Course Outline Form

ODD SEMESTER 2019

Dear Student: Course outlines are intended to provide students with an overall plan for a course to enable them to function efficiently and effectively in the course.

Academic Programs
Please Select
EMEA College
Kondotty

Course Outline : Bioprocess technology (2018-2019)

Name of the Stream	Science
Name of the Programme	Please Select
Name of the Course	Bioprocess technology
Nature of the Course	Core Course
Semester	Fifth
Lecturer(s)	Somysoman and RubaBadarudheen
Name of the Coordinator	Dr.K.Mashhoor
Year	2018-2019
No of Credits	3
No of Contact Hours	4
Course Description	This course is concerned with manufacturing processes involving biological substances. produces therein. Specific topics covered include Enzyme kinetics, cell culture kinetics, transport phenomena in cells, membranes, and biological reactors ,genetics, bio separation and downstream processing, energetic of metabolic pathways, operation modes of cell cultures, mixed and their applications. Protein and Enzymes; Bioreactor Process Principles fermentation and scale-up, recovery and purification Special consideration for animal and plant cell cultures.
Course Objectives	Students gain detailed knowledge in the design and operation of bioreactors and learn about bio molecules produces therein.It helps students understand the basics skills applied in Fermentation Technology and build a foundation for more advanced studies in Bioprocess Technology. It train students to get involved in startup projects by uisng fermentation technology. Help students to aspire forentrepreneurship in future.
Course Outcome	Describe the principle and applications of bioprocess technology and apply fundamental calculation in bioprocessing. Illustrate the schematic diagram of upstream and downstream processing for product recovery and purification. Analyze the mass transfer and material balance calculation in different types of application in bioprocess. Analyze the kinetics parameter values in different types of fermentation modes. Discuss the important aspects in bioprocess technology for commercialization purpose of biotechnology products .
Assessment Method	Assignments Homeworks Class Tests Unit Tests Term Exam Seminars Lab Experiments

Teaching Methods Used	Lectures Cooperative Learning Class Discussion Classroom Activities Guest Lectures Seminars Project Presentations
Textbook	Principles of fermentation technology,Stanburry . Industrial microbiology ,cassida.
References	1.Stanburry P.F.A. Whitaker and S.J. Hall (1995). Principles of fermentation technology. Pregamon Press 2. Cassida, I.E., Jr. Industrial microbiology (1994). Wiley eastern. 3. Cruger and Annilesse cruger (1990). A text book of industrial microbiology, sinaser associates. Inc. 4. Demain, A.L. and Solomon, N.A. Manual of industrial microbiology and biotechnology (1986). American society for microbiology. 5. Gasesca, P. and Able, J.J. (1987). Enzyme technology. Open University Press. 6. Purohit, S.S. (1988). Lab Manual of Plant Biotechnology, India. 7. Alman. A. (1988). Agricultural Biotechnology. Marcel and Decker Inc. Medium avenue (NY). 8. Burler, W. (1995). Bioreactor design and product yield. Heineman Lincare House, Oxford. 9. Fermentation a practical approach: Ed. B.M.C Neil and L.M. Harvey (1990) University Press.
Internet Resources	

Internal Exam Pattern

Items	Marks/20	Marks/15
Assignment	4	3
Test Paper(s)/Viva voce	8	6
Seminar/Presentation	4	3
Class Room Participation based on Attendance	4	3
Total	**20**	**15**

External Exam Pattern

Question Type	No of Question	Marks/Question	Total Marks
Short Questions(2-3 Sentences)	15	2	Ceiling 25
Paragraph / Problem Type	8	5	Ceiling 35
Essay Type	2 out of 4	10	20
Total			**80**
Time			**2.5 hrs**

Graduate Attributes	**Name of the Course:** Bioprocess technology **Knowledge** **Academic and Intellectual Skills** Collaborative Learning **Professional Skills** Communication Skills Team Work and Leadership Critical and Analytical Skills Problem Solving Skills Research Skills Entrepreneur Aptitude **Personal Skills** Creative Thinking Application Skills **Attitude and Values** Social Responsibility Ethical Commitment Global Citizen Nation Building

Course Schedule

Introduction to microbial fermentations. Range of microbial fermentation processes.	Week 1
Recombinant DNA technology assisted products. Flow chart of typical industrial fermentation process.	Week 2
Concept of value addition shelf life improvement. Low volume - high value and High volume - low value products.	Week 3
II. Isolation of industrially useful microbes from soil air and water. Microbial screening procedure.	Week 4
Preservation of Microorganisms: Stock culture maintenance. Storage at low temperatures on agar slants and liquid nitrogen. Storage in dehydrated form-dried culture.	Week 5
Industrial strain improvement: Different DNA mutating agents like UV, NTG, Nitrous acid, intercalating agents. Application of genetic engineering and protoplast fusion techniques in strain improvement.	Week 6
Fermentation media: Media composition. Requirement of Carbon-nitrogen minerals, growth factors, water and oxygen.	Week 7

Media sterilization: Batch and continuous sterilization, filter sterilization of fermentation media (for animal cell culture) and air.	Week 8
Microbial growth kinetics - Batch, fed-batch and continuous cultures:	Week 9
Fermentation equipment and use-parts of fementor. Types of bioreactors - CSTR, air-lift. Packed bed and immobilized reactors.	Week 10
Fermentation process control-control of temperature, pH, dissolved oxygen and RPM.	Week 11
. Fermentation process operation: Inoculum preparation, scale-up of fermentations.	Week 12
Downstream processing: Separation of cells by froath floatation, sedimentation, flocculation, Filtration and centrifugation. Cell disruption for intracellular products.Membrane filtrations, including reverse osmosis.	Week 13
Chromatographic techniques - Adsorption, ion-exchange, affinity and gel exclusion chromatography. Precipitation, crystallization and drying of biologicals .	Week 14
Typical fermentation processes: Antibiotics (Penicillins), organic acids (acetic acid), Microbial enzymes (Amylases and proteases)	Week 15
ethanol. Single cell proteins (SCP), Vatminas (Vti B 12).	Week 16
Enzyme technology: Basic concept of enzymes, sources and extraction of enzymes. Control of microbial enzyme production.	Week 17
Immobilization of enzyme of adsorption, entrapment, crosslinking and encapsulation methods. Application of immobilized enzymes.	Week 18

Contact Details

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