

“Dissemination of Education for Knowledge, Science and Culture”
-
Shikshanmaharshi Dr. Bapuji Salunkhe

**Shri Swami Vivekanand Shikshan Sanstha’s
Vivekanand College, Kolhapur
(Empowered Autonomous)**



DEPARTMENT OF BIOTECHNOLOGY (ENTIRE)

**B.Sc. Part - II
Semester-III & IV**

**SYLLABUS
(As per NEP 2020)**

to be implemented from Academic Year 2024-2025

“Education for Knowledge Science and Culture”

- Dr Bapuji Salunkhe



VIVEKANAND COLLEGE

KOLHAPUR

(EMPOWERED AUTONOMOUS),

DEPARTMENT OF BIOTECHNOLOGY



Syllabus For

Bachelor of Science Part - II

BIOTECHNOLOGY (ENTIRE)

SEMESTER III AND IV - (AS PER NEP 2020)

(Syllabus to be implemented from June, 2024 onwards.)

NEP SYLLABUS

For Bachelor of Science Part - II BIOTECHNOLOGY (Entire)

1. TITLE: Biotechnology-Entire

2. YEAR OF IMPLEMENTATION:- NEP Syllabus will be implemented from June, 2024 onwards.

3. PREAMBLE:

This syllabus is framed to give sound knowledge with understanding of Biotechnology to undergraduate students at first year of three years of B.Sc. degree course. Students learn Biotechnology as a separate subject from B.Sc. II. The goal of the syllabus is to make the study of Biotechnology popular, interesting and encouraging to the students for higher Studies including research. The new and updated syllabus is based on a basic and applied approach with vigor and depth. At the same time precaution is taken to make the syllabus comparable to the syllabi of other universities and the needs of industries and research. The syllabus is prepared after discussion at length with number of faculty members of the subject and experts from industries and research fields. The units of the syllabus are well defined, taking into consideration the level and capacity of students.

4. GENERAL OBJECTIVES OF THE COURSE / PAPER:

- 1) To make the students knowledgeable with respect to the subject and it's practicable **Applicability.**
- 2) To promote understanding of basic and advanced concepts in Biotechnology.
- 3) To expose the students to various emerging areas of Biotechnology.
- 4) To prepare students for further studies, helping in their bright career in the subject.
- 5) To expose the students to different processes used in industries and in research field.
- 6) To prepare the students to accept the challenges in life sciences.
- 7) To develop skills required in various industries, research labs and in the field of human health.

5. DURATION

- **The course shall be three year full time course.**

6. PATTERN:-

Pattern of theory Examination will be Semester. Practical examination will be annual

7. MEDIUM OF INSTRUCTION:

The medium of instruction shall be English.

3) OTHER FEATURES:

(A) LIBRARY:

Reference and Text Books, Journals and Periodicals, Reference Books. – List Attached

(B) LABORATORY SAFETY EQUIPMENT:

- 1) Fire extinguisher
- 2) First aid kit
- 3) Fumigation chamber
- 4) Stabilized power supply
- 5) Insulated wiring for electric supply.
- 6) Good valves & regulators for gas supply.
- 7) Operational manuals for instruments.
- 8) Emergency exits.

❖ Guidelines shall be as per B. Sc. Regular Program.

❖ Rules and Regulations shall be as per B. Sc. Regular Program except

NEP B. Sc. II Structure of Program and List of

Courses. Preamble:

This syllabus is framed to give sound knowledge with understanding of Biotechnology to undergraduate students of B. Sc. Biotechnology Entire Program. Students learn Biotechnology as a separate course (Subject) from B. Sc. II.

❖ The goal of the syllabus is to make the study of Biotechnology popular, Interesting and encouraging students for higher studies including Research.

B.Sc-II Biotechnology (Entire) NEP Syllabus

Structure of Program and List of Courses are as follows:

B.Sc Part II NEP Biotechnology (Entire) (Sem III and IV)

SEMESTER - III					SEMESTER - IV				
Sr. No.	Course Abbr.	Course code	Course Name	Course Credits	Sr. No.	Course Abbr.	Course code	Course Name	Course Credits
1	DSC-V	DSC07BTE31	Molecular Biology-I	2	1	DSC-VII	DSC07BTE41	Molecular Biology -II	2
2	DSC-VI	DSC07BTE32	Metabolic Pathways - I	2	2	DSC-VIII	DSC07BTE42	Metabolic Pathways - II	2
3	MIN-V	MIN07BTE31	Microbial Genetics	2	3	MIN-VII	MIN07BTE41	Immunology	2
4	MIN-VI	MIN07BTE32	Environmental Microbiology	2	4	MIN-VIII	MIN07BTE42	Advances in Cell Biology	2
5	VSC PR-II	VSC07BTE39	Techniques in Microbial Genetics	2	5	VSC PR - III	VSC07BTE49	Basics in Forensic Sciences	2
6	AEC-III	AEC07ENG31	Communication Skills-I	2	6	AEC-IV	AEC07ENG41	Communication Skills-II	2
7	VEC-I	VEC07DEG31	Democracy, Election and Good Governance (DEGG)	2	7	VEC-III	VEC07EVS41	Environmental Studies	2
8	VEC-II	VEC07EVS31	Environmental Studies	2	8	CC	CC06	C0-Curricular Courses	2
9	DSC PR-III	DSC07BTE39	Techniques in Molecular Biology	4	9	DSC PR- IV	DSC07BTE49	Techniques in Metabolic Pathways	4
10	MIN PR-III	MIN07BTE39	Techniques in Environmental Microbiology	2	10	MIN PR-IV	MIN07BTE49	Techniques in Immunology	2

DSC-V - DSC07BTE31- Molecular Biology- I

Topic No.	Credit I	30
1.	<p>Experimental Evidences for DNA as a genetic material:- Griffith's Exp., Avery, Macleod, McCarty Exp., Blender Exp., RNA As a genetic material Gierer and Schram expt.</p> <p>Properties and Function of DNA:- T_m, Cot Curve, Purity of DNA, Acid- Base Nature, Buoyant Density Concept of Gene, Unit of Gene (Cistron, Recon, and Muton), Fine Structure of gene, One gene One Polypeptide Hypothesis, interrupted gene.</p> <p>Organization of genome:- Viral (Lambda, T4), Bacteria (<i>E. coli</i>), Eukaryote, Typical Structure of chromosome (Euchromatin & Heterochromatin), Packaging of DNA (Nucleosome, Solenoid Model).</p>	15
	Credit II	
2.	<p>Nucleic Acid biosynthesis:- De novo synthesis of Purine and Pyrimidine ring, Salvage Pathway, Feedback inhibition.</p> <p>DNA Replication- Semi conservative model of replication (M.S Expt.). Direction of replication (Uni & Bidirectional). Prokaryotic and eukaryotic replication- Enzymes involved in replication, initiation, elongation and termination. Rolling circle model and telomere replication.</p> <p>DNA Repair DNA repair- Direct repair, Excision repair (Nucleotide and Base), Mismatch repair, SOS repair, Recombination repair, Repair of double strand DNA break.</p>	15

References:

- 1) Molecular biology by Watson
- 2) Genetics by Strickberger
- 3) Molecular Biology by Glickpastornack
- 4) Molecular biolage Geralad Carph
- 5) Gene By Levin

DSC-VI : DSC07BTE32 - Metabolic Pathways- I

Topic No.	Credit- I	Lectures 30
1.	<p>Metabolism:- Introduction to metabolism, anabolism & catabolism, catabolism & its three stages, types of metabolic reactions, Methods employed to study metabolism (by cell free extract, using auxotrophic mutants, radioisotopes), High energy compounds enlist some examples 5 to 6.</p> <p>Carbohydrates Metabolism:- Reactions and energetics of Glycolysis, Gluconeogenesis, TCA cycle, Glyoxylate cycle, HMP and its significance.</p> <p>Shuttle system- Malate Aspartate shuttle system, Glycerol 3 Phosphate shuttle system. Cori Cycle</p>	15
	Credit-II	
2.	<p>Lipid Metabolism: Biosynthesis of fatty acid with respect to Palmitic acid & degradation of fatty acid (β-oxidation) with respect to Palmitic acid.</p> <p>Respiration:- Aerobic:-Flow of electrons in ETC, Redox potential components of ETC, Mechanism of ATP generation- Chemiosmotic hypothesis, ATP synthase complex. Inhibitors of ETC Anaerobic Respiration:- Alcoholic and Lactic acid fermentation.</p>	15

References:-

- 1) Biochemistry- Lubert Stryer
- 2) Biochemistry- Nelson and Cox
- 3) Practical Biochemistry- Wilson and Walker
- 4) Fundamentals of Biochemistry – J. L. Jain
- 5) Principals of Biochemistry- Voet and Voet
- 6) Fundamentals of Plant Physiology- V. K. Jain

MIN-V MIN07BTE31- Microbial Genetics		
Topic No.	Credit-I	Lectures 30
1	<p>Mendel's law of Inheritance – Mendel's Experiment, Dominance and recessiveness, Principle of segregation, independent assortment, back and test cross. Deviations of Mendel laws - Incomplete dominance, co-dominance, multiple alleles. Modifiers, suppressors, pleiotropic gene.</p> <p>Interaction of gene-Dominant and Recessive Epistasis.</p> <p>Linkage - Definition, coupling and repulsion hypothesis, linkage groups.</p> <p>Crossing over-Mechanism and theory.</p> <p>Structural and numerical changes in chromosomes.</p> <p>Extra chromosomal or cytoplasmic or organellar inheritance-mitochondrial and plastid.</p>	15
Credit II		
2.	<p>Mutation: Definition, Types (spontaneous and Induced) Mechanism of Mutagenesis- Base analogue, Nitrous acid, hydroxyl amine, alkylation agent, Acridine dyes, U.V. Light.</p> <p>Plasmid- Types, Structure, properties and applications.</p> <p>Genetic recombination in bacteria- Definition, fate of exogenote in recipient cell, transformation, conjugation, transduction.</p> <p>Genetics Disease: Autosomal and Sex Linked</p>	15

References:

1. Strickberger "Genetics"
2. Freifelder "Genetics"
5. Stanier "General Microbiology"
6. P. K. Gupta "Genetics"
7. C. Sarin "Genetics"
8. Larry Snyder Wendy Champness "Molecular Genetics of Bacteria"

Topic No.	MIN-VI : MIN07BTE32-Environmental Microbiology	Lectures 30
	Credit - I	
1	<p>Water Pollution -Definition, Sources and Types- Physical, Chemical and Biological, Hardness [Mechanism, Determination, Types], Water softening methods [Clark's method, Use of cation and anion exchange resins], COD and BOD [Concept, Determination], Eutrophication (Concept, Types and Control), Purification of water (Physical Methods-UV Treatment, Distillation, Chemical Methods-Chlorination, Ozonization)</p> <p>Air Pollution -Definition, Sources, London and LA Smog (Mechanisms of Formation), Greenhouse Effect (Concept, Reasons, Role of dipole moment of gaseous molecules), Ozone Depletion (Role of CFCs, Control)</p> <p>Soil Pollution -Definition, Sources, Role of pesticide in soil pollution, control Measures.</p> <p>Environmental Toxicology Definition, classification and concept, Pesticide Toxicity –Classification (Organic and Inorganic), Mode of action of toxicants (Metals, organophosphates, carbamates and mutagens), Bioconcentration, Bioaccumulation, Biomagnification, Control of Toxic effects- Biotransformation and excretion.</p>	15
	Credit II	
2	<p>Environmental Impact Assessment- Introduction, History, Process, salient features and Importance</p> <p>Bio Fuel production Production of Bio ethanol from sugary and starchy sources. Production ,Advantages and limitation of Biodiesel</p> <p>Bioremediation Techniques -Definition, Principle, <i>In situ and Exsitu</i> Bioremediation - Solid Waste Treatment [Plastics and Aromatics], Slurry Phase Treatment Bioremediation of waste waters (MSW, BSW and ISW), Activated Sludge Process, Lagoons, Oxidation ponds, Trickling filter. Agricultural Bioremediation- Microbial Composting, Biogas, Land Farming and pest Control, Bioremediation of Industrial wastes, Xenobiotics, Bioaugmentation and Biofiltration.</p>	15

References:-

1. Applied and environmental Microbiology; Amann, R.I Stromely, J. Stahl.
2. Environmental Biotechnology. , Chattergy.
3. Environmental Biology, Verma Agerwal
4. Environmental pollution, Peavy and Rowe.
5. Environmental problems and solution. and Environmental Science., Saigo

SEMESTER - IV

DSC-VII - DSC07BTE41- Molecular Biology-II

Topic No.	Credit-I	Lecture 30
1.	Transcription in prokaryote and Eukaryote Mechanism of transcription-Enzyme involved, initiation, elongation and termination. Inhibitors of transcription, Post transcriptional modification, Transcriptional control by hormones. Genetic Code Properties of genetic code. Assignment of codons with Unknown sequences a) Polyuridylic b) Acid Copolymers method. Assignment of codons with known sequences a) Binding technique b) Repetitive seq. technique. Wobble Hypothesis, Variation in genetic code.	15
2.	Translation in prokaryote and Eukaryote Structure and role of ribosome in translation, Amino acid t-RNA complex formation, Initiation, Elongation, termination of translation Inhibitors of translation. Post- translation modifications (Protein folding, Removal of Leader sequences, Phosphorylation, Glycosylation). Regulation of gene expression in prokaryote and eukaryote. Regulation of gene expression in prokaryote a) Lac operon b) Tryptophan operon c) Arabinose operon. Regulation of gene expression at transcriptional and translation level.	15

References:

- 1) Molecular biology by Watson
- 2) Genetics by Strickberger
- 3) Molecular Biology by Glickpastornack
- 4) Molecular biolage Geralad Carph
- 5) Gene by Levin
- 6) Genome by T.A. Brown

DSC-VIII - DSC07BTE42- Metabolic Pathways-II

Topic No.	Credit - I	Lectures 30
1.	<p>Plant Water Relation:- Introduction, Absorption of water-Mechanism, Theories (Active and Passive), Translocation of water- Mechanism, Theories (Root pressure, Capillary), Transpiration.</p> <p>Photosynthesis:-Ultra structure of chloroplast, Photosynthetic pigments, red drop and Emerson's enhancement effect, mechanism of photosynthesis, light reaction, dark reaction, C-3 pathway, C-4 pathway, CAM, photorespiration.</p>	15
2.	Credit-II	15
	<p>Nitrogen Metabolism: - Role of nitrogen in plants, source of nitrogen, nitrogen fixation- symbiotic & Non-symbiotic, Mechanism of Nitrogen fixation, nif gene- concept and significance, transamination.</p> <p>Introduction to Plant Hormones Biosynthesis of plant hormones- Auxin, Cytokinin, Gibberellin.</p> <p>Secondary metabolite: Introduction, Classification and its biological application</p> <p>Concept: Photoperiodism and Vernalisation.</p>	

References:-

- 1) Biochemistry- Lubert Stryer
- 2) Biochemistry- Nelson and Cox
- 3) Practical Biochemistry- Wilson and Walker
- 4) Fundamentals of Biochemistry – J. L. Jain
- 5) Principals of Biochemistry- Voet and Voet
- 6) Fundamentals of Plant Physiology- V. K.Jain

MIN-VII : MIN07BTE41-Immunology		
TopicNo.	Credit- I	Lectures 30
1.	<p>Introduction- Types of immunity-i)Innate (specific and non-specific) ii) Acquired (Active and Passive), Types of Defense- a) first line of defense (barriers at the portal of entry, physical and chemical barriers) b) second line of defense (Phagocytosis–oxygen dependent and independent) c) third line of defense-specific defense mechanism. Introduction to cells and organs of immune system- Organs of immune system-primary and secondary lymphoid organs- structure and their role. Cells of immune system-a) broad categories of leucocytes, their role and properties b) B-lymphocytes c) T-cells-subsets d) other cells (APC, Null, NK)</p>	15
Credit-II		
2.	<p>Antigen and Antibody Antigen- definition, nature, types of antigen, factors affecting antigenicity. Antibody- definition, nature, basic structure of immunoglobulin molecule, major human immunoglobulin classes, properties and functions. Theories of antibody production. Immune response- primary and secondary immune response, Antigen Antibody reactions- Principle and applications of a) agglutination b) Precipitation c) complement fixation d) ELISA. Hypersensitivity- Concept and types with example. (Type-I,II,III)</p>	15

References:

1. Riott “Essential Immunology”
2. Kuby “Immunology”
3. Ashim Chakravar “Immunology and Serology”
4. Tizzard “Immunology- An Introduction”-4th Edition
5. S. K. Gupta “Essentials of Immunology”
6. M. P. Arora “Immunology”

MIN-VIII : MIN07BTE42- Advances in Cell Biology		
Topic No	Credit-I	Lectures 30
1.	<p>Secretary pathway and protein trafficking Secretary pathway-ER associated ribosomal translation, co-translational vectoral transport of nascent polypeptide chain to ER lumen. Transport to Golgi apparatus, secretary granules. Transport of proteins to- mitochondria, chloroplast, peroxisomes, nucleus.</p> <p>Cell signaling Introduction, general principles of cell signaling. Types of cell signaling-contact dependent signaling, autocrine, paracrine, synaptic, endocrine, gap junctions, combinatorial signaling. Cell surface receptor proteins- Ion channel linked receptors, G-protein linked receptors and enzyme linked receptors. Signaling through G-protein coupled receptors.</p>	15
	Credit II	
2.	<p>Cell division cycle Introduction, definition, phases of cell cycle. Regulation of cell cycle- CDK and cyclins (G-CDK, S-CDK, M-CDK and APC). Cell cycle checkpoint-Start checkpoint, G2/M checkpoint, Metaphase to anaphase transition Programmed cell death. Cancer - types, characteristics of cancer cells, causes of cancer, tumor suppressor genes.</p> <p>Cell division Introduction and types of cell division-amitosis, mitosis and meiosis. Mitosis- history, phases in mitosis, significance. Meiosis -history, phases in meiosis, significance. Role of spindle fibers in chromosome separation. Condensation of chromosome. Synaptonemal complex.</p>	15

References:-

- 1) Molecular biology of cell-Albert
- 2) Molecular biology & cell biology – Lodish et al
- 3) Cell biology –De Robertis
- 4) Cell biology-Genetics, molecular biology-P.S. Warma & Agarwal
- 5) Genes- Lewin
- 6) Cell biology –Geral karp

7) Practical biochemistry – Keith Wilson and Walke

DSC PR-III: DSC07BTE39 Techniques in Molecular Biology	
Sr. No.	Name of the Practical
Major Experiments	
1	Eukaryotic DNA Isolation from Plant Material.
2	Eukaryotic DNA isolation from Animal Material.
3	Purification of DNA by silica membrane (solution based).
4	Plasmid isolation from Bacteria.
5	Isolation of RNA from plant.
6	SDS-PAGE for separation of protein using CCB.
Minor Experiments	
1	Genomic DNA isolation from bacteria.
2	Agarose gel electrophoresis to separate DNA.
3	Agarose gel electrophoresis to separate RNA.
4	Restriction digestion of DNA.
5	Silica Gel Extraction by spin column method.
6	Plasmid isolation by spin column method.

MIN PR-III: MIN07BTE39 Techniques in Environmental Microbiology	
Sr. No.	Name of the Practical
Major Experiments	
1	Estimation of COD of Industrial Effluent sample.
2	Estimation of BOD of domestic waste sample.
3	IMViC Test
4	Determination of total and permanent hardness of water sample.
Minor Experiments	
1	Determination of TDS of water sample.
2	Routine bacteriological analysis of water Presumptive, Confirmatory, Completed, MPN.
3	Isolation of microorganism from air by solid impaction technique.
4	Study of effect of heavy metal on growth of organisms.
5	Determination of total ash content of given sample.
6	Determination of moisture content of given soil sample.

Techniques in Microbial Genetics	
Sr. No.	Name of the Practical
Major Experiments	
1	Isolation of Lac negative mutants of E. coli by visual detection method.
2	Isolation of Streptomycin resistant mutants by gradient plate technique.
3	Conjugation in E. coli.
4	U.V survival curve.
Minor Experiments	
1	Problems based on Mendelian Inheritance, linkage and crossing over.
2	Testing of Carcinogenicity of substance by Ame's Test.

DSC PR - IV : DSCO7BTE49 Techniques in Metabolic Pathways	
Sr. No.	Name of the Practical
Major Experiments	
1	Estimation of fructose by Resorcinol method.
2	Estimation of DNA by Diphenylamine method.
3	Estimation of RNA by Orcinol Method.
4	Isolation of Amylase from germinating seed and determination of its activity.
5	Estimation of Total Phenolic Content of Plant Extract of by Folin - Ciocalteau Method
6	Determination of Km of Amylase.
Minor Experiments	
1	Effect of Activator on enzyme activity of amylase
2	Effect of Inhibitor on enzyme activity of amylase.
3	Study of nitrate reductase activity.
4	Estimation of Indole-3 Acetic Acid by (Salkowaski reagent) Colorimetric method.
5	Determination of Antioxidant activity of Plant extract by suitable method
6	Separation of Chlorophyll pigment by Silica Gel Column Chromatography.

MIN PR-IV: MIN07BTE49-Techniques in Immunology	
Sr. No.	Name of the Practical
Major Experiments	
1	ELISA-dot ELISA.
2	Rocket Immuno electrophoresis
3	Widal test – Quantitative.
4	Radial immune diffusion Assay
5	Serum Separation from Blood and salting out of IgG by Ammonium sulphate precipitation .
Minor Experiments	
1	Blood group detection
2	Immuno electrophoresis- (Qualitative).
3	Widal test – Qualitative
4	RPR card test.
5	ASO Test

List of minimum equipment's-for Biotechnology

- 1) *Hot air oven - 1*
- 2) *Incubator - 1*
- 3) *Autoclave - 1*
- 4) *Refrigerator - 1*
- 5) *Students microscopes (oil immersion) - 10 nos. for one batch*
- 6) *Digital balance - 2*
- 7) *pH meter - 1*
- 8) *Centrifuge - 1*
- 9) *Colorimeter - 1*
- 10) *Distilled Water Plant - 1*
- 11) *Laminar air flow cabinet - 1*
- 12) *Colony counter - 1*
- 13) *Water bath - 1*
- 14) *Arrangements for gas supply and fitting of two burners per table.*

- 15) *One working table of 6' x 2½' for two students.*
- 16) *One separate sterilization room attach to the laboratory (10' x 15')*
- 17) *At least one wash basin for a group of five students*
- 18) *One separate instrument room attached to lab (10' x 15')*
- 19) *One laboratory for one batch including working tables (6' x 2½') per two students for One batch*
- 20) *Store room (10' x 15')*

Practical Examination

(A) The practical examination will be conducted on two consecutive days for three hours per day per batch of the practical examination.

(B) Each candidate must produce a certificate from the Head of the Department in her/his college, stating that he/she has completed in a satisfactory manner the practical course online laid down from time to time by Academic Council on the recommendations of Board of Studies and that the journal has been properly maintained. Every candidate must have recorded his/her observations in the laboratory journal and have written a report on each exercise performed. Every journal is to be checked and signed periodically by a member of teaching staff and certified by the Head of the Department at the end of the year. Candidates must produce their journals at the time of practical examinations.

Note:- At least 90% Practical's should be covered in practical examination.

Nature of Question Paper (Theory)

Instructions

1. All the questions are compulsory.
2. Figures to the right indicates full marks.
3. Draw neat labeled diagram wherever necessary.

Time: 2 Hrs

Total Marks: 40

Q. 1. Rewrite the sentences by selecting correct alternative from the following. (8 Marks)

i.

a)

b)

c)

d)

As above (i) to (viii)

Q. 2. Attempt any two. (16 Marks)

i.

ii.

iii.

Q. 3. Attempt any four. (16 Marks)

i.

ii.

B.Sc-II Biotechnology (Entire) NEP Syllabus

- iii.
- iv.
- v.
- vi.

Scheme of marking (Theory)

Semester	Core Course	Marks	Evaluation	Standard of passing
III.	DSC - C	40	semester wise	40% (16 M)
IV	DSC - D	40	semester wise	40% (16 M)

Scheme of marking (CIE - Continuous Internal Evaluation)

Semester	Core Course	Marks	Evaluation	Standard of passing
III.	DSC - C	10	semester wise	40% (4 M)
IV	DSC - D	10	semester wise	40% (4 M)

Scheme of marking (practical)

Semester	Marks	Evaluation	Standard of passing
III & IV	Fr DSC Major subject 50 Marks	semester wise	20 (40%)
III & IV	Fr MIN Minor Subject 25 Marks	semester wise	10 (40%)

B.Sc-II Biotechnology (Entire) NEP Syllabus

Vivekanand College, Kolhapur (Empowered Autonomous)

Department of Biotechnology

Course outcome of B. Sc-II (Entire) Biotechnology

Subject wise both Semester-III and IV

Implemented as per NEP 2020

Subject Offered Semester-III	Course Outcome
DSC-V: DSC07BTE31- Molecular Biology I	At the end of this course students will be able to: CO 1. Explain structure and function of the macromolecules CO2. List the underlined mechanism of Nucleotide Biosynthesis CO3. Compare the mechanism of replication in prokaryotes and eukaryotes. CO 4. Discuss DNA damage and repair mechanism,
DSC-VI: DSC07BTE32 – Metabolic Pathways- I	At the end of this course students will be able to: CO 1. compare different biochemical reactions in cell CO 2. Explain different methods to study metabolism. CO 3. Conclude the stoichiometry of metabolic pathways. CO 4. To analyze the relation between ATP generation and Electron transport Chain.
MIN-V: MIN07BTE31- Microbial Genetics	At the end of this course students will be able to: CO 1. Outline of Mendelian inheritance. CO2. Demonstrate the chromosome structure, chromatin organization and variation using model. CO 3. Perceive knowledge about the genetic disease. CO 4. Predict and illustrate model of Pedigree analysis.
MIN-VI: MIN07BTE32 Environmental Microbiology	At the end of this course students will be able to: CO 1. Classify different kinds of pollution CO 2. Describe the concept of toxicity. CO 3. Describe sources of bioethanol production CO4. Discover the different ways of Bioremediation

Subject Offered Semester-IV	Course Outcome
DSC-VII : DSC07BTE41- Molecular Biology-II	At the end of this course students will be able to: CO 1. Compare the mechanism of Transcription & post-transcriptional modification in prokaryotes and eukaryotes CO 2. Outline the character of genetic code CO 3. Compare the mechanism of Translation & post-translational modification in prokaryotes and eukaryotes CO4. Draw a contrast between operon model and normal gene expression.
DSC-VIII : DSC07BTE42- Metabolic Pathways-II	At the end of this course students will be able to: CO 1. Explain mechanism of water absorption. CO 2. Illustrate concept of photosynthesis. CO 3. Differentiate between symbiotic and non symbiotic Nitrogen fixation. CO4. Predict the relationship between vernalization and photoperiodism.
MIN-VII : MIN07BTE41- Immunology	At the end of this course students will be able to: CO 1. Differentiate between different types of immunity. CO 2. Classify cells of immune system. CO 3. Construct models demonstrating antigen-antibody interaction. CO 4. Perform various serological tests for diagnosis of various types' diseases.
MIN-VIII : MIN07BTE42- Advances in Cell Biology	At the end of this course students will be able to: CO 1. Elaborate the mechanism of cell communication. CO 2. Roles of different organelle in protein trafficking. CO 3. Predict causes of Cancer CO 4. Understand the mechanism of cell division

