



SRI VENKATESWARA COLLEGE OF ENGINEERING (AUTONOMOUS)

COURSE DELIVERY PLAN - THEORY

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Department of Biotechnology		LP: BT22308 Rev. No: 00 Date: 01/08/2023
B.E/B.Tech/M.E/M.Tech : B. Tech	Regulation: 2022	
PG Specialisation : - NA-		
Sub. Code / Sub. Name : BT 22308 / Basic Industrial Biotechnology		
Unit : I Introduction to Industrial Bioprocess		

Unit Syllabus: Introduction to Industrial Bioprocess (12 Hrs)

Fermentation, Traditional and modern Biotechnology, A brief survey of organisms, processes, products, Basic concepts of upstream and downstream processing in Bioprocess, Bioreactor and its types.

1. Preparation of inoculum media and production media
2. Production of traditional fermentation products

Objective: To understand the various fermentation techniques in bioprocess and learn the hands on experiment on production of bioproducts.

Session No *	Topics to be covered	Ref	Teaching Aids
1.	Introduction to industrial bioprocess	RB2 - Ch1 Pg. 1-10 RB6 - Ch1 Pg. 1-12	Black Board / LCD
2.	Biochemistry of fermentation – bacterial, fungal and yeast fermentation	RB2 - Ch1 Pg. 11-52, 553-569	Black Board / LCD
3.	Historical overview of industrial fermentation products. Comparison between traditional and modern methods of fermentation.	TB1 - Ch.19 Pg. 239-269 RB 2 - Ch1 Pg.14-19	Black Board / LCD
4.	Industrially useful microorganisms and its products. Overview of fermentation processes – biomass, microbial enzymes, metabolites, food products, vitamins and transformation products	TB1 - Ch. 19 Pg. 239-245 RB2 - Ch.11 Pg. 309-311 TB3 - Ch.14 Pg. 350 RB5 - Ch.1 Pg. 1-10	Black Board / LCD
5.	Basic design of the fermenter – agitator, foam controller, oxygen delivery system, temperature and pH controller, sterilization facility	TB1- Ch. 19 Pg.239-269	Black Board / LCD
6.	Upstream and downstream processing – product recovery and purification by various bioprocess techniques.	TB1 - Ch. 20 Pg.270-280 TB3 - Ch.14 Pg. 366 RB3 - Ch.5 Pg.74-80 RB3 - Ch.6 Pg.111-123	Black Board / LCD
7.	Preparation of inoculum media and production media	RB6 – Ch 6 Pg. 147-167	Demonstration/ Doing Experiments in the laboratory
8.			
9.			
10.	Production of traditional fermentation products	Journal 1	Demonstration/ Doing Experiments in the laboratory
11.			
12.			

Content beyond syllabus covered (if any): -Nil-

* Session duration: 50 minutes



Sub. Code / Sub. Name: BT22308/Basic Industrial Biotechnology
Unit : II Production of Primary Metabolites

Unit Syllabus: Production of Primary Metabolites (12 Hrs)

Primary metabolites: Production of commercially important primary metabolites, organic acids, amino acids and alcohol.

1. Production of alcohol from yeast
2. Production of organic acid from agricultural waste

Objective: To be familiar with commercial production of Industrial Products and learn the hands on experiment on production of bioproducts.

Session No *	Topics to be covered	Ref	Teaching Aids
13.	Citric acid production – biosynthesis by microorganisms, strain improvement, industrial process, product recovery and purification	TB1 - Ch.24 Pg.318-322 RB3 - Ch.8 Pg. 134 RB2 - Ch25 Pg.572-601	Black Board / LCD
14.	Lactic acid production - biosynthesis by microorganisms, strain improvement, industrial process, product recovery and purification	TB1 - Ch.24 Pg.325 RB3 - Ch.8 Pg. 147	Black Board / LCD
15.	Acetic acid production and outline of process for production of other commercially important organic acids.	TB1 - Ch.24 Pg.326 RB3 - Ch.8 Pg. 142	Black Board / LCD
16.	Glutamic acid production - biosynthesis by microorganisms, strain improvement, industrial process, product recovery and purification	TB1 - Ch.26 Pg.344-346 RB3 - Ch.8 Pg. 158	Black Board / LCD
17.	Ethanol production – HPLC, electrophoresis, gas chromatography, mass spectroscopy	TB1 - Ch.23 Pg.311-316 RB3 - Ch.7 Pg. 124 RB2 - Ch4 Pg. 113-141	Black Board / LCD
18.	Butanol production – biosynthesis, nutrient preparation, fermentation and distillation of product	TB1 - Ch.23 Pg.311-316 RB3 - Ch.7 Pg. 129	Black Board / LCD
19.	Production of ethanol from yeast	Journal 2	Demonstration/ Doing Experiments in the laboratory
20.			
21.			
22.	Production of organic acid from agricultural waste	RB7 - 415– 438	Demonstration/ Doing Experiments in the laboratory
23.			
24.			
Content beyond syllabus covered (if any): -Nil-			

* Session duration: 50 mins



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Sub. Code / Sub. Name: BT22308 / Basic Industrial Biotechnology
Unit : III Production of Secondary Metabolites

Unit Syllabus: Production of Secondary Metabolites (12 Hrs)

Secondary metabolites: Production of commercially important secondary metabolites, antibiotics, steroids, and industrial enzymes.

1. Analysis of antibiotic activity by well diffusion/disc diffusion method
2. Production of enzyme by batch fermentation method

Objective: To be familiar with commercial production of secondary metabolites and learn the hands on experiment on isolation of product producing microorganisms and production of bioproducts.

Session No *	Topics to be covered	Ref	Teaching Aids
25.	Introduction to secondary metabolite production	RB3 - Ch.13 Pg. 229 TB4 - Ch.18 Pg. 433-456	Black Board / LCD
26.	Overview of production process of antibiotics – antimicrobial activity, mechanism of action, strain development and biosynthesis	RB3 - Ch.13 Pg. 229 TB1 - Ch.25 Pg.329 RB3 - Ch.13 Pg. 230-270	Black Board / LCD
27.	Production process of steroids – corticosteroids, androgens, estrogens and progestogens.	RB3 - Ch.15 Pg. 274 & 292	Black Board / LCD
28.	Introduction to enzyme production – intracellular and extracellular enzymes	TB1- Ch.21 Pg.281-286 TB4 - Ch.20 Pg. 477-497 TB5 - Ch.22 Pg. 476-494	Black Board / LCD
29.	Production of Proteases – alkaline, neutral and acid proteases	RB3 - Ch.11 Pg. 203	Black Board / LCD
30.	Production of amylases – α amylases, β amylases, gluconases, glucose isomerases, isoamylases	RB3 - Ch.11 Pg. 191	Black Board / LCD
31.	Analysis of antibiotic activity by well diffusion/disc diffusion method	Journal 3	Demonstration/ Doing Experiments in the laboratory
32.			
33.			
34.	Production of protease/amylase by batch fermentation method	Journal 4	Demonstration/ Doing Experiments in the laboratory
35.			
36.			
Content beyond syllabus covered (if any): Product formulation strategies of bioproducts			

* Session duration: 50 mins



Sub. Code / Sub. Name: BT22308 / Basic Industrial Biotechnology
Unit : IV Production of Modern Biotechnology Products

Unit Syllabus: Production of Other Bioproducts (12 Hrs)

Production of biopesticides, biofertilizers, biopolymers, biodiesel, and SCP.

1. Production of biopolymer by batch fermentation method
2. Production of biodiesel

Objective: To apply basic biotechnological principles, methods and models to solve biotechnological tasks and learn the hands on experiment on production of bioproducts.

Session No *	Topics to be covered	Ref	Teaching Aids
37.	Production of biopesticides – <i>Bacillus thuringiensis</i> and its effect	RB3 - Ch.15 Pg. 301	Black Board / LCD
38.	Production of biofertilizers – phospho fertilizer, ageto bacter fertilizer, rhizo fertilizer, n ₂ fixing fertilizer	TB1 - Ch.52 Pg.645-647	Black Board / LCD
39.	Production of xanthan gum - production, recovery and yield	TB1 - Ch.30 Pg.373-386 RB3 - Ch.16 Pg. 306-315	Black Board / LCD
40.	Production of PHB - production, recovery and yield	TB1 - Ch.30 Pg.373-386 RB3 - Ch.16 Pg. 306-315	Black Board / LCD
41.	Production of biodiesel	Journal 5	Black Board / LCD
42.	Production of SCP – bacteria, fungi, yeast and actinomycetes producing single cell protein	TB1 - Ch.29 Pg.373-381 RB3 - Ch.16 Pg. 306-315	Black Board / LCD
43.	Production of bioploymer by batch fermentation method	Journal 6	Demonstration/ Doing Experiments in the laboratory
44.			
45.			
46.	Production of biodiesel	Journal 5	Demonstration/ Doing Experiments in the laboratory
47.			
48.			
Content beyond syllabus covered (if any): Edible vaccine production and application of nanotechnology in bioprocess.			

* Session duration: 50 mins



Sub. Code / Sub. Name: BT22308 / Basic Industrial Biotechnology
Unit : V Modern Biotechnology Products

Unit Syllabus: Modern Biotechnology Products (12 Hrs)

Production of recombinant proteins having therapeutic and diagnostic applications, Bioprocess strategies in plant cell and animal cell culture.

1. Plant cell culture techniques
2. Animal cell culture techniques

Objective: To identify and debate the ethical, legal, professional issues in the field of biotechnology and learn the latest application of recombinant protein production, vaccine Production using bioprocess technology.

Session No *	Topics to be covered	Ref	Teaching Aids
49.	Production of recombinant proteins – Protein production, Expression and Problems faced in protein expression.	RB4 - Ch.8 Pg.227-243	Black Board / LCD
50.	Production of recombinant proteins – Protein Biotechnology for production of new structural proteins for industrial application.	RB4 - Ch.8 Pg.227-243	Black Board / LCD
51.	Production of recombinant proteins – Protein expression system, Translational fusion and optimizing translation of clone	RB4 - Ch.8 Pg.227-243	Black Board / LCD
52.	Production of vaccines	RB4 - Ch.8 Pg.286-298	Black Board / LCD
53.	Production of monoclonal antibodies – PEG method to produce hybridoma cells and application in pregnancy and HIV test	RB4. - Ch.8 Pg.286-298	Black Board / LCD
54.	Products of plant cell culture – tissue culture, callus culture, cell suspension culture, anther culture, embryo culture, protoplast culture, micropropagation and Applications. Animal cell culture - cell lines, culturing media, subculturing, Transfecting, Model systems for toxicity testing and cancer research. Products of animal cell culture.	TB1 - Ch.33 Pg. 407-414 & 497-516 TB3 - Ch.12 Pg. 178-202 & 255-307 TB4 - Ch.23 Pg. 549-578 TB5 - Ch.10 Pg. 196-223 RB5. - Ch.12 Pg.159-179	Black Board / LCD
55.	Plant cell culture techniques	Journal 7	Demonstration/ Doing Experiments in the laboratory
56.			
57.			
58.	Animal cell culture techniques	Journal 8	Demonstration/ Doing Experiments in the laboratory
59.			
60.			
Content beyond syllabus covered (if any):			

* Session duration: 50 mins

**Sub. Code / Sub. Name: BT22308 / Basic Industrial Biotechnology****REFERENCES:****TEXT BOOKS**

1. Satyanarayana, U. "Biotechnology" Books & Allied (P) Ltd., 2005.
2. Kumar, H.D. "A Textbook on Biotechnology" 2nd Edition. Affiliated East West Press Pvt.Ltd., 1998.
3. Balasubramanian, D. "Concepts in Biotechnology" Universities Press Pvt.Ltd., 2004.
4. Ratledge, Colin and Bjorn Kristiansen "Basic Biotechnology" 3rd Edition Cambridge University Press, 2006.
5. Dubey, R.C. "A Textbook of Biotechnology" S.Chand & Co. Ltd., 2022.

REFERENCE BOOKS

1. Patel, A H. "Industrial Microbiology" Macmillan (P) Ltd., 2005.
2. Presscott, S.C. and Cecil G. Dunn, "Industrial Microbiology", Agrobios (India), 2005.
3. Cruger, Wulf and Anneliese Crueger, "Biotechnology: A Textbook of Industrial Microbiology", 2nd Edition, Panima Publishing, 2000.
4. Moo-Young, Murrey, "Comprehensive Biotechnology", 4 Vols. Pergamon Press, (An Imprint of Elsevier) 2004.
5. Ramawat K.G. and Shaily Goyal, "Comprehensive Biotechnology", 4th Edition S. Chand publications, 2019
6. Stanbury P.F, Whitaker A and Hall S.J, "Principles of Fermentation Technology", 2nd Edition, Butterworth – Heinemann (an imprint of Elsevier), 1995.
7. Sharma, N., Sahota, P.P., Singh, M.P. (2020). Organic Acid Production from Agricultural Waste. In: Kashyap, B.K., Solanki, M.K., Kamboj, D.V., Pandey, A.K. (eds) Waste to Energy: Prospects and Applications. Springer, Singapore. https://doi.org/10.1007/978-981-33-4347-4_17

JOURNAL

1. Rawat, K., Kumari, A., Kumar, S., Kumar, R. and Gehlot, R., 2018. Traditional fermented products of India. Int J Curr Microbiol App Sci, 7(4), pp.1873-1883.
2. Maicas, S., 2020. The role of yeasts in fermentation processes. Microorganisms, 8(8), p.1142.
3. Balouiri, M., Sadiki, M. and Ibsouda, S.K., 2016. Methods for in vitro evaluating antimicrobial activity: A review. Journal of pharmaceutical analysis, 6(2), pp.71-79.
4. Sharma, K.M., Kumar, R., Panwar, S. and Kumar, A., 2017. Microbial alkaline proteases: Optimization of production parameters and their properties. Journal of Genetic Engineering and Biotechnology, 15(1), pp.115-126.
5. Chintagunta, A.D., Zuccaro, G., Kumar, M., Kumar, S.J., Garlapati, V.K., Postemsky, P.D., Kumar, N.S., Chandel, A.K. and Simal-Gandara, J., 2021. Biodiesel production from lignocellulosic biomass using oleaginous microbes: Prospects for integrated biofuel production. Frontiers in Microbiology, 12, p.658284.
6. Singhaboot, P. and Kaewkannetra, P., 2015. A higher in value biopolymer product of polyhydroxyalkanoates (PHAs) synthesized by *Alcaligenes latus* in batch/repeated batch fermentation processes of sugar cane juice. Annals of microbiology, 65(4), pp.2081-2089.
7. Espinosa-Leal, C.A., Puente-Garza, C.A. and García-Lara, S., 2018. In vitro plant tissue culture: means for production of biological active compounds. Planta, 248, pp.1-18.
8. Yao, T. and Asayama, Y., 2017. Animal-cell culture media: History, characteristics, and current issues. Reproductive medicine and biology, 16(2), pp.99-117.

	Prepared by	Approved by
Signature		
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Designation	Professor, Biotechnology	HOD, Biotechnology
Date	01/08/2023	01/08/2023
Remarks *: The same lesson plan will be followed in the subsequent semester/year		
Remarks *: -		

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