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| **B.Sc MICROBIOLOGY (CBCS) SYLLABUS**  **THIRD YEAR – SEMESTER- VI** |
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| **MBT- 701 MICROBIAL BIOTECHNOLOGY** |
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| **TOTAL HOURS: 36** **CREDITS: 3** |
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| **UNIT- I** **No. of Hours: 8** |
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| Microbial biotechnology: Scope and its applications in human therapeutics, agriculture (Biofertilizers, PGPR, Mycorrhizae), environmental, and food technology.  Genetically engineered microbes for industrial application: Bacteria and yeast |
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| **UNIT- II** **No. of Hours: 7** |
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| Recombinant microbial production processes in pharmaceutical industries - Streptokinase, recombinant vaccines (Hepatitis B vaccine).  Over view of production and applications of Microbial polysaccharides, Bioplastics and Microbial biosensors |
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| **UNIT- III**  **No. of Hours: 10** |
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| Microbial based transformation of steroids and sterols.  Bio-catalytic processes and their industrial applications: Production of high fructose syrup and production of cocoa butter substitute.  Immobilization methods and their application: Whole cell immobilization |
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| **UNIT- IV No. of Hours: 7** |
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| Bio-ethanol and bio-diesel production: commercial production from lignocellulosic waste and algal biomass.  Biogas production: Methane and hydrogen production using microbial culture. Microorganisms in bioremediation: Degradation of xenobiotics.  Mineral recovery, removal of heavy metals from aqueous effluents. |
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| **UNIT- V** **No. of Hours: 4** |
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| Outlines of Intellectual Property Rights: Patents, Copyrights, Trademarks |

**Learning Out comes:**

1. **Student should be able to demonstrate with the wide diversity of microbes and their potential for use in microbial biotechnology**
2. **It is assumed that students will have get outlines of intellectual property rights.**

**MBP- 701 MICROBIAL BIOTECHNOLOGY**

**TOTAL HOURS: 36** **CREDITS: 2**

1. Yeast cell immobilization in calcium alginate gels

1. Enzyme immobilization by sodium alginate method
2. Pigment production from fungi (*Trichoderma* / *Aspergillus* / *Penicillium*)
3. Isolation of xylanase or lipase producing bacteria
4. Study of algal Single Cell Proteins

**SUGGESTED READING**

Crueger W, Crueger A (1990) Biotechnology: **A text Book of Industrial Microbiology** 2nd edition Sinauer associates, Inc.

Demain, A. L and Davies, J. E. (1999). **Manual of Industrial Microbiology and Biotechnology**, 2nd Edition, ASM Press.

Glazer AN and Nikaido H (2007) **Microbial Biotechnology**, 2nd edition, Cambridge University Press

Glick BR, Pasternak JJ, and Patten CL (2010) **Molecular Biotechnology** 4th edition, ASM Press

Gupta PK (2009) **Elements of Biotechnology** 2nd edition, Rastogi Publications

Prescott, Harley and Klein’s **Microbiology** by Willey JM, Sherwood LM, Woolverton CJ (2014), 9th edition, Mc Graw Hill Publishers.

Ratledge, C and Kristiansen, B. (2001). **Basic Biotechnology**, 2nd Edition, Cambridge University Press.

Stanbury PF, Whitaker A, Hall SJ (1995) **Principles of Fermentation Technology** 2nd edition., Elsevier Science

Swartz, J. R. (2001). **Advances in Escherichia coli production of therapeutic proteins. Current Opinion in Biotechnology**, 12, 195–201.

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| **B.Sc MICROBIOLOGY (CBCS) SYLLABUS**  **THIRD YEAR – SEMESTER- VI** |
| **CLUSTER PAPERS UNDER ELECTIVE 801 (801 A1, 801A2 & 801A3)** |
| |  | | --- | | **MBT- 801 A1: MICROBIAL DIAGNOSIS IN HEALTH CLINICS** | |  | | **TOTAL HOURS: 36** **CREDITS: 3** | |  | | **UNIT- I No. of hours: 8** | | Study of Bacterial,(Tuberculosis and Typhoid) Viral,(Influenza and HIV) Fungal (Aspergillosis and Candidiasis)and Protozoan Malaria and Amebiasis)Diseases affecting humans. | |  | | **UNIT- II No. of hours: 8** | |  | | Collection of clinical samples (oral cavity, throat, skin, blood, CSF, urine and faeces) and precautions required.  Method of transport of clinical samples to laboratory and storage. | |  | | **UNIT- III**  **No. of hours: 8** | |  | | Examination of sample by staining - Gram stain, Ziehl-Neelson staining for tuberculosis, Giemsa-stained thin blood film for malaria  Preparation and use of culture media - Blood agar, Chocolate agar, Lowenstein-Jensen medium, MacConkey agar, Distinct colony properties of various bacterial pathogens. | |  | | **UNIT- IV No. of hours: 6** | |  | | Serological Methods - Agglutination, ELISA, immunofluorescence, Nucleic acid based methods - PCR, Nucleic acid probes.  Typhoid, Dengue and HIV, Swine flu. | |  | | **UNIT- V No. of hours: 6** | |  | | Importance, Determination of resistance/sensitivity of bacteria using disc diffusion method, Determination of minimal inhibitory concentration (MIC) of an antibiotic by serial double dilution method |   **Learning Out comes:**   1. **Develop knowledge on disease transmission and control** 2. **Demonstrate on collection, handling and diagnosis of laboratory specimens** 3. **Develop a information making personal health decision in regard to infectious diseases.**     **MBP- 801 A1: MICROBIAL DIAGNOSIS IN HEALTH CLINICS**  **TOTAL HOURS: 36**  **CREDITS: 2**   1. Collection transport and processing of any one of the following clinical specimens (Blood/ Urine/ Stool/Sputum). Receipts, Labeling, recording and dispatching clinical specimens.   2. Isolation of bacteria in pure culture and Antibiotic sensitivity.  3. Identification of common bacteria( E.coli, Staphylococus aureus and Streptococus sps) by studying their morphology, cultural character, Biochemical reactions, and other tests.  4. Maintenance and preservation of stock culture.  **SUGGESTED READING**  Ananthanarayan R and Paniker CKJ (2009) **Textbook of Microbiology**, 8th edition, Universities Press Private Ltd.  Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013) Jawetz, Melnick and Adelberg’s **Medical Microbiology**. 26th edition. McGraw Hill Publication  Collee JG, Fraser, AG, Marmion, BP, Simmons A (2007) Mackie and Mccartney Practical **Medical Microbiology**, 14th edition, Elsevier.  Randhawa, VS, Mehta G and Sharma KB (2009) **Practicals and Viva in Medical Microbiology** 2nd edition, Elsevier India Pvt Ltd  Tille P (2013) Bailey’s and Scott’s **Diagnostic Microbiology**, 13th edition, Mosby   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | |  | | --- | |  | |  | |  | | |  |  | | --- | --- | |  | | |  | | |  | | |  | | |  | | |  | | |  | | |  | | |  | | |  | | |  | | |  | | |  | | |  | | |  | | |  | | |  | | |  | | |  | | |  | | |  | | |  | | |  | | | .   |  | | --- | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |   **B.Sc MICROBIOLOGY (CBCS) SYLLABUS**  **THIRD YEAR – SEMISTER-VI**  **MBT- 801 A3: BIOFERTILIZERS AND BIOPESTICIDES**  **TOTAL HOURS: 36** **CREDITS: 3**  **UNIT – I** **No of Hours: 10**  General account of the microbes used as biofertilizers for various crop plants and their advantages over chemical fertilizers.  Symbiotic N2 fixers: *Rhizobium* - Isolation, characteristics, types, inoculum production and field application, legume/pulses plants  *Frankia*  from non-legumes and characterization.  Cyanobacteria from *Azolla*, characterization, mass multiplication, Role in rice cultivation, Crop response, field application.  **UNIT – II** **No of Hours: 6**  Free living *Azospirillum*, *Azotobacter* - isolation, characteristics, mass inoculum production and field application.  **UNIT – III** **No of Hours: 6**  Phosphate solubilizing microbes - Isolation, characterization, mass inoculum production, field application  **UNIT – IV** **No of Hours: 7**  Importance of mycorrizal inoculum, types of mycorrhizae and associated plants, Mass inoculum production of VAM, field applications of Ectomycorrhizae and VAM.  **UNIT – V** **No of Hours: 7**  General account of microbes used as bioinsecticides and their advantages over synthetic pesticides. *Bacillus thuringiensis* - production, Field applications.  Viruses – NPV cultivation and field applications.  **MBP- 801 A3: BIOFERTILIZERS AND BIOPESTICIDES**  **TOTAL HOURS: 36** **CREDITS: 2**   1. Isolation of *Rhizobium* from root nodules.   3. Isolation of phosphate solubilizers from soil  4. Staining and observation of VAM  3. A visit to biofertilizer production unit.    **SUGGESTED READINGS**  Agarwal SK (2005) **Advanced Environmental Biotechnology**, APH publication.  Kannaiyan, S. (2003). **Bioetchnology of Biofertilizers,** CHIPS, Texas.  Mahendra K. Rai (2005). **Hand book of Microbial biofertilizers**, The Haworth Press, Inc. New York.  Reddy, S.M. et. al. (2002). **Bioinoculants for sustainable agriculture and forestry**, Scientific Publishers.  Saleem F and Shakoori AR (2012) **Development of Bioinsecticide,** Lap Lambert Academic Publishing GmbH KG  Subba Rao N.S (1995) **Soil microorganisms and plant growth** Oxford and IBH publishing co. Pvt. Ltd. NewDelhi.  **Learning Out comes:**   1. **Develop knowledge and skills on mass multiplication and field application of biofertilizers and biopesticides.** | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | | |