

Books:-

S.No.	Name of Books/ Author/Publisher
1.	All About Bioinformatics: From Beginner to Expert- Yasha Hasija (2023)
2.	Hands on Data Science for Biologists Using Python- Yasha Hasija, Rajkumar Chakraborty (2021).
3.	Beginners Guide To Bioinformatics For High Throughput Sequencing- Tin Wee Tan, Eric Cheng-yu Lee (2018).
4.	Translational Biotechnology-A Journey from Laboratory to Clinics- Editor: Yasha Hasija (2021)
5.	Essentials of Bioinformatics, Volume II, In silico life science: medicine- Shaik (2019)

Details of course: -

Course Title	Course Structure			Pre-Requisite
	L	T	P	
Bioprocess Technology and downstream processing (BT 209)	3	0	2	

Course Objective:

Introduction of bioprocess technology necessitates innovation in process development scale-up and design. An integral and cost intensive part of these processes is associated with downstream processing for product isolation and purification.

Course Outcome (CO):

- 1 Distinguish between bioprocessing vs. chemical processing. Understand the basics of cell culture techniques, media design and inoculum development and aseptic transfer methods.
- 2 Compare and contrast primary and secondary metabolite, their process technology and extraction of metabolites from plant and animal cell culture.
- 3 Apply the knowledge for understanding an industrial set up to produce products such as microbial enzymes, biomass, biofertilizers and biopesticides.
- 4 To gain knowledge about characteristics of bio products, cell disruption methods and mechanical methods of separation.
- 5 To gain insight to the working of downstream processes at an industrial scale.

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S.No.	Content	Contact Hours
Unit 1	Bioprocess vs. chemical processing; substrate for bioconversion process and design media. Cell culture techniques: isolation methods, media design and sterilization ; Inoculum development and aseptic transfer : criteria for inoculum transfer, aseptic inoculation	8
Unit 2	Process technology for production of primary metabolites - Baker's yeast, ethanol, acetone-butanol , citric acid, amino acids, polysaccharides and petides and plastics; Production of secondary metabolites - Penicillin , cephalosporins, streptomycin etc. metabolites from plant and animal cell culture.	9
Unit 3	Microbial production of industrial enzymes such as glucose-isomerase, penicillin acylase, cellulase, amylase, lipase, protease etc.; Biomass (mushroom) production from agro-residues; Biofertilizers and Biopesticides.	8
Unit 4	Characteristic of bioproducts; Cell disruption methods; Mechanical methods of separation Flocculation and conditioning of broth. Sedimentation, Filtration and centrifugation – principle, instrumentation, types and application	8
Unit 5	Solid liquid separation- Protein precipitation and its separation; aqueous two phase extraction - principle, instrumentation and applications; adsorption- desorption processes; Membrane based separation; Dialysis, Electrodialysis, Microfiltration, Ultrafiltration, electrophoresis.Chromatographic methods of separation based on size, charge, hydrophobic interaction and biological affinity; Crystallization and drying.	9
Total		42

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1	Industrial Microbiology: An Introduction by Michael J. Waites, Wiley-Blackwell (2009)
2	Principles of fermentation technology by Stanbury and Whitaker, Elsevier Science (2016)
3	Introduction to Biochemical Engineering by D.G. Rao, McGraw Hill education (2009)
4	Bioprocess Engineering Principles by P. Doran, Elsevier Science (2013)