

NORTH MAHARASHTRA UNIVERSITY, JALGAON



SYLLABUS FOR

S.Y.B.Sc.

Biotechnology

(With effect from JUNE, 2013)

North Maharashtra University, Jalgaon

Syllabus S. Y. B. Sc. Biotechnology

[With effect from June 2013]

1. Each theory course has to be completed in 60 lectures in each semester.
1. Practical examination of laboratory course shall be conducted annually.
2. Each Theory course will be of 50 marks (10 marks internal and 40 marks external examination)
3. Practical course will be of 100 marks (20 marks internal and 80 marks external examination)
4. BT YSC [Y for year, S for semester and C for course number].

Theory Courses

FIRST SEMESTER	
BT-211: Cell Biology and Basic Metabolism	BT-212: Molecular Biology
1.1 Cell division and Cell ageing	1.1 Genome organization
1.2 Cell Membrane and Transport	1.2 Replication and Damage
1.3 Biocatalysts	1.3 Transcription and Translation
1.4 Metabolic Pathways	1.4 Regulation of gene regulation

SECOND SEMESTER	
BT-221: Basic techniques for biotechnology	BT-222: Immunology and Bioprocess Technology
2.1 Spectrophotometry	2.1 Immune system and Immunity
2.2 Chromatography	2.2 Antigen and Antibody
2.3 Electrophoresis	2.3 Immunology and Bioprocess Technology

Practical Course (Annual)

Annual
BT-203 : Practical Course in Biotechnology

FIRST SEMESTER

BT-211: Cell Biology and Basic Metabolism

Unit: 1.1	Cell division and Cell death	15L/10 marks
	<ul style="list-style-type: none">• Cell cycle process: G1, S, G2 and M Phases.• Regulation of cell cycle and significance• Mitosis and Meiosis: significance and comparison• Basic concept of cell apoptosis.	
Unit: 1.2	Cell Membrane and Transport	15L/10 marks
	<ul style="list-style-type: none">• Structure and organization of cell membrane• Membrane transport: Active and Passive• Membrane models: Bilayer and Danielli-Davson model• Cytoskeletal elements: microtubules, cilia, flagella, & microfilaments• Transport by vesicle formation: Endocytosis and Exocytosis	
Unit: 1.3	Biocatalysts	15L/10 marks
	<ul style="list-style-type: none">• Concept and terminologies in enzymology• General properties of enzymes• Enzyme nomenclature and classification with example• Mechanism of enzyme catalysis: Lock and key, Induced fit• Concept of enzyme activity and specific activity• Factors affecting on enzyme activity: Enzyme concentration, Substrate concentration, pH, Temperature, Activators and Inhibitors• Concept of Enzyme Inhibition	
Unit: 1.4	Metabolic Pathways	15L/10 marks
	<ul style="list-style-type: none">• Concept of Metabolism: Catabolism and Anabolism• Catabolic pathways, energetics and regulation of: Glycolysis, TCA cycle, Fatty acid degradation: β- oxidation• Anabolic pathways and regulation of: Gluconeogenesis, Glycogenesis.• Protein degradation: Transamination and Deamination	

References:

1. Price.N.C., Stewens Levis;” Fundamentals of Enzymology”, 3rd edition
2. Modi.H.A; ”Elementary Microbiology”, Vol I; Akta Publication, Nadiad
3. Nelson D.L,Cox M.M, “Lehninger’s Principles of Biochemistry” CBS Publications,2000.
4. Pawar.C.B; (1989) “Cell Biology”; Himalaya Pub. House, Mumbai
5. Murray R.K,Granner D.K,Mayes P.A and Rodwell V.W, "Harper's Biochemistry",Appleton and Lange,Stanford, Connecticut.
6. Satyanarayan U, “ Biochemistry”,Books and Allied (P) ltd,Kolkata.
7. Lohar, P.S. (ISBN 81-8094-027-6) “Cell and Molecular Biology”, MJP Publishers Chennai.
7. Rastogi S.C, “Cell Biology” ,3rd edition,New Age International (P) Ltd.
8. Stryer L,"Biochemistry",4th edition,W.H.Freeman and Co,New York,USA.

SECOND SEMESTER**BT-221: Basic techniques for Biotechnology.**

Unit: 2.1	Spectrophotometry	20L/13marks
	<ul style="list-style-type: none">• Concept of electromagnetic radiations, Absorption spectrum, Beer-Lambert's law and its limitations.• Basic concept of chromophore and auxochrome.• Principle, instrumentation and applications of UV and visible Spectrophotometry : Single beam, Double beam and Dual Wavelength	
Unit: 2.2	Chromatography	20L/14marks
	<ul style="list-style-type: none">• Chromatography: Stationary and mobile phases, Concept of partition coefficient and nature of partition forces.• Principle, Methodology and applications of Paper, Thin layer, Ion exchange, Affinity and Molecular exclusion chromatography• Concept of modern chromatography techniques: HPLC and GC.	
Unit: 2.3	Electrophoresis	20L/13marks
	<ul style="list-style-type: none">• Electrophoresis: Concept and Principle, Types : Free & Zonal electrophoresis• Principle, Methodology and applications of: Paper electrophoresis, Agarose gel electrophoresis and SDS PAGE• Isoelectric Focusing.	

References :

- 1) Upadhyay, Upadhyay and Nath (2003) "Biophysical chemistry: Principles and Techniques", Himalaya Publishing House, Mumbai.
- 2) Narayanan P, "Essentials of Biophysics", New Age Publishers.
- 3) Friefelder D, "Physical Biochemistry", 2nd edition, W.H. Freeman and co.
- 4) Singh Ayodhya and Singh Ratnesh, "Biophysical Chemistry : Principles and Techniques", Campus Books, New Delhi.
- 5) Keith Wilson and Walker John (2000), "Practical Biochemistry: Principles and Techniques", Cambridge University Press, Low price edition.

FIRST SEMESTER**BT-212: Molecular Biology**

Unit: 1.1	Genome organization	15L/10marks
	<ul style="list-style-type: none"> • Concept of Gene, Genome, Chromosome, Cistron, Muton, Recon, Introns and Exons. • Organization of Chromatin, Histone and Non-histone proteins. • Nature and Properties of Genetic Code. 	
Unit: 1.2	Prokaryotic DNA replication, Damage and Repair	15L/10marks
	<ul style="list-style-type: none"> • Prokaryotic DNA replication: Enzymes and proteins involved • Mechanism of Replication: Initiation, Elongation, synthesis of Leading and lagging strands, Termination. • Mutation concept: types: Spontaneous Mutation and Induced Mutation • Mutagens: Physical Mutagens and Chemical Mutagens • DNA repair mechanisms: Photoreactivation and Dark Excision repair 	
Unit: 1.3	Transcription and Translation	15L/10marks
	<ul style="list-style-type: none"> • Transcription: RNA polymerase, Initiation, Elongation and Termination. • Inhibitors of transcription. • Translation: Role of Ribosome, Activation of amino acids, Initiation, chain Elongation and termination of translation. • Inhibitors of translation 	
Unit: 1.4	Regulation of gene regulation	15L/10marks
	<ul style="list-style-type: none"> • Concept of Operon • Promoter, Operator, Structural and Regulatory genes. • Model of Lactose operon: Structure, Positive and Negative regulation 	

References :

- 1) Rastogi S.C.; "Concepts in Molecular Biology", New Age International (P) Ltd, New Delhi.
- 2) Verma P.S. and Agrawal V.K. (2001), "Concepts in Molecular Biology", S.Chand and Co.Ltd; New Delhi.
- 3) Pasupuleti Mukesh, "Molecular Biotechnology",MJP (P) Chennai.
- 4) Powar C.B, "Gene Regulation",Himalaya Book Pvt.Ltd, Mumbai.
- 5) Lohar P.S. (ISBN 81-8094-027-6) "Cell and Molecular Biology", MJP PublishersChennai.
- 6) Friefilder D,"Basics of Molecular Biology",Barlett Publications.
- 7) Strickburger M.W,(1995) "Genetics", Practice hall of India pvt Ltd,new Delhi.
- 8) Upadhyay Avinash and K.Upadhyay (2005),"Basic Molecular Biology",Himalaya Publishing House, Mumbai.

SECOND SEMESTER**BT-222: Immunology and Bioprocess Technology**

Unit: 2.1	Introduction to Immunology	20L/13marks
	<ul style="list-style-type: none"> • Properties of immune system: Specificity, Diversity, Self v/s non-self-discrimination • Types of immunity: Innate and Acquired. • Cellular and Humoral immune responses • Primary and Secondary immune response 	
Unit: 2.2	Antigen and Antibody	20L/13marks
	<ul style="list-style-type: none"> • Concept of antigen, Types of antigen, Antigenic determinants, Hapten. • Antigen and Immunogen, antigenicity and Immunogenicity. • Factors affecting antigenicity • Structure, types and functions of Immunoglobulin. 	
Unit: 2.3	Basics of Bioprocess Technology	20L/14marks
	<ul style="list-style-type: none"> • Concept and significance of Bioprocess technology • Screening : Primary and Secondary • Preservation of industrially important micro-organisms : Storage at reduced temperature and storage in dehydrated form • Culture collection and culture collection Centers. • Concept of Bioreactor and Fermenter. • Design of Fermenter: The key considerations. • Types of fermentation process: Batch and Continuous • Typical fermentation process: Ethanol production. 	

References :

- 1) Singh Bharat, "Immunology", Pointer Pub, Jaipur.
- 2) Yadav .P.R,"Immunology", Dicoverly Pub House, New Delhi.
- 3) Coleman.R.M, Lombard.M.F, Sicard.R.E, Rencocca.N.J , "Fundamentals of Immunology", W.C.Brown Pub,1989
- 4) Stanburi.P.F.; Whitakar & Hall.S.J, "Principles of Fermentation Technology",2nd Edition
- 5) Cassida.L.E. Jr, "Industrial Microbiology", New Age Int Publishers
- 6) Dubey.R.C; Maheshwari.D.K, "A Textbook of Microbiology", S.Chand Publication, New Delhi.
- 7) Patel.A.H; "Industrial Microbiology" Mac.Millon India Limited.
- 8) Dubey.R.C; "A Textbook of Biotechnology", S Chand & Co. Ltd. ,New Delhi.
- 9) I.Kannan (2007), "Immunology",MJP Publishers,Chennai 600005.
- 10) I. Shastri,"Basic Immunology", Himalaya Publications, Nagpur.

BT-203: Practical Course in Biotechnology

	Name of Experiments
1.	Determination of cell size by micrometry (Yeast/Bacterial Cell)
2.	Determination of λ_{max} by using a suitable dye.
3.	Separation of amino acids by paper chromatography.
4.	Separation of sugar / amino acid by thin layer chromatography.
5.	Separation of amino acids by paper electrophoresis.
6.	Study of mitotic cell division by squash method(onion root tip)
7.	Study of meiotic cell division (<i>Triadiscantia</i> buds/Grasshopper testis)
8.	Study of ethanol production by using <i>Saccharomyces cerevisiae</i> .
9.	Spectrophotometric estimation of DNA.
10.	Spectrophotometric estimation of RNA.
11.	Isolation of organic acid producing organism.
12.	Isolation of amylase / protease producing organism.
13.	Determination of enzyme activity of acid / alkaline phosphatase.
14.	Determination of blood group with Rh typing.
15.	Demonstration of various parts of stirred tank reactor.
16.	Demonstration of agarose gel electrophoresis of DNA.
17.	Estimation of Citric acid in fermented broth.
18.	Isolation of mutants by replica plate method.

References :

- 1) Aneja K.R.(1996) "Experiments in Microbiology, Plant Pathology, Tissue Culture and Mushroom Cultivation",New Age International (P) ltd, New Delhi.
- 2) Plummer D.T, "An Introduction to Practical Biochemistry,3rd edition; Tata McGraw Hill, Delhi.
- 3) Sadasivam S.and Manikam A(1996) "Biochemical Methods", 2nd edition New Age International (P) Ltd.New Delhi.
- 4) Harisha S, "An Introduction to Practical Biotechnology" Laxmi Publication (P) Ltd.new Delhi.
- 5) J Jayraman "laboratory Manual in Biochemistry" New Age International (P) Ltd.Publishers,New Delhi ,1999.
- 6) Wilson K. and Walker J,"Practical Biochemistry: Principles and Techniques", (5th edition), Cambridge Uni. Press, Cambridge
- 7) Sawhney S.K; Singh Randhir, "Introductory Practical Biochemistry ", Narosa Publishing House,New Delhi.