

Name of the Programme: M.Sc. Biotechnology

Course Code: GBT-603

Title of the Course: LAB VIII: BIOPROCESS TECHNOLOGY

Number of Credits: 2

Effective from AY: 2022-23

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| Pre-requisites for the Course: | None | |
| Course Objectives: | The objectives of this laboratory course is/are: 1) To educate students about fundamental concepts of Bioprocess technology 2) To provide hands-on training to students in upstream and downstream unit operations. | |
| Content: | <p style="text-align: center;"><u>MODULE I</u></p> <ul style="list-style-type: none">• Microbial production of ethanol using yeast sp.• Estimating ethanol concentration by Ceric Ammonium nitrate method.• Microbial production and estimation of organic acids: Citric acid using <i>Aspergillus sp.</i>• Microbial production of antibiotics.• Immobilization of microbial cells: use of alginate.• Fermentation: Batch, Fed-Batch and Continuous. | No. of hours 30 |
| | <p style="text-align: center;"><u>MODULE II</u></p> <ul style="list-style-type: none">• Use of fermentor with special reference to scale-up operations.• Microfiltrations: separation of cells from broth• Bioseparations: Chromatography and extractions (organic acid & antibiotics)• Manufacture of ginger ale and estimating the alcohol content.• Solid State Fermentation: Mushroom cultivation.• Food Microbiology: Preparation of an edible fermented product. | 30 |
| Pedagogy: | Hands-on experiments in the laboratory, online videos. | |

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| References/ Readings: | <ol style="list-style-type: none"> 1. A. Moser. Bioprocess technology: kinetics and reactors. Springer Science & Business, 2012. 2. A. Wiseman (Ed). Topics in enzyme & Fermentation technology. British Polymer Journal, Wiley Blackwell, 1984. 3. B. Ray, & A. Bhunia, Fundamental food microbiology. CRC press, 2013. 4. D. Behrens & P. Kramer (Ed), Bioprocess engineering: Downstream processing & recovery of bioproducts, safety in Biotechnology and regulations, 1990. 5. F. Stanbury & A. Whitaker, Principles of fermentation technology. Elsevier, 2016. 6. J.M. Coulson & J.F. Richardso. Chemical engineering. Elsevier, 2017. 7. J. P. Tamang (Ed.). Health benefits of fermented foods and beverages. CRC Press, 2015. 8. Khramtsov, N., McDade, L., Amerik, A., Yu, E., Divatia, K., Tikhonov,A., & Henck, S. Industrial yeast strain engineered to ferment ethanol from lignocellulosic biomass. Bioresource Technology, 102(17), 8310-8313, 2011. 9. L.E. Cassida, Industrial microbiology. New Age International Pvt Ltd Publishers, 1994. 10. M.C. Flickinger & S.W. Drew (Ed). Encyclopedia of bioprocess technology. Vol 1-5. Wiley Blackwell, 1999. 11. M.D. Trevan, Immobilized enzymes: An introduction & application in Biotechnology. Wiley Blackwell, 1980. 12. M. Young (Ed) Comprehensive Biotechnology. Vol 2- 4. Elsevier, 1985. 13. P. Prave, V. Fanst, W. Sitting, D.A. Sukatesh (Ed.) Fundamentals of Biotechnology. Saras Publications, 1987. 14. T. Korzybski, Z. Kowszyk-Gindifer, & W Kurylowicz. Antibiotics: origin, nature and properties. Elsevier, 2013. 15. T. T. Ngo (Ed.). Molecular interactions in bioseparations. Springer Science & Business, 2013. |
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| Course Outcomes: | <p>On completing the course, students should be able to:</p> <ol style="list-style-type: none"> 1. appreciate relevance of microorganisms from industrial context; 2. carry out stoichiometric calculations and specify models of growth; 3. give an account of design and operations of various fermenters; 4. present unit operations together with fundamental principles for basic methods in production techniques for bio-based products; 5. calculate yield and production rates in biological production process, and also interpret data; 6. give an account of important microbial/enzymatic industrial processes in the industry. |
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