

S-01 & 02 June, 2016 AC after Circulars from Circular No.100 & onwards

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DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY**CIRCULAR NO. SU/Sci./B.Sc. Syllabi/6/2016**

It is hereby inform to all concerned that, on the recommendations of the Committees/Ad-hoc Boards the Hon'ble Vice-Chancellor has accepted the following revised syllabi in his emergency powers under Section-14[7] of the Maharashtra Universities Act, 1994 on behalf of the Academic Council as mentioned against their names under the **Faculty of Science** :-

Sr. No.	B.Sc. III Year Revised Syllabi	Semester
[1]	B.Sc. Automobile Technology [Degree Course],	V & VI
[2]	B.Sc. Workshop Technology [Degree Course],	V & VI
[3]	B.Sc. Refrigeration & Air Conditioning [Degree Course],	V & VI
[4]	B.Sc. Bioinformatics [Degree Course].	V & VI
[5]	B.Sc. Biotechnology [Optional],	V & VI
[6]	B.Sc. Horticulture [Optional],	V & VI
[7]	B.Sc. Dry Land Agriculture [Optional],	V & VI
[8]	B.Sc. Sericulture [Optional],	V & VI

This is effective from the **Academic Year 2016-2017** and onwards as appended herewith.

These syllabi are also available on the University Website **www.bamu.ac.in**

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.
REF.No.SU/B.Sc./2016/3849-68

Date:- 23-06-2016.

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Director,

Board of College and
University Development.

Copy forwarded with compliments to :-

- 1] The Principals, affiliated concerned Colleges,
Dr. Babasaheb Ambedkar Marathwada University.

Copy to :-

- 1] The Controller of Examinations,
- 2] The Section Officer, [B.Sc. Unit],
- 3] The Section Officer, [B.C.S. Unit],
- 4] The Programmer [Computer Unit-1] Examinations,
- 5] The Programmer [Computer Unit-2] Examinations,
- 6] The In-Charge, E-Suvidha Kendra, [Professional Unit], Rajarshi Shahu Maharaj Pariksha Bhavan, Dr. Babasaheb Ambedkar Marathwada University,
- 7] The Record Keeper,
Dr. Babasaheb Ambedkar Marathwada University.

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**DR. BABASAHEB AMBEDKAR
MARATHWADA UNIVERSITY,
AURANGABAD.**



Revised Syllabus of

B.Sc. III YEAR

BIOTECHNOLOGY

[OPTIONAL]

Semester-V & VI

[Effective from 2016-17 & onwards]

B. Sc. Third Year
Semester V
Paper XV- BPE Bioprocess Engineering

Credit: 03**Marks: 50**

1. **Introduction:** Design of basic fermenter, Bioreactor configuration, design features, individual parts, baffles, impellers, foam separators, sparger, culture vessel, cooling and heating devices, probes for online monitoring,. Batch, Continuous and solid state fermentations.
2. **Basics of Industrial Fermentation Processes:** Screening, physicochemical and biological assays of fermentation products, inoculum development and various methods of preservation of industrially important microorganisms such as serial transfers, lyophilization and liquid nitrogen storage. Brief introduction to different techniques employed for strain improvement.
3. **Fermentation Media:** Media composition, utilization of cheap natural raw materials employed for different fermentations (media economics). Different methods of media sterilization control of bacterial and phage contamination during fermentation. Scale up of fermentations.
4. **Downstream Processing:** Methods employed for process recovery Viz., Sedimentation, centrifugation, filtration, precipitation, liquid-liquid extraction, chromatography, membrane process, drying and crystallization.

References:

1. Baily & Ollis Biochemical Engineering Fundamentals, Tata Mcgraw hill New York.
2. Stanbury & Whittaker Principles of Fermentation technology Pergamon Press, oxford
3. Creuger & Creuger, Biotechnology, A text book of industrial Microbiology, Sinaeur Associates.
4. H.J.Rehm & Reed G, Biotechnology: A comprehensive treatise, VCH
5. L.E. Cassida, Industrial Microbiology Wiley Eastern
6. Applied Microbiology series
7. Veith W.F Bioprocess Engineering kinetics, Mass transport, Reactors, & Gene Expression, John Wiley & Sons.
8. Atkinsons B Biochemical reactors Pion Ltd, London.
9. Battley, E.H. Energetics of Microbial growth, John Wiley & Sons.
10. Davis , J.E and Demain, A.L- Manual of Industrial Microbiology and Biotechnology 2nd Edition , ASM, Publication.

Paper XVI-RDT Recombinant DNA Technology**Credits: 3****Marks: 50**

1. **Introduction to Recombinant DNA Technology:** Definitions, steps in gene cloning, tools and techniques and applications. **Molecular Tools and Applications:** Enzymes-Type II restriction endonuclease, Nucleases, Polymerases, Phosphatases and Kinases, DNA ligases, **PCR**-Essential features, design of primers, DNA polymerases for PCR.

Radiolabelling of Nucleic acids: end labeling, Nick translation, labeling by primer extension.

Southern and Northern Hybridization, DNA sequencing-enzymatic method.

Techniques of introducing DNA into cell-calcium chloride transformation & High efficiency transformation by electroporation, Agrobacterium-mediated transformation, Protoplast transformation, Particle bombardment

2. **Gene Cloning Vehicles: Plasmid vectors for *E. coli***-pBR322, pUC18, **Bacteriophage vectors for *E. coli***- λ insertion vectors, λ replacement vectors, M13mp18, **Hybrid plasmid / phage vectors, Vectors for use in Eukaryotic cells**- Vectors for plant cell: Ti-plasmid, viral Cauliflower mosaic virus, Binary vectors. Vectors for animal cell: P elements, SV40. **Artificial chromosomes:** YACs & BACs.

Cloning strategies- cloning from mRNA, cloning from genomic DNA,

3. **Recombinant Analysis and Applications of rDNA technology: Genetic selection and screening methods**- Chromogenic substrates, insertional inactivation, complementation, **Screening using nucleic acid hybridization** – Nucleic acid probes, screening clone banks, **Immunological screening for expressed genes, Analysis of cloned genes**- in vitro mRNA translation, restriction mapping, blotting techniques, DNA sequencing

4. **Applications of rDNA technology** – in understanding genes & genomes, in biotechnology (protein production & protein engineering), in medicine & forensics, transgenic plants & animals.

References:

1. An introduction to Genetic Engineering –Desmond S T Nicholl, Cambridge university press, 2nd Ed.
2. Watson J.D., Recombinant DNA: A short Course, Scientific American.
3. Old R.W & Primrose S.B., Principles of Gene manipulations, Blackwell Scientific publications.
4. Ausbel S. M , Brent R, Current Protocols in Molecular Biology., Wiley International New York.
5. Maniatis I, Fritsch E.F, & Sambrook J, Molecular cloning.
6. Winneker From Genes to Clones.
7. Setlow & Hollander A, Genetic Engineering: Principles & Methods, Plenum Press.
8. D.M Glover, DNA cloning, A practical approach.
9. Methods in Enzymology series, vol 152, 185, Academic press inc, Sandiego.

Paper XVII-LC-7 Bioprocess Engineering

Credit -1.5

Marks-50

1. Isolation of industrially important microbes from the environment.
2. Determination of TDP & TDT of microorganisms.
3. Determination of growth curve of a industrial organism & compute substrate degradation profile, specific growth rate & growth yield.
4. Screening & enrichment for a primary secondary metabolite from the environment.
5. Strain improvement for a higher yield of product
6. Random & strategic screening for a metabolite.
7. Media balancing experiment.

Paper XVIII-LC-8 Recombinant DNA Technology

Credit: 1.5

Marks : 50

1. Study of Conjugation in *E. coli*, and score for a marker.
2. Generalized Transduction in *E. coli* using P1 phage.
3. Transduction of tn family and insertional inactivation in *E. coli*.
4. Phage titration.
5. Gene expression in *E. coli*
6. Isolation of plasmid from *E. coli*,
7. Restriction fragment analysis.
8. Transformation of *E. coli*.
9. Transformation with phage DNA & isolation of lysogens.
10. Isolation of genomic DNA.

Semester VI

Paper XIX-MBT Microbial Biotechnology

Credit: 03**Marks: 50**

1. Production of Organic Acid: Citric Acid by *Aspergillus niger*: Media, raw material, fermentation conditions, biochemical pathways and regulation of citric acid production, recovery methods and industrial applications. **Fermentation of Antibiotic:** Penicillin production inoculum, production media with precursors, penicillin harvest and recovery.

2. Biosynthesis of Polysaccharides e.g. Dextran: Introduction, functions of polysaccharides, mechanism of synthesis of dextran by *Leuconostoc dextranicum*/ *Leuconostoc mesenteroides*. Recovery and its applications. **Production of Amino Acid:** Glutamic Acid production from *Corynebacterium*, glutamic acid permeability, fermentation conditions, recovery and applications.

3. Production of Enzyme: Production of fungal and bacterial α - amylase, applications of α - amylase.

Production of Plant Hormones: Gibberlins by *Giberella fujikori*, media used, culture conditions, recovery and its applications.

4. Production of Biofertilizers: Production of phosphate solubilizers & nitrogen fixers: media used, production conditions, product packaging using carrier materials.

Production of Industrial Alcohol: Microorganisms producing ethanol, media used for fermentation, fermentation conditions and product recovery.

References:

1. Baily & Ollis Biochemical Engineering Fundamentals, Tata Mcgraw hill New York
2. Stanbury & Whittaker Principles of Fermentation technology Pergamon Press, oxford
3. Creuger & Creuger, Biotechnology, A text book of industrial Microbiology, Sinaeur Associates.
4. H.J.Rehm & Reed G, Biotechnology: A comprehensive treatise, VCH
5. L.E. Cassida, Industrial Microbiology Wiley Eastern
6. Applied Microbiology series
7. Veith W.F Bioprocess Engineering kinetics, Mass transport, Reactors, & Gene Expression, John Wiley & Sons.
8. Atkinsons B Biochemical reactors Pion Ltd, London.
9. Battley, E.H. Energetics of Microbial growth, John Wiley & Sons.
10. Davis , J.E and Demain, A.L- Manual of Industrial Microbiology and Biotechnology 2nd Edition , ASM , Publication.

Paper XX-BIN Bioinformatics**Credit : 3****Marks : 50**

1. **Introduction to Bioinformatics:** History of bioinformatics, a brief idea about various biological data banks (e.g. NCBI), primary sequence databases: Protein sequence data bank, nucleic acid sequence data banks, Secondary sequence databases and composite sequence databases, search engines- SRS & Entrez.
2. **Sequence Alignment & Analysis:** Sequence alignment definition and types, sequence analysis using programs like BLAST, FASTA, multiple sequence analysis using ClustalW, applications of sequence analysis.
3. **Genomics:** Definition and brief introduction of: ORF, gene and genome annotation, functional & comparative genomics. **Proteomics:** Definition and significance. Primary structure (Primary, secondary, tertiary & quaternary), Structural Classification (SCOP & CATH), Protein secondary structure prediction methods: Chou Fasman, GOR, HMM, Protein tertiary structure prediction methods: AB initio, Homology modeling and threading, Structure Visualization tools: Rasmol & Swiss PDB viewer
4. **Applications of Bioinformatics:** Genome and proteome analysis using microarray, **DNA microarray:** printing oligonucleotides on glass slides, Nitrocellulose paper, application of this microarray in diagnosis, whole genome analysis using labeled probes, analysis of single nucleotide polymorphism. **Protein micro arrays:** proteome analysis by 2D electrophoresis, advantages, uses of this technology Medical informatics, Human Genome Project and its significance, drug designing brief introduction.

References:

1. Baxevanis Bioinformatics: A practical guide to analysis of genes & protein.
2. S.Sunderrajan & Balaji R – Introduction to Bioinformatics, Himalaya Publishing House.
3. Attwood, Introduction to Bioinformatics
4. Claverie, Bioinformatics A Beginner'S Guide
5. S. C. Rastogi, Namita Mendiratta, Parag Rastogi, Bioinformatics: Methods and Applications: Genomics, Proteomics and Drug Discovery

Paper XXI-LC-9 Microbial Biotechnology

Credit: 1.5

Marks : 50

1. Production of Organic acid by fermentation.
2. Production of Amino acid by fermentation.
3. Antibiotic fermentation- Penicillin
4. Microbial Enzyme production and its characterization.
5. Microbial polysaccharide production.
6. Bioinsecticides isolation purification and assay.
7. Biofertilizers production.

Paper XXII-LC-10 Bioinformatics

Credit: 1.5

Marks : 50

1. Exploring public domain databases for nucleic acid (NCBI, EMBL) and protein sequences (SWISSPROT, PDB)
2. Database searching for nucleic acid and proteins.
3. Sequence similarity search using BLAST/FASTA and analysis
4. Secondary structure prediction of proteins /enzymes
5. Protein structure prediction by homology modeling and structure evaluation

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