnology is a process used to enhance the production, nutritional value, safety, and taste of foods. Food Biotechnology emphasizes modern techniques in food microbiology, biotechnology, and food analysis. Other areas of strong

interest are fermentation to improve foods, food ingredients, functional foods, and food waste remediation. Food Biotechnology is beneficial to develop an in-depth knowledge of food science, and food processing and composition, focusing on biotechnology applied to food. Can have jobs in food processing companies where they work in different sections like Production, Quality Assurance, R&D (Research and Development), etc. Can work as a Sensory scientist or Quality controller to monitor organic properties like aroma, flavor, quality, hygiene, and more. Students will be able to understand how biotechnology can be utilized for improving the nutritional content of foods.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Gain detailed knowledge of the role of microorganisms in food production.	U
2	Demonstrate competence in basic fermentation techniques.	R
3	Understand the principle of food preservation and food preservation techniques.	U
4	Understand food spoilage and food borne illness and HACCP.	U

****Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)***

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5	PSO6	PSO7
CO 1				√			
CO 2				√			
CO 3	√						
CO 4	√						

COURSE CONTENT

MODULE	UNIT	DESCRIPTION	HOURS
1	**INTRODUCTION TO FERMENTATION AND FERMENTED BEVERAGES**		
	1	Food fermentation, Primary and secondary fermentation.	3
	2	Fermented beverages-Wines and different types of Wines.	3
	3	Brewing- steps involved in Beer production.	4
	4	Distilled liquors (Whisky, Brandy, Rum, Vodka, Tequila, Gin).	5

2	**FERMENTED FOOD PRODUCTS**		
	1	Fermented milk products - Cheese, Butter, Yoghurt and Kefir.	5
	2	Fermented vegetables – Sauerkraut and Kimchi.	3
	3	Bread and other indigenous fermented foods (Idly).	3
	4	Single cell protein - Spirulina.	4

	1	Principles of food preservation - high temperature and low temperature storage, drying, food additives, chemicals, irradiation and Pascalization.	5
	2	Preservation of milk, meat, fish, fruits, and vegetables.	2
	3	Food spoilage - Spoilage of milk, canned food, fruits and vegetables.	4
	4	Hazard Analysis Critical Control Points (HACCP). FSSAI.	4
4	**LABORATORY EXPERIMENTS**		
	1	Production and characterization of wine.	8
	2	Production of beer.	7
	3	Production of cheese	5
	4	Production of yoghurt	5
	5	Production of sauerkraut.	5
3	**FOOD PRESERVATION AND SPOILAGE**		
5	**Teacher Specific Module**		**5**
	Directions		

Essential Readings:

1. Industrial microbiology. A H Patel. MacMillian (2008)
2. Food Biotechnology- S.N Tripathy - Dominant pu (2004)
3. Bioprocess technology. P T Kalaichelvan, I ArunPandi. MJP publishers (2021)

Reference Distribution:

Module	Unit	Reference No.
1	1	2
	2	1
	3	2
	4	2
2	1	5
	2	6
	3	1
	4	2
3	1	2
	2	2
	3	2
	4	2
4	1	2
	2	4
	3	5
	4	6

Suggested Readings:

1. Principles of fermentation technology. Stanbury PF, A Whitaker, and S J Hall. Elsevier (2013)
2. Biotechnology. A textbook of Industrial Microbiology. Wulf Crueger and Annelies Crueger. 3rd edn-Medtech (2017)
3. Industrial Microbiology. L E Casida. 2nd edn- NEW AGE International Publications (2019)

Assessment Rubrics:

	Evaluation Type		**Marks (%)**
Theory part	**Continuous Evaluation**	**Test Paper**	**10**
		Quiz/Debate	**5**
		Assignment	**5**
		Product development	**10**
	End Semester Evaluation		**70**
	Total		**100**

	Evaluation Type		**Marks (%)**
Practical Part	**Continuous Evaluation**	**Lab performance**	**60**
	End Semester Evaluation	**Record**	**15**
		Viva Voce	**25**
	Total		**100**

Percentage of marks in the course = (percentage of marks in theory * 3 + percentage of marks in practical) / 4