



Department of <b>Biotechnology</b>		LP: BT22022
B.E/B.Tech/M.E/M.Tech : <b>Biotechnology</b> Regulation: <b>2022</b>		Rev. No: 00
PG Specialisation : NA		Date: 09-07-2023
Sub. Code / Sub. Name : <b>BT22022 / Food Biotechnology</b>		
Unit : <b>I</b>		

**Unit Syllabus: FUNDAMENTALS OF FOOD BIOTECHNOLOGY (9 h)**

Definition and scope of food biotechnology; Importance of biotechnology in food production and its significance; Historical development and milestones in food biotechnology; Microbial fermentation in food processing; Role of microorganisms in food fermentation; Role of food processing in quality of life; Introduction to 3D bio printing in advanced food technology. Importance of food regulations in public health and consumer protection.

Objective: To familiarize with the fundamental techniques of food biotechnology

Session No *	Topics to be covered	Ref	Teaching Aids
1.	Definition and scope of food biotechnology	T1 (1,2); T2 (1-3); R1 (1-3); R3 (3,4)	BB & PPT
2.	Importance of biotechnology in food production and its significance	T1 (1,2); T2 (4); R1 (309);	BB & PPT
3.	Historical development and milestones in food biotechnology	T1 (2-5, 13,14); T2 (4-8); R1(3,4)	BB & PPT
4.	Historical development and milestones in food biotechnology	T1 (2-5, 13,14); T2 (4-8); R1(3,4)	BB & PPT
5.	Microbial fermentation in food processing	T1(6-8)	BB & PPT
6.	Role of microorganisms in food fermentation	T1(13-14); R3(4-10)	BB & PPT
7.	Role of food processing in quality of life	T1(33-34); R3 (25-29)	BB & PPT
8.	Introduction to 3D bioprinting in advanced food technology	T1(14-26); R1 (42,43)	BB & PPT
9.	Importance of food regulations in public health and consumer protection.	T1(22-25, 29, 73-74); T2(20-22); R1 (44,45); R3(27-37)	BB & PPT
<b>Content beyond syllabus covered (if any): Nil</b>			

\* Session duration: 50 minutes; BB – Black Board; PPT – Power Point.



Sub. Code / Sub. Name: **BT22022 / Food Biotechnology**

Unit : **II**

Unit Syllabus : **ENZYME TECHNOLOGY IN FOOD PROCESSING (9 h)**

Fermentative production of enzymes used in food industry; solid state fermentation; recovery of enzymes from natural sources; cheese making and whey processing, impact of enzyme technology (bioethanol, protein hydrolysates, bioactive peptides); enzymatic processing of fruit juices. Role of enzymes in baking, meat and meat processing; comparative methods of toxicity testing in (novel) foods; biosensors; enzymatic approach to tailor made fats; catabolic processes and oxygen-dependent reactions in food.

Objective: To explore the role of enzymes in food processing and the application of enzyme technology

Session No *	Topics to be covered	Ref	Teaching Aids
10	Fermentative production of enzymes used in food industry; solid state fermentation	T1(83-88); T2(140-143)	BB & PPT
11	Recovery of enzymes from natural sources	T1(38-66); T2(144-150); R1(26-28)	BB & PPT
12	Cheese making and whey processing	T1(67-72); T2(151-168) R1(29-37, 309-312)	BB & PPT
13	Impact of enzyme technology (bioethanol, protein hydrolysates, bioactive peptides)	T1(91-93); R1(296-308)	BB & PPT
14	Enzymatic processing of fruit juices	T1(96-97); R2(2.41-2.118); R3(67-79)	BB & PPT
15	Role of enzymes in baking, meat and meat processing	T1(96-97); R2(2.41-2.118); R3(67-79)	BB & PPT
16	Comparative methods of toxicity testing in (novel) foods	T1(99-100); R2(2.41-2.118); R3(67-79)	BB & PPT
17	Biosensors; enzymatic approach to tailor made fats	T1(99-100); R2(2.41-2.118); R3(67-79)	BB & PPT
18	Catabolic processes and oxygen-dependent reactions in food	T1(136-140); T2(200-202) R3(128-136)	BB & PPT
<b>Content beyond syllabus covered (if any): Nil</b>			

\* Session duration: 50 minutes; BB – Black Board; PPT – Power Point.



Sub. Code / Sub. Name: **BT22022 / Food Biotechnology**

Unit : **III**

Unit Syllabus: **GENETIC ENGINEERING IN FOOD PRODUCTION (9 h)**

Principles of genetic engineering in food biotechnology; Genetically modified organisms (GMOs) in food production; Applications of genetic engineering in crop improvement and animal breeding; Safety assessment of genetically modified organisms (GMOs) in food and feed; Characterization of food samples and packed foods. Environmental impact assessments of genetically modified crops.

Objective: To assess the genetic engineering of microorganisms for food fermentation and processing

Session No *	Topics to be covered	Ref	Teaching Aids
19	Principles of genetic engineering in food biotechnology	T1(257-260); T2(767-769); R1(318-324, 453-455)	BB & PPT
20	Genetically modified organisms (GMOs) in food production	T1(260-266); T2(771-776); R1(325-331)	BB & PPT
21	Genetically modified organisms (GMOs) in food production	T1(260-266); T2(771-776); R1(325-331)	BB & PPT
22	Applications of genetic engineering in crop improvement and animal breeding	T1(267-273); T2(773-774, 779-781); R1(461-465)	BB & PPT
23	Applications of genetic engineering in crop improvement and animal breeding	T1(267-273); T2(773-774, 779-781); R1(461-465)	BB & PPT
24	Safety assessment of genetically modified organisms (GMOs) in food and feed	T1(283-316); T2(808-809)	BB & PPT
25	Characterization of food samples and packed foods	T2(852-853)	BB & PPT
26	Environmental impact assessments of genetically modified crops	T1(305-309); T2(874-877)	BB & PPT
27	Environmental impact assessments of genetically modified crops.	T1(305-309); T2(874-877)	Blended Learning Video 1
<b>Content beyond syllabus covered (if any): Nil</b>			

\* Session duration: 50 minutes; BB – Black Board; PPT – Power Point.



Sub. Code / Sub. Name: **BT22022 / Food Biotechnology**

Unit : **IV**

Unit Syllabus : **SYNTHETIC BIOLOGY AND BIOACTIVE COMPONENTS (9 h)**

Overview of synthetic biology in Food Technology; Applications of metabolic engineering and biofortification; Health benefits and mechanisms of action of functional foods; Development of novel bioactive compounds and functional ingredients; Definition and classification of functional foods; Bioactive compounds: antioxidants, probiotics, prebiotics, etc.

**Objective:** To analyse the synthetic biology and bioactive compounds in food production

Session No *	Topics to be covered	Ref	Teaching Aids
27	Overview of synthetic biology in Food Technology	T1(369-374); R1(154-170)	BB & PPT
28	Applications of metabolic engineering and biofortification	T1(376-406) R1(191-213)	BB & PPT
29	Health benefits and mechanisms of action of functional foods	T1(376-406) R1(191-213)	BB & PPT
30	Health benefits and mechanisms of action of functional foods	T1(376-406) R1(191-213)	BB & PPT
31	Development of novel bioactive compounds and functional ingredients	R1(224-238)	BB & PPT
32	Development of novel bioactive compounds and functional ingredients	R1(224-238)	BB & PPT
33	Definition and classification of functional foods	R1(198-213)	BB & PPT
34	Bioactive compounds: antioxidants	T1(407-416)	BB & PPT
35	Probiotics	T1(407-416)	BB & PPT
36	Prebiotics	T1(407-416)	BB & PPT
<b>Content beyond syllabus covered (if any): Nil</b>			

\* Session duration: 50 minutes; BB – Black Board; PPT – Power Point.



Sub. Code / Sub. Name: **BT22022 / Food Biotechnology**  
Unit : **V**

Unit Syllabus : **EMERGING ISSUES AND CHALLENGES IN FOOD BIOTECHNOLOGY (9 h)**

Novel foods and ingredients: regulation of biotech foods, plant-based meat substitutes, etc.; Food fraud and authenticity: adulteration, mislabeling, counterfeit products; Regulatory responses to emerging foodborne pathogens and contaminants; Current trends and emerging technologies in food biotechnology; Future prospects and challenges in the field; Analysis of case studies highlighting regulatory issues and challenges in the food industry. Ethical dilemmas in food biotechnology for health enhancement.

Objective: To evaluate the socio-economic and ethical implications of novel biotech foods and ingredients

Session No *	Topics to be covered	Ref	Teaching Aids
37	Novel foods and ingredients	T1(447-451)	BB & PPT
38	Regulation of biotech foods, plant-based meat substitutes, etc	T1(451-470)	BB & PPT
39	Food fraud and authenticity: adulteration, mislabeling, counterfeit products	T1(451-470)	BB & PPT
40	Regulatory responses to emerging foodborne pathogens and contaminants	T1(500-503)	BB & PPT
41	Current trends and emerging technologies in food biotechnology	T1(503-510)	BB & PPT
42	Future prospects and challenges in the field	T1(517-518)	BB & PPT
43	Analysis of case studies highlighting regulatory issues and challenges in the food industry	T1(523-535); R1(614-618)	BB & PPT
44	Analysis of case studies highlighting regulatory issues and challenges in the food industry	T1(523-535); R1(614-618)	Blended Learning Video 2
45	Ethical dilemmas in food biotechnology for health enhancement	T1(540-546)	BB & PPT
<b>Content beyond syllabus covered (if any): Nil</b>			

\* Session duration: 50 minutes; BB – Black Board; PPT – Power Point.




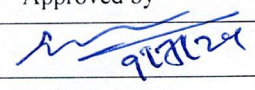
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**TEXT BOOKS**

1. Lee. B. H. "Fundamentals of food biotechnology", Byong H. Lee – 2 nd edition. 2015.
2. Rao. V. K. & Singh. R. P. "Principles of Fermentation Technology". PHI Learning Pvt. Ltd. 2018.
3. Kaput. J. & Rodriguez, R. L. (Eds.), "Nutritional Genomics: The Impact of Dietary Regulation of Gene Function on Human Disease", Academic Press, 2019.
4. Dr. Vijai Kumar Gupta, Dr. Maria G, Tuohy, "Biotechnology of Bioactive Compounds: Sources and applications", John Wiley & Sons, Ltd, 2015.

**REFERENCES**

1. Robert J. Whitehurst, Marten van Oort, "Enzymes in Food Technology", Willy Publisher, 2009.
2. Vipin Masih Prasad, Antima Gupta, Baljit Singh, Nityamanjari Mishra, Arghya Mani, "Trends & Prospects in Food Science & Processing Technology", Hardbound Publisher, 2020.
3. Suwendu Bhattacharya, "Conventional and Advanced Food Processing Technologies", Willy Publisher, 2014.

	Prepared by	Approved by
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Date	09.07.2024	09.07.2024
Remarks *	Nil	
Remarks *	Nil	

\* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD

