

बरकतउल्ला विश्वविद्यालय,भोपाल
Barkatullah University, Bhopal

As per model syllabus of U.G.C. New Delhi, Approved by Board of
Studies Biotechnology



जीव विज्ञान संकाय
Faculty of Life Science
पाठ्यक्रम एवं निर्धारित पुस्तकें
Syllabus & Prescribed Books

एम.एस.सी. (बायोटेक्नोलॉजी) चतुर्थ सेमेस्टर

M.Sc. (Biotechnology) Fourth Semester

प्रकाशक
कुलसचिव
बरकतउल्ला विश्वविद्यालय,भोपाल

BARKATULLAH UNIVERSITY, BHOPAL
M.Sc. (Biotechnology)
Fourth Semester Examination Scheme

1. Course Code	:		6. Maximum Theory Marks	:	500
2. Course Name	:	M.Sc. Biotechnology	7. Minimum Passing Percentage	:	36
3. Total Paper	:	04	8. Laboratory	:	100
4. Compulsory Paper	:	04	9. Laboratory Passing Percentage	:	36
5. Laboratory	:	01			

Title of the Paper	Theory		CCE		Total Marks		Practical		Total Marks	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
Advance in Fermentation and Food Biotechnology	85	31	15	05	100	36	---	---	100	36
Applied Immunology and Immunodiagnostics	85	31	15	05	100	36	---	---	100	36
Principles of Drug Designing	85	31	15	05	100	36	---	---	100	36
Training/Survey/Visit in a private industry/ treatment plant or lab at national or regional level for one month 50 marks for report 50 marks for presentation before external examiner	85	31	15	05	100	36	---	---	100	36
Laboratory-IV	---	---	---	---	---	---	100	36	100	36

SEMESTER IV:			
BT-401	Project Work/Dissertation	300	
	Training in a National Lab/Private industry/parent department for six months Evaluation, presentation skill and defence	200	
		Total:	500

BARKATULLAH UNIVERSITY, BHOPAL

Class - **M.Sc.**
Subject - **Biotechnology**
Paper Name - **BT-401 Advances in Fermentation and Food
Biotechnology**
Semester - **Fourth**

MM : 85

UNIT-I Role of Fermentation, Biochemistry of Fermentation- Carbohydrates, Protein and lipid metabolism, Formation of flavour. Fermentation systems- Characterization and Techniques of fermentation systems. Continuous fermentation for anaerobic microorganisms. Economics and Validation of Fermentation process.

UNIT-II Carbohydrate based therapeutics, Bioprocess development for detoxification and decolorization, Industrially important microorganisms for food applications. Reproduction Genetic manipulations- Recombination, strain improvement. Stabilization of transformants, Foreign proteins (enzymes and hormones), Commercial production of some foreign proteins (enzymes and hormones) in microorganisms.

UNIT-III Food spoilage- Types of food spoilages Physical, chemical, microbial and enzymic. Control of food spoilage. Food preservation- Reasons (advantages) for preserving food: Methods of food preservation- Freezing, chilling, heat treatments, irradiation, and dehydration. Chemical preservatives. Packaging- Modified, vacuum and permeable packaging. Food preservation by hurdle technology.

Food Toxicology- Scope, history and development of toxicology. Important terms and definitions. Naturally occurring toxicants in Foods (animal and plant). Toxicants formed in Processed Foods (mutagens, carcinogens). Factors influencing growth of toxigenic microorganisms. Environmental Toxicants (heavy metals, pesticides, industrial contaminants). Food and feed additives. Control of agricultural products. Microbial succession- Interactions between microorganisms.

UNIT-IV Fermented food products- Identity, characteristics, and sources of microorganisms in food fermentations. Metabolic activities of microorganisms and their influence on product attributes. Types of fermented foods. Processing of fermented foods. Growth, maintenance, and preservation of microbial starter cultures. Problems and solutions during fermentations of foods. Microbial toxins –control of toxin in food. Bioreactors in food fermentation. Packaging of fermented food products. Sensory evaluation of fermented food. Bio- monitoring of foods. Food safety and waste management in food processing industries- Introduction to Regulations and legislations. HACCP. Biosensors.

UNIT-V Protein engineering in food technology: Strategies and approaches of protein engineering research- De-novo and Rational design. Directed evolution in food applications- Design and construct proteins with desired function(s), Computational protein design. New industrial enzymes for food applications; Improving enzyme performance in food applications; Industrial enzyme production for food

applications; Immobilized enzyme technology for food applications; Novel enzyme technology for food applications: enzymes to improve textural and other properties of food; Enzymatically modified protein and protein-based fat replacers; Enzymatic production of bioactive peptides; Applications of cold adapted proteases in the food industry. Enzymes in food and feed applications- Glucose oxidase, Lipase, Lipoxygenase, Xylanase and Protease. Enzyme supplements in feed- Phytase, Hemi-cellulose degrading enzyme-glucanase and xylanase.

Recommended Books:

Fermentation biotechnology - B.C.Saha

Biotech food fermentation- Vol I & II – V.K. Joshi & Ashok Pandey

Food microbial fundamentals and frontiers – Doyle, Beuhat and Montville.

BARKATULLAH UNIVERSITY, BHOPAL

Class - **M.Sc.**
Subject - **Biotechnology**
Paper Name - **BT-402 Applied Immunology and
Immunodiagnostics**
Semester - **Fourth**

MM : 85

UNIT-I Immunization: routes of immunization, adjuvants, Equilibrium dialysis to measure antibody affinity and avidity, Precipitation reaction, Immunoelectrophoresis: principle and applications, ELISA, ELISPOT assay , RIA. Phage display libraries for antibody V-region production.

UNIT-II Immuno fluorescence microscopy; Immuno electronmicroscopy; principle and application. Immunohistochemistry, Immunoblotting technique; principle and applications

UNIT-III Isolation of lymphocytes by Ficoll-Hypaque gradient, Culture maintenance and application of lymphocyte culture. Flow Cytometry, Florescence Activated Cell Sorting (FACS) principle and application, Congenic mice, SCID-HU mice and their use in immunology

UNIT-IV Immunodiagnostics for detection of infectious agents : fungi, bacteria, viruses and protozoan, cancer (malignant and non malignant) and autoimmune diseases ; Immunosensors.

UNIT-V Therapeutic monoclonal antibodies: principle and applications, Biological response modifiers (immunostimulators and immunosuppressant), Recombinant vaccines- vector, DNA, synthetic peptide.

Recommended Books:

1. Immunology-Roitt *et.al*.
2. Immunochemistry- Kear and Thorpe.
3. Immunology-Abbas.
4. Cellular and Molecular Immunology-Abbs, Lichtman and Pober.
5. Immunology-Tizzard.

BARKATULLAH UNIVERSITY, BHOPAL

Class	-	M.Sc.
Subject	-	Biotechnology
Paper Name	-	BT-403 Principles of Drug Designing
Semester	-	Fourth

MM : 85

UNIT-I Organized drug discovery & development:

Pharmacological, microbial, recombinant, biochemical and molecular level screening system and their construction strategies. Alternative strategies in lead identification and lead optimization. Preclinical development: clinical trials, patenting & clearance for application.

UNIT-II Quantitative Structure Activity Relationships (QSAR):

Fundamentals of QSAR, Types of QSAR models, Classification of parameters utilized in QSAR studies, Statistical concept of QSAR, Hansch model of QSAR, De Novo model of QSAR, Hammett and Taft model of QSAR equations, Applications of QSAR in drug design. 3D QSAR approach.

UNIT-III Thermodynamic and structural principles:

Objective & approaches in the native ligand modification; Molecular graphic and modeling tools: hardware and software component of molecular graphics. Molecular modeling methods: MO theory, empirical methods, geometry optimization, force field, Conformational search, Perturbation free Energy.

UNIT-IV Stereochemistry and drug design- Stereospecificity in molecular recognition, Significance of stereochemistry in drug design, Methods of obtaining pure stereoisomers, Analytical methods of determining purity of stereoisomers. Three dimensional aided drug design – structure aided drug design process, methods to derive 3D structures. Design process, software aided drug design, optimization of identified compounds, example of structure aided drug design.

Molecular modeling – Generation of 3D coordinates, Sketch approach, conversion of 2D structure in 3D form, force field, geometry optimization, energy minimizing procedures, Quantum mechanical methods, conformational analysis, pharmacophore identification, molecular modeling in 3D QSAR – CoMFA and related methods.

UNIT-V Modeling drug receptor interaction: Receptor - introduction and source of information. Receptor fitting. Receptor mapping – pharmacophore concept. Pseudoreceptor. Role of solvent. Peptidomimetic design – goal and achievement. Enzyme catalytic principle - recapitulation, affinity labels, principles of suicide inactivation, design strategies scope and limitations. Illustrative examples of hydrolases, PLP based enzyme, isomerases & redox enzymes inhibitors. Synthetic peptide libraries, peptide libraries through phage display: application in epitope and antigen mapping & in synthetic vaccine designing.

Recommended Books:

1. Comprehensive medicinal chemistry (Vol. I-VI) Academic press,.Hansch
2. Ansel's Pharmaceutical Dosage forms a Drug delivery system-8th. Alen Popovich & Ansel
3. Molecular Modeling in Drug Design, Academic Press. N. Claude Cohen (Edi)
4. Molecular Modeling and Drug Design – Topics in Molecular and Structural Biology. CRC Press. J. G. Vinter and Mark Gardner (Edi)
5. Drug Design-Kulkarni & BotharaS
6. Burger,A., Medicinal Chemistry.
7. Wilson and Gisvold, Organic Medicinal Pharmaceutical Chemistry.
8. Ariens, Drug Design, Academic Press, New York, 1975.
9. Schueler, Chemobiodynamic and drug design.
10. Foye, Principles of Medicinal Chemistry.
11. Solkovisky, Sinkula and Valvani, Physicochemical Properties of Drugs, Marcel Deeker, Newyork, 1980.
12. Martin, Y., Quantitative Structural Activity Relationships, 1978.
13. Hansch, Principles of Medicinal Chemistry.
14. Kubiny's, Quantitative Structure Activity Relationships.
15. Holtje, Sippl, Rognan and Folkers, Molecular Modeling.
16. P.K. Larsen, Tommy and U. Madsen, Textbook of Drug Design and Discovery.
17. T.J. Perun and C.L. Propst, Computer Aided Drug Design.

BARKATULLAH UNIVERSITY, BHOPAL

Class - **M.Sc.**
Subject - **Biotechnology**
Paper Name - **BT-404**
Semester - **Fourth**

MM : 100

Training/Survey/Visit in a private industry/ treatment plant or lab at national or regional level for one month

50 marks for report

50 marks for presentation before external examiner

BARKATULLAH UNIVERSITY, BHOPAL

Class - **M.Sc.**
Subject - **Biotechnology**
Paper Name - **BT-405 Laboratory-IV**
Semester - **Fourth**

MM : 100

1. Immuno diffusion.
2. Immuno electrophoresis.
3. Study of agglutination & rosette formation.
4. PAGE on native gel & study of isozyme by activity staining.
5. Permanent slide on mammalian physiology.
6. Determination of aspartate content in given sample by enzymatic method.
7. To immobilize chymotrypsin on agarose gel beads by Oxirane method.
8. Production of monoclonal antibody against purified protein.
9. To detect nitrate reductase in leaf extracts by immunodiffusion test.
10. To detect antibodies in sera by competitive ELISA.
11. Identification of bacteria by using fluorescent antibody techniques (FAT).
12. Quality testing of milk by resazurin test.
13. Determination of phosphatase activity in butter, whey, milk powder.
14. Microbiological analysis of food production.
15. Presumptive test for coliform in butter.
16. Analysis of mycotoxin in fungal contaminated food materials.

Note: 70% of the above list should be compulsorily performed.