DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY

CIRCULAR NO.SU/Sci./Syllabi/Model Coll.Sem.-I & II/86/2016

It is hereby inform to all concerned that, on the recommendation of the Committee, the Hon'ble Vice-Chancellor has accepted the **"Syllabi of B.Sc. Honors degree courses in [1] Biotechnology, [2] Bio-Chemistry & [3] Computer Science Ist & IInd Semester under Credit Based System"** on behalf of the Academic Council under Section-14[7] of the Maharashtra Universities Act, 1994 run **at Model College, Ghansawangi, Dist-Jalna**.

The admission criteria for the courses as per U.G.C. norms.

This is effective from the Academic Year 2015-16 & onwards as appended herewith.

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

University Campus,
Aurangabad-431 004.
REF.NO.SU/SCI./MODEL COLL./
2016/15975-84
Date:- 16-02-2016.

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Director,
Board of College and
University Development.

Copy forwarded with compliments to:-

1] The Principal, Model College, Ghansawangi, Dist-Jalna.

Copy to :-

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

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S*/-150216/-

NAAC 'A' Accreditation

Dr. Babasaheb Ambedkar Marathwada University

Aurangabad-431004

Affiliated

Model College, Ghansavangi,

Jalna

Syllabus of

B. Sc. (Honors) Degree Course (Biotechnology)

(Effective from 2015-16 and onwards)

B. Sc. Biotechnology Scheme for Semester I

Sr. No	Course Code	Name of the subject	Scheme of Teaching Contact hours each week				Scheme of Evaluation (Marks)			
			Lec.	Pr.	Total con. Hr/wk	Credits	class tests + tutorials	university exam	university pr. exam	Total Marks
1	BT CL101	ENGLISH I	4	-	4	4	40	60	-	100
2	BT IL 102	Second Language	4	-	4	4	40	60	-	100
3	BT CC 103	Inheritance Biology	3	2	5	5	10	50	40	100
4	BT CC104	Genomes & Inheritance	3	2	5	5	10	50	40	100
5	BT SU 105 Major Supportive	Biomolecules I	2	2	4	4	10	50	40	100
6	BT SU 106 Major Applied	Essentials of Microbiology	2	2	4	4	10	50	40	100
7	BT JOC 107	JOC (Life Skill Cirriculum)	2	-	2	2	10+10	30	-	50
8	BT VOC 108	VOC (Life Skill Cirriculum)	2	-	2	2	10+10	30	-	50
					Total	30				700

B. Sc. Biotechnology Scheme for Semester II

Sr. No	Course Code	Name of the subject	Scheme of Teaching Contact hours each week				Scheme of Evaluation (Marks)			
			Lec.	Pr.	Total con. Hr/wk	Credits	class tests + tutorials	university exam	university pr. exam	Total Marks
1	BT CL201	ENGLISH II	4	-	4	4	40	60	-	100
2	BT IL 202	Second Language	4	-	4	4	40	60	-	100
3	BT CC 203	Cell Biology	3	2	5	5	10	50	40	100
4	BT CC204	Fundamentals of Genetics	3	2	5	5	10	50	40	100
5	BT SU 205 Major Supportive	Microbial Physiology	2	2	4	4	10	50	40	100
6	BT SU 206 Major Applied	Biomolecules II	2	2	4	4	10	50	40	100
7	BT JOC 207	JOC (Life Skill Cirriculum)	2	-	2	2	10+10	30	-	50
8	BT VOC 208	VOC (Life Skill Cirriculum)	2	-	2	2	10+10	30	-	50
					Total	30				700

B. Sc. Biotechnology, Part I, Semester I

Paper I **Inheritance Biology (Core A -30hours, 3Cr. Th)**

Unit I **Historical and Evolutionary perspective**

Contribution of various scientists in Evolutionary Genetics: Lamark, Russel Wallace, Darwin, Weisman, Hugo de veries. Definition of gene. Discovery of genetic material –Experimental evidences, Watson and Crick DNA structure.

Unit II **Gene Concept and Inheritance**

Concept of gene: Allele, Alleles, Psudoallele, Complementation test. Mendelian Principles: segregation; Mendels experiment, terminology, testing phenotypes, examples of gene differences and segregation. Mendelian Principle II: Independent assortment; genotypes of dihybrid corsses, testing dihybrid genotypes.

Unit III **Extension of Mendel Principles**

Codominance, Incomplete dominance, Pleiotrophy, Genomic Imprinting, Penetrance and Expressivity, Phenocopy, Linkage and Crossing over, Sex determination, Sex Linkage, Sex limited and Sex influenced characters. Gene interaction, Epistasis.

References:

1. Principles of Genetics, 7th edition R. H. Tamarin, Tata McGraw Hill Edition, Reprint 2004.
2. Molecular Genetics: an introductory narrative (2nd edition) Gunther S. Stent, and Riochard Calenar, CBS publishers and Distributiors, Reprint 2004
3. Genetics 5th edition, Strickberger, Pearsons Bublisher, LPE.
4. Modern Microbial Genetics Editors Uldis N Streips and Ronald E. Yassbin, Wiley Liss Pubication 1991.
5. Genetics: Conceptual approach by Benjamin Pierce
6. i-Genetics: A molecular approach 3rd edition, -Peter J. Russel.

B. Sc. Biotechnology, Part I, Semester I

Paper II **Genomes and Inheritance (Core B -30 hours -3 Cr. Th)**

Unit I Organization of genomes, prokaryotes, eukaryotes. *Escherichia coli* genome, examples of eukaryotic genomes; *Saccharomyces cereviceae, C. elegans, Arabidopsis thaliana,* human genome.

Unit II Subcellular and extrachromosomosomal inheritance, Plasmid genomes, viral genomes, Plastid genomes, Mitochondrial genomes

Unit III Non Nuclear Inheritance

Maternal inheritance/maternal effect, cytoplasmic inheritance, Plastid inheritance, Endosymbiont mediated inheritance and Uniparental Inheritance

References:

1. Principles of Genetics, 7th edition R. H. Tamarin, Tata McGraw Hill Edition, Reprint 2004.
2. Molecular Genetics: an introductory narrative (2nd edition) Gunther S. Stent, and Riochard Calenar, CBS publishers and Distributiors, Reprint 2004
3. Genetics 5th edition, Strickberger, Pearsons Bublisher, LPE.
4. Modern Microbial Genetics Editors Uldis N Streips and Ronald E. Yassbin, Wiley Liss Pubication 1991.
5. Genetics: Conceptual approach by Benjamin Pierce
6. i-Genetics: A molecular approach 3rd edition, -Peter J. Russel.
7. Genomes: T. A. Brown 3rd edition
8. Principles of Genomes and Genomics 7th edition, Primrose and Twyman.

B. Sc. Biotechnology, Part I, Semester I

Major Supportive

Biomolecules I (24 contact hours -2cr. Th)

Unit-1: Basic Concepts:

Concept and definition of acid, base, Water and pH, Buffers and biological systems, Henderson-Hassalbach equation.

Types of bond in biomolecules- Covalent (Glycosidic, peptide , Phospodiester) Ionic hydrogen, Van der Waals, Hydrophobic, Co-ordinate, There Formation and interaction.

Unit-2: Thermodynamics and bioenergetics

Basic concepts of Thermodynamics, Enthalpy, entropy. Law of Thermodynamics, Thermodynamics and biological system, Application of Thermodynamics. Concepts of free energy, relation between Equilibrium constant and Standard Free energy change Biological oxidation reduction reaction. High Energy phosphate compound – Introduction, phosphate group transfer, Hydrolysis of ATP and Sugar phosphate Along with reasons for ΔG

Unit-3: Nucleic Acids

Physico-chemical properties of Nucleic acids, nitrogenous bases (Purines and Pyrimidines), structure of nucleosides and nucleotides. Structure of DNA- Watson and Crick Model, DNA forms and conformations Denaturation of DNA. RNA- types, structure and role.

References:

1. Cohn & Stump – Outline of Biochemistry Wiley Eastern Ltd.
2. L. Lehninger, D. L. Nelson & M M Cox – Principles of Biochemistry.
3. Lubert Stryer – Biochemistry
4. J. Jayraman- Practical Biochemistry
5. Plummer. –Practical Biochemistry
6. A.C.Deb Fundementals of biochemistry
7. Zuby - Biochemistry 4th edition
8. Boyer- Concepts in Biochemistry
9. Cooper -The tools of Biochemistry
10. Biochemistry- U Satyanaran

B. Sc., Biotechnology, Part I, Semester I

Major Applied (32 contact hours -2 Cr. Th)

Essentials of Microbiology

Unit I **Determination of micro-organisms**

Various shapes of bacteria, determination of microbes by Stains and Staining procedure, Classification, Negative staining, Monochrome staining, Gram staining, Acid Fast staining

Unit II **Isolation and purification**

Types of growth media: Natural, Synthetic, Enriched, Enrinchment and selection, Differential medium.

Isolation & Purification: Pure culture techniques; streak plate, pour plate and spread plate technique. Techniques used for isolation purification of aerobic and anaerobic microbes.

Unit II **Microbial Control**

Physical: Sterilization: Heat: Dry heat, Moist heat, Tyndalization & Pasteurization. Radiations.

Unit III-

Chemical control

General properties of disinfectant, types of disinfectants, Antimicrobial compounds

References:

1. R. Y. Stanier 6th Edition, General Microbiology, Mc Millan Press. Inc.
2. PelczarMicrobiology, TMH publication
3. Anantnarayan text book of Microbiology 9th edition, Orient Longman Delhi
4. Cappucinno Microbiology; a laboratory manual 4th edition
5. Toratora Microbiology: An introduction
6. Salle A. J. Fundamental Principles of Bacteriology
7. Prescott Microbiology

Practical 2Cr. Each

LC-I Inheritance Biology

1. Problems based on monohybrid and back cross
2. Problems based on di-hybrid
3. Problems based on tri-hybrid
4. Problems based on pedigree analysis
5. Problems based on epistasis.
6. Problems based on Linkage

LC II Genomes & Inheritance

1. Isolation & Demonstration of Plastids from plant source
2. Isolation and Demonstration f Mitochondria
3. Comparison of Microbial and Eukaryotic genomes (structure & Function level)
4. Comparison of virus and corresponding host genomes (Structure and Function)

LC-III Biomolecules

1. Preparation of reagents, Molar and normal solution
2. Preparation of various buffers and determination of p^H
3. Quantitative estimation of DNA by diphenylamine method
4. Quantitative estimation of RNA by Orcinol method.

LC-IV Microbiology

1. Simple staining/Monochrome staining

2. Negative staining

3. Differential staining –Grams staining and Acid Fast staining

4. Media preparation & Test of sterility

5. Isolation of bacteria from soil, water by streak plate, pour plate and spread plate method

B. Sc. Biotechnology, Part I, Semester II

B. Sc. Biotechnology, Part I, Semester II

Paper III - Cell Biology (Core A -30 hours 3 Cr. Th)

Unit1. Cell Structure and organelles

Cell theory Organization : Origin of eukaryotic cells-endosymbiotic theory, Giardia-a living fossil. **Overview of cell specializations**: **Plants**-epidermis,vascular tissue and cortex, **Animals**-epithelia,connective tissue, nervous tissue, muscle, blood, germ cells and sensory cells.

Structure and Functions of Organelles:

Endoplasmic Reticulum, Lysosome, Golgi Complex, Peroxisome (Microbody), Centriole, Mitochondria, Cytoskeleton-microtubules, intermediates filaments, actin filaments, mechanism of muscle contraction, motors and movements, Cilia & Flagella, Nucleus, Special Properties of Plant Cells-cell wall, vacuoles and chloroplast.

Unit 2. Membrane Structure Membrane models -Overton's lipid nature of membrane, Langmuir's lipid monolayer, Gorter and Grendel's lipid bilayer, Davson and Danielli's lipid bilayer plus protein sheet, Robertson's Unit membrane, Singer and Nicolson's fluid mosaic. **Membrane structure-**2D Lipid bilayer, composition of lipid bilayer, asymmetric nature, fluidity, membrane proteins and their function.

Unit 3. Cell Division and CellCycle

Mitosis, Meiosis, and Cytokinesis, role of protein kinases and Cyclin-Cdk-complex in controlling cell cycle, control of cell proliferation in multicellular organisms, programmed cell death

References:

1. Cell Biology by -Sadava
2. Molecular Cell Biology, Lodish *et al.*,FreemanandCompany,NewYork,1999
3. Essential Cell Biology -An introduction to the molecular Biology of thec ell-Alberts,Bray,Johnson,Lewis,Raff,Roberts,Walter,GarlandPublishing.
4. Molecular Biology of the cell-BruceAlberts,GarlandPublishingInc.
5. Cell Biology-Ashortcourse,Secondedition,StephenR.Bolsover,WielyPublication
6. Genes XI-BenjaminLewin,PrenticeHallPublication
7. An introduction to Practical Biochemistry- David T Plummer, Tata McGraw-HillEdition
8. Developmental Biology,Ninth edition,S.F.Gilbert,SinauerAssociatesInc.

B. Sc. Biotechnology Part I (Semester II)

Paper IV **Fundamentals of genetics (Core B -30 hr. 3Cr. Th)**

Unit I **Chromosomal Abberations**

Mutation: spontaneous, replica plating, fluctuation test, S-benzer test, induced mutation: physical, chemical and biological. UV and gamma ray induced mutation, base substitution analogue, hydroxyl amine, nitrous acid, acridine dyes mediated mutations. Mutations by transposition.

Unit II **Safe Guarding principles**

Choice of restriction and modification within cell, type I, type II and type III restriction enzymes. UV repair, Photoreactivation, post replication repair and SOS repair system.

Homologous: general and site specific examples, non homologous recombination.

Unit III **Genetic Code**

Codon, degeneracy of codon, amino acids and their codon , wobble hypothesis, unusual amino acids, codon usage, tRNA stucrutre and classes of tRNA synthetases, charging of tRNA,

References:

1. Principles of genetics : Tamarin, McGrahall
2. Principles of genetics 8th edition, E. J. Gardner, MJ. Simmons and D. P. Snustad.
3. Genetics : 5th edition Strickberger Pearson Publisher, Low Price Edition,
4. General Microbiology: RY Stanier, 6th edition
5. Genes XI, Benjamin Lewin
6. Molecular genetics : An introductory narrative 2nd edition, Gunther S. Stent and R. Calendar, CBS publisher and Distributors, reprint 2004

B. Sc. Biotechnology Part I (Semester II)

Supportive

Microbial Physiology (Core A -24hrs 2 Cr. Th)

Unit I Microbial Growth: Growth curve, quantification of growth –direct/indirect, Arithmatic, continuous and synchronous growth

Unit II Microbial Differentiation: Bacterial sporulation, stages and biochemical changes during sporulation and germination of spore

Unit III Microbial toxins and stress response: types of toxin, Shiga toxin, toxins from *E. coli*, cholera toxin, Staphylococcal toxin, spectic shock, botulism. Heat shock and cold schock, stress during prolonged stationary phase and other environmental conditions.

References:

1. R. Y. Stanier 6th Edition, General Microbiology, Mc Millan Press. Inc.
2. PelczarMicrobiology, TMH publication
3. Anantnarayan text book of Microbiology 9th edition, Orient Longman Delhi
4. Cappucinno Microbiology; a laboratory manual 4th edition
5. Toratora Microbiology: An introduction
6. Salle A. J. Fundamental Principles of Bacteriology
7. Prescott Microbiology
8. Rose Chemical Microbiology
9. Cruickshank, Duguid Medical Microbiology

B. Sc. Biotechnology Part I (Semester II)

Applied

Biomolecules II (Applied -32hrs)

Unit I **Carbohydrates**

Structure of monosccharides, steroisomerism and optical isomeris of sugars. Structure, occurrence and biological importance of monosaccharides, oligosaccharides, and polysaccharides e. g. cellulose, chitin, agar, algenic acids, pectins, proteoglycans, sialic acids, blood group polysaccharides, glycogen and starch. Bacterial cell wall polysaccharides and glycoproteins

Unit II **Lipids**

Definition and classification. Fatty acids: introduction, classification, nomenclature, structure and properties of saturated and unsaturated fatty acids. Essential fatty acids, prostaglandins. Triacylglycerols: nonmenclature, physical properties, chemical properties and characterization of fats –hydrolysis, saponification value, rancidity of fats, Reichert-Meissel number and reaction of glycerol. Biological sifnificance of fats. Glycerophospholipids (lecithins, lysolecithins, cephalins, phsophatidyl serine, phosphatidyl inositol, polasmalogens), sphingomyelins, glyolipids –cerebrosides, gangliosides. Properties and functions of phospholipids, isoprenoids and sterols.

Unit III **Proteins**

Introduction, classification based on solubility, shape, composition and functions. Amino acids: common structural features, stereo-isomerism and RS system of designating optical isomers, classification and structures of standard amino acids as zwitterions in aqueous solutions, physical and chemical properties, titration of amino acids, separation of amino acids. Essential amino acids.

Peptides; structure of peptide bond, chemical synthesis of polypeptides –protection and deprotection of N-terminal, and C-terminal ends and functional groups in the side chains, formation of peptide bonds, condensing agents, strategy of chemical synthesis, Merrfield solid-phase peptide synthesis. Determination of the amino acid sequence of a polypeptide chain, specific chemical and enzymatic cleavage of a polypeptide chains and separation of peptides.

Protein structure: levels of struvture in protein architecture, primary structure of proteins, secondary structure of proteins, -helix and pleated sheets, tertiary structure of proteins, forces stabilizing the tertiary structure and quaternary structure of proteins. Denaturation and renaturation of proteins. Behaviours of proteins in solutions, salting in and salting out of proteins. Structure and biological functions of fibrous proteins (keratins, collagen and elastin), globular proteins (hemoglobin, myoglobin), lipoproteins, metalloproteins, glycoproteins and nucleoproteins.

References:

1. Cohn & Stump – Outline of Biochemistry Wiley Eastern Ltd.
2. L. Lehninger, D. L. Nelson & M M Cox – Principles of Biochemistry.
3. Lubert Stryer – Biochemistry
4. J. Jayraman- Practical Biochemistry
5. Plummer. –Practical Biochemistry
6. A.C.Deb Fundementals of biochemistry
7. Zuby - Biochemistry 4th edition
8. Boyer- Concepts in Biochemistry
9. Cooper -The tools of Biochemistry
10. Biochemistry- U Satyanaran

Laboratory courses 2Cr. Each Pr.

LC V –Cell biology

1. Demonstration of golgi body, endoplasmic reticulum, peroxisomes (Permanent preparations)
2. Studies on various stages of Mitosis and Meiosis (Slide)
3. Studies on Plasmoptysis and Plasmolysis

LC VI –Fundamentals of Genetics

1. Spontaneous mutant isolation (Streptomycin resistant)
2. UV induced mutations (Streptomycin resistant)
3. Mutations induced by chemical mutagen (Nitrous acid, hydroxyl amine, acridine dyes)
4. Fluctuation test analysis
5. Replica plate analysis

LC VII – Microbial physiology

1. Growth curve –optical density method
2. Standard plate count
3. Total viable count (samples from prolonged stationary phase of growth curve experiment)
4. Arithmetic growth
5. Synchronous culture
6. Demonstration of sporulation
7. Spore staining

LC VIII –Biomolecules II

1. Qualitative/ Quantitative test: demonstration of reducing sugar
2. Qualitative/quantitative test :demonstration of non-reducing sugar
3. Demonstration of starch hydrolysis
4. Sugar estimation
5. Demonstration of rancidity
6. Demonstration of saponification
7. Qualitative test for detection of proteins and amino acids both: purified and natural sources
8. Protein Estimation

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