

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

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



DEPARTMENT OF BIOTECHNOLOGY OPTINAL

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

SYLLABUS

Under New Education Policy Phase II

To be implemented from Academic Year 2025-26

Vivekanand College, Kolhapur (Empowered Autonomous Institute)

Department of Biotechnology (Optional)

Departmental Teaching and Evaluation Scheme

Three/Four- Years UG Programme

Department/Subject Specific Core or Major (DSC)

(As per NEP-2020 Guidelines)

Second Year Semester-III & IV

Academic year 2025-26

Sr. No.	Course Abbr.	Course code	Course Name	Teaching Scheme Hours/week		Examination Scheme and Marks				Course Credits
				TH	PR	SEE	CIE	PR	Marks	
Semester-III										
Major										
1	DSC-V	2DSC03BIT31	Fundamentals of enzyme technology	2	-	40	10	-	50	2
2	DSC-VI	2DSC03BIT32	Fundamentals of Molecular Biology	2	-	40	10	-	50	2
3	VSC-PR-II	2VSC03BIT39	Serological techniques	-	4	-	-	25	25	2
4	DSC-PR-III	2DSC03BIT39	DSC Biotechnology Lab-3	-	8	-	-	50	50	4
Minor										
1	MIN-V	2MIN03BIT31	Basics of enzymology	2	-	40	10	-	50	2
2	MIN-VI	2MIN03BIT32	Basics of Molecular Biology	2	-	40	10	-	50	2
3	MIN-PR-III	2MIN03MIC39	MIN-Biotechnology Lab-3	-	4	-	-	25	25	2
Open Elective										
1	OEC LFS-PR-III	2OEC03LFS34	Basic Bioinformatics I	-	4	-	-	25	25	2
Semester –III Total				8	20	160	40	125	325	18
Semester-IV										
Major										
1	DSC-VII	2DSC03BIT41	Fundamentals of immune technology	2	-	40	10	-	50	2
2	DSC-VIII	2DSC03BIT 42	Fundamentals of Genetic engineering	2	-	40	10	-	50	2
3	VSC-PR-III	2VSC03BIT49	Techniques in Forensic Science	-	4	-	-	25	25	2
4	DSC-PR-IV	2DSC03BIT49	DSC Biotechnology Lab-4	-	8	-	-	50	50	4

Minor										
1	MIN-VII	2MIN03BIT41	Pharmaceutical biotechnology	2	-	40	10	-	50	2
2	MIN-VIII	2MIN03BIT42	Basic of Genetic engineering	2	-	40	10	-	50	2
3	MIN-PR-IV	2MIN03MIC49	MIN Biotechnology Lab-2	-	4	-	-	25	25	2
Open Elective										
1	OEC LFS-PR-IV	2OEC03LFS44	Basic Bioinformatics II	-	4	-	-	25	25	2
Semester –IV Total				8	20	160	40	125	325	18

Vivekanand College, Kolhapur (Empowered Autonomous Institute)
Department of Biotechnology (Optional)

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Department/Subject Specific Core or Major (DSC)
(As per NEP-2020 Guidelines)
Second Year Semester-III & IV

Academic year 2025-26

	Major SEMESTER III
	2DSC0BIT31- Fundamentals of enzyme technology
	CO1: Enzyme Technology deals with the study of the detailed structure and function and applications of enzymes for biological system. CO2: The course will allow understanding the following concepts; IUB classification Steady-state kinetics and regulation CO3: Students are able to understand enzyme kinetics and different determination methods of Km and Vmax CO4: Students are gaining knowledge regarding various methods in industries used for enzyme and cell immobilization and biosensors uses in medical , environmental pollution monitoring.
	2DSC0BIT32- Fundamentals of molecular biology
	CO1: Molecular Biology gives detailed knowledge chemical and molecular processes that occur in and between cells. CO2: Student will able to describe and explain processes and their meaning for the characteristics of living organisms. CO3: Students will gain insight into the most significant molecular and cell-based methods used today to expand our understanding of biology. CO4: After completion of this course students will understand following techniques; a) Gel Electrophoresis b) Blotting Techniques c) Polymerase Chain Reaction d) Genetic Engineering
	Minor
	2MIN03BIT31-BASICS OF ENZYMOLOGY
	CO1: Enzyme Technology deals with the study of the detailed structure & and function of Enzymes. CO2: The course will give the opportunity to understand the following concepts; IUB classification Steady-state kinetics CO3: Students are able to understand the effect of various factor on enzyme activity. CO4: Students are gaining knowledge regarding various methods in industries used for enzyme and cell immobilization.
	2MIN03 BIT32- Basics of molecular biology
	CO1: Molecular Biology gives knowledge about the structure and function of the macromolecules, essential to life. CO2: Students will describe and explain processes and their meaning for the characteristics of living organisms. CO3: Students will gain insight into the most significant molecular and cell-based

	<p>methods used today to expand our understanding of biology.</p> <p>CO4: After completion of this course students will understand following techniques; a) Gel Electrophoresis b) Blotting Techniques c) Polymerase Chain Reaction d) Genetic Engineering</p>
	Major SEMESTER IV
	2DSC03BIT41- Fundamentals of immune technology
	<p>CO1: The immune system governs defence against pathogens and is of importance for development of immunity against various diseases.</p> <p>CO2: The course discusses basic immunology including cellular and molecular processes that represent the human immune system.</p> <p>CO3: This subject offers a detailed study of the following concepts; a) Immunological processes at a cellular and molecular level b) Defence mechanism (Physico-chemical barriers) c) Innate and acquired Immunity Hypersensitivity</p> <p>CO4: Students can understand serological tests in pathological laboratories</p>
	2DSC03BIT42- Fundamentals of genetic engineering
	<p>CO1: In genetic engineering different enzymes are studied</p> <p>CO2: The course discusses different vectors and cDNA and genomic library are studies helps in various gene therapies.</p> <p>CO3: This subject offers a detailed study of different DNA sequencing methods and probe and blotting techniques were studied</p> <p>CO4: Students can understand PCR and Screening of transformed cells and applications of gene cloning as well as safety measures and biological risk for r-DNA work</p>
	Minor
	2MIN03BIT41- Pharmaceutical biotechnology
	<p>CO1: Students are eligible to study impact of biotechnology on pharma industry</p> <p>CO2: The course discusses different genetic manipulation method</p> <p>CO3: This subject offers a detailed study basic principles of biochemical engineering</p> <p>CO4: Students can understand application of fermentation technology in producing compounds of pharmaceutical interests</p>
	2MIN03BIT42- Basics of genetic engineering
	<p>CO1: In genetic engineering different enzymes are studied involved in r-DNA study</p> <p>CO2: The course discusses different vectors .applications of these vectors in rDNA technology.</p> <p>CO3: This subject offers a detailed study of different DNA sequencing methods and probe and blotting techniques were studied</p> <p>CO4: Students can understand PCR and Screening of transformed cells and applications of gene cloning as well as safety measures and biological risk for r-DNA work</p>

SEMESTER III

Vivekanand College, Kolhapur (Empowered Autonomous Institute)
B.Sc. II BIOTECHNOLOGY (OPTIONAL)

NEP 2.0 with effect from July 2025

SEMESTER III

2DSC03BIT31- Fundamentals of enzyme technology

CO1: Enzyme Technology deals with the study of the detailed structure and function and applications of enzymes for biological system.

CO2: The course will allow understanding the following concepts; IUB classification Steady-state kinetics and regulation

CO3: Students are able to understand enzyme kinetics and different determination methods of K_m and V_{max}

CO4: Students are gaining knowledge regarding various methods in industries used for enzyme and cell immobilization and biosensors uses in medical , environmental pollution monitoring.

Unit	Content	Credit
1	Basics of Enzyme 1. Introduction and definition and history 2. Enzyme classification –According to international Union of Biochemistry (IUB) and its feature 3. Active site of enzyme – Mechanism of action by Lock and key and Induced fit hypothesis 4. Concept of Coenzyme, Cofactor, Halo enzyme, Apo enzyme 5. Types of Enzymes (Intracellular, Extracellular) , (Inducible constitutive) Factors affecting enzyme activity-Temperature, pH, Enzyme concentration, Substrate concentration	08
2	2.1. Enzyme kinetics a. Concept of Activation energy b. Concept of steady state kinetics c. Michelis Menten equation d. Determination of K_m by Lineweaver Burk plot and Eadie Hofstee plot 2.2 Regulation of enzyme activity a. Inhibition – type i. Reversible inhibition – Competitive, Non- competitive Un-competitive ii. Irreversible Inhibition iii. Feedback inhibition	07
3	Types of enzyme 3.1 Allosteric enzyme – Mode of action by Symmetry and Sequential model 3.2 Ribozyme Structur. types and function 3.3 Isozyme- Example Lactate dehydrogenase structure and function other examples of Isozyme, Other clinically important Isoenzymes	07
4	Immobilization of enzyme and Biosensor a Advantages of immobilization of enzyme. b. disadvantages of immobilization of enzyme c. Application of immobilized enzyme d. Methods of immobilization--Physical adsorption, Covalent bonding, Entrapment, Encapsulation, Cross-linking 4.2. Biosensor- 1) Definition, Components, Features Types of Biosensor	

	2) Enzyme electrode(glucose oxidase)	
	3) Bacterial electrode / Cell based electrode	
	4)Enzyme immunosensor	

References

1. Fundamentals of Biochemistry by -J.L.Jain
2. Biotechnology – R.C. Duby
3. Enzyme technology- S. Shanmugam and T, Satishkumar
4. Bioinstrumentation – L. Veerakumari
5. Biochemistry – U. Sattyanarayan
6. Principles of biochemistry – Lehninger
7. Biochemistry – Lubert Stryer
8. Fundamentals of Enzymology- Price abd Stevens
9. Enzymes – Trevor Palmer
10. Enzymes Biotechnology- N. Gray .M. Calvin. SC Bhatia

2DSC03BIT32- Fundamentals of Molecular biology

CO1: Molecular Biology gives detailed knowledge chemical and molecular processes that occur in and between cells.

CO2: Student will able to describe and explain processes and their meaning for the characteristics of living organisms.

CO3: Students will gain insight into the most significant molecular and cell-based methods used today to expand our understanding of biology.

CO4: After completion of this course students will understand following techniques; a) Gel Electrophoresis b) Blotting Techniques c) Polymerase Chain Reaction d) Genetic Engineering

Unit	Content	Credit
1	1. Concept of Nucleic acid, components of nucleic acid, Nucleoside , Nucleotide, polynucleotide. 2. Structure of DNA by Watson and Crick Model and Forms of DNA Forces stabilizing structure of DNA 3.Forms of RNA their structure and functions (mRNA ,rRNA, tRNA) 4. DNA replication in prokaryotes – 1. Rolling circle model and 2. θ modeof replication 5. DNA replication in eukaryotes – Mechanism of replication andinhibitors of replication	08
2	Transcription a. Prokaryotic transcription – Initiation, elongation, termination b. Eukaryotic transcription - Initiation, elongation, termination c. post transcriptional modification d. Inhibitors of translation	07
3	Genetic code and its properties a. Translation in Prokaryotes – Initiation, elongation, termination b. Translation in Eukaryotes- Initiation , elongation, termination c. post translational modification d. Inhibitors of translation	08
4	Gene regulation and Expression in prokaryotes 1. Operon Model- Lactose operon Structure and role of Lac repressor and inducer. 2. DNA damage repair Mechanism and mutation 1. DNA damage by Physical , chemical and biological agent 2. DNA repair mechanism by 1.Photo reactivation 2.Excision Repair- Base excision and nucleotide excision repair 3. SOS repair system 3. Mutation –types 1. Spontaneous 2. Induced mutation	08

Reference

1. Molecular biology- Watson
2. Molecular biology- Glickpastornack
3. Molecular Biology- Geralad Carph
4. Genetics- Strickberger
5. Cell biology , Genetics, Molecular Biology Evolution and Ecology- S.Chand

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SEMESTER III

2VSC03 BIT39- SEROLOGICAL TECHNIQUES

SN	Content	Credit
1	Qualitative Widal- to study qualitative diagnosis of typhoid	
2	Quantitative Widal- to study quantitative diagnosis of typhoid	
3	Blood group detection by ABO blood group kit	
4	Radial immune diffusion (single diffusion assay)	
5	ELISA Study of antigen/ antibody by ELISA method	
6	RPR study of diseases by RPR method.	
7	Antibiotic sensitivity test	
8	Antibiotic assay by disc diffusion method.	
9	Screening of antibiotic producing bacteria.	
10	Comb's test	
11	ASO test	
12	Study of complement fixation test	
13	Rocket immunoelectrophoresis	

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SEMESTER III

2DSC03 BIT39 - DSC BIOTECHNOLOGY LAB -3

S.N.	Content	Credit
1	Introduction to Enzymology concepts	
2	Amylase assay	
3	Effect of temperature on amylase	
4	Effect of Activator on Invertase	
5	Effect of Inhibitor on Invertase	
6	Determination of nitrate reductase activity from plant material	
7	Separation of amino acid from mixture by thin layer chromatography	
8	Separation of macro and micro molecules by dialysis	
9	Estimation of fructose by Resorcinol method	
10	Effect of substrate concentration on enzyme activity	
	Techniques in molecular biology	
11	Isolation of genomic DNA from Bacteria	
12	Isolation of plasmid DNA from Bacteria	
13	Separation of plasmid DNA by gel electrophoresis	

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SEMESTER III

2MIN03BIT31-BASICS OF ENZYMOLOGY

CO1: Enzyme Technology deals with the study of the detailed structure & and function of Enzymes.

CO2: The course will give the opportunity to understand the following concepts; IUB classification

Steady-state kinetics

CO3: Students are able to understand the effect of various factor on enzyme activity.

CO4: Students are gaining knowledge regarding various methods in industries used for enzyme and cell immobilization.

Unit	Content	Credit
1	1.1Introduction and definition and history 1.2Enzyme classification – According to international Union of Biochemistry (IUB) and its feature 1.3Active site of enzyme – Mechanism of action by Lock and key and Induced fit hypothesis 1.4Concept of Coenzyme, Cofactor, Haloenzyme, Apoenzyme 1.5 Factors affecting enzyme activity- Temperature, pH, Enzyme concentration, Substrate concentration	08
2	Enzyme kinetics 2.1. Enzyme kinetics a. Concept of Activation energy b. Concept of steady state kinetics c. Michelis Menten equation d. Determination of Km byLineweaver Burk plot 2.2 Regulation of enzyme activity Types of inhibition	07
3	Types of enzyme 3.1. Allosteric enzyme Mode of action by Symmetry and Sequential model 3.2 Ribozyme Structure and function 3.3Isozyme- Example Lactate dehydrogenase structure and functionOther examples of Isoenzyme	08
4	Immobilization of enzyme 1. Advantage and disadvantages of immobilization of enzyme 2. Application of immobilized enzyme 3. Methods of immobilization--Physical adsorption , Covalent bonding, Entrapment, Encapsulation, Cross-linking	07

References

1. Principles of biochemistry – Lehninger
2. Biochemistry – Lubert Stryer
3. Fundamentals of Enzymology- Price abd Stevens
4. Enzymes – Trevor Palmer
5. 5. Enzymes Biotechnology- N. Gray .M. Calvin. SC Bhatia

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SEMESTER III

2MIN03 BIT32- Basics of Molecular biology

CO1: Molecular Biology gives knowledge about the structure and function of the macromolecules, essential to life.

CO2: Students will gain an understanding of chemical and molecular processes that occur in and between cells. Students understanding will become such that they will be able to describe and explain processes and their meaning for the characteristics of living organisms.

CO3: Students will gain insight into the most significant molecular and cell-based methods used today to expand our understanding of biology.

CO4: After completion of this course students will understand following techniques; a)

Gel Electrophoresis b) Blotting Techniques c) Polymerase Chain Reaction d) Genetic

Engineering

Unit	Content	Credit
1	1.1DNA replication in prokaryotes – Rolling circle model and θ mode of replication 1.2DNA replication in eukaryotes – Mechanism of replication	08
2	1.Genetic Code and its properties 2.Transcription Prokaryotic transcription – Initiation, elongation, termination Eukaryotic transcription - Initiation, elongation, termination	07
3	Translation Translation in Prokaryotes – Initiation, elongation, termination Translation in Eukaryotes- Initiation, elongation, termination	08
4	DNA damage and mutation 1. Introduction to mutation, mutagenesis 2. Types of mutation (Spontaneous and induced mutation, frame shift mutation) 3. Physical and chemical mutagens	07

Reference

1.Molecular biology- Watson

2.Molecular biology- Glickpastornack

3.Molecular Biology- Gerald Carph

4Genetics- Strickberger

5.Cell biology, Genetics, Molecular Biology Evolution and Ecology- S.Chand

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SEMESTER III

2MIN03BIT39- MIN BIOTECHNOLOGY LAB -3

SN	Name of Practical	Credit
	Techniques in Enzymology and Biochemical analysis	
1.	Introduction to Enzymology concepts	
2.	Amylase assay	
3	Effect of temperature on amylase	
4	Effect of Activator on Invertase	
5	Effect of Inhibitor on Invertase	
6	Determination of nitrate reductase activity from plant material	
7	Separation of amino acid from mixture by thin layer chromatography	
8	Separation of macro and micro molecules by dialysis	
9	Estimation of fructose by Resorcinol method	
10	Effect of substrate concentration on enzyme activity	
	Techniques in molecular biology	
11.	Isolation of genomic DNA from Bacteria	
12.	Isolation of plasmid DNA from Bacteria	
13	Separation of plasmid DNA by gel electrophoresis	

Vivekanand College, Kolhapur (Empowered Autonomous Institute)

B.Sc.II BIOTECHNOLOGY (OPTIONAL)

NEP 2.0 SYLLABUS with effect from July 2025

SEMESTER III

S.N.	Content	Credit
1	Use of Internet in Bioinformatics.	
2	Use of Computer in Bioinformatics.	
3	Browsing and understanding of NCBI Webpage	
4	Introduction of Literature database - PubMed	
5	Exploring Nucleic acid database. And its type	
6	Exploring Nucleic acid database from bacterial cell source	
7	Exploring Nucleic acid database from yeast cell source	
8	Exploring Nucleic acid database from plant cell.	
9	Exploring Protein Structural Database	
10	PUBMED and PUBMED Central Database	
11	Exploring Protein Structural Database RASMOL PART -1	
12	Exploring Protein Structural Database RASMOL PART -1	

SEMESTER IV

Vivekanand College, Kolhapur (Empowered Autonomous Institute)
B.Sc.II BIOTECHNOLOGY (OPTIONAL)
Nep 2.0 syllabus with effect from July 2025

SEMESTER IV

2DSC03BIT41- Fundamentals of immune technology

CO1: The immune system governs defence against pathogens and is of importance for development of immunity against various diseases.

CO2: The course discusses basic immunology including cellular and molecular processes that represent the human immune system.

CO3: This subject offers a detailed study of the following concepts; a) Immunological processes at a cellular and molecular level b) Defence mechanism (Physico-chemical barriers) c) Innate and acquired Immunity Hypersensitivity

CO4: Students can understand serological tests in pathological laboratories.

Unit	Content	Credit
1	Unit -1 Immunology 1.1Immunity- introduction 1.2. Types of immunity a. Innate immunity- Types, Factors influencing innate immunity b. Acquired Immunity- Active and Passive 1.3. Nonspecific- a. First line of defense- (Physico-chemical- barriers) b. Second line defense- (Phagocytes and mechanism of phagocytosis) B. Specific defense mechanism - Third line of defense	08
2	Unit -2 Organs of immune system 2.1 Organs of immune system- Structure and role of primary lymphoid organs &secondary lymphoid organs 2.2 Cell of immune system – monocytes and macrophages, granulocytes Mast cells,dendritic cells, NK cells, B and T lymphocytes	07
3	Unit -3 Antigen and Antibodies 3.1Antigen- definition, chemical nature, types of antigen, factors affectingantigenicity. 3.2Antibodies- definition, chemical nature, basic structure of immunoglobulin,properties and function of major human immunoglobulin classes, theories of antibody production 3.3Immune response- Primary and secondary immune response	08
4	Unit -4Antigen-antibody reaction - 4.1 Principle, mechanism, application of a. agglutination b. Precipitation c. Complement fixation d. ELISA(Sandwich) 4.2Introduction to some disease causing pathogens-Enteric fever- <i>Salmonella typhi</i> Urinary tract infection-(UTI)- <i>Escheria coli</i> , <i>Pseudomonas aerogenosa</i>	07

References

1. Essential immunology – Riott
2. Immunology - Kuby
3. General Microbiology- Stainer
4. Immunology an introduction – Tizzard 4th edition
5. Medical Bacteriology – Dey and Dey

SEMESTER IV

2DSC03BIT42- Fundamentals of genetic engineering

CO1: In genetic engineering different enzymes are studied

CO2: The course discusses different vectors and cDNA and genomic library are studies helps in various gene therapies.

CO3: This subject offers a detailed study of different DNA sequencing methods and probe and blotting techniques were studied

CO4: Students can understand PCR and Screening of transformed cells and applications of gene cloning as well as safety measures and biological risk for r-DNA work

Unit	Content	Credit
1	Introduction to Genetic engineering a. Nucleases - types and uses 1.1 Restriction enzymes- Types- I,II III Recognition sequences, cleavage patterns 1.2 Enzymes to modify ends of DNA- Alkaline phosphatase , S1 nuclease, DNA ligase, terminal transferase Adaptors , Linkers	08
2	2.1 Cloning Vectors- Plasmids (pBR322, pUC 18) Bacteriophages (λ phage) cosmids,phagemids (pEMBL8), Animal vectors, plant vectors (Ti and Ri) , Shuttle vectors (YAC and BAC) 2.2 Construction of c-DNA library, genomic DNA library	07
3	3.1 DNA sequencing techniques- a. Maxam Gilbert method b. Sanger and Nicolson method c. Automated sequencer 3.2 Probes-Preparation, Labeling, and Applications 3.3 Blotting techniques- a. Southern Blotting b. Northern Blotting c. Western Blotting	08
4	4.1 PCR- Concept types (Reverse Transcriptase- PCR, Real time PCR, Nested PCR,Hot start PCR, Multiple PCR, Colony PCR) application 4.2 Screening of transformed cells- Colony hybridization, immunological screening,blue -white screening. insertional inactivation 4.3 Applications of gene cloning 1. Production of r- Insulin 4.4 Safety measures and biological risk for r-DNA work- Hazards in genetic engineering	07

Reference :

1. Biotechnology – U.Styanarayanan
2. Biotechnology – R.C. Dubey
3. Gene Biotechnology – S.N. Jogdan
4. Fundamentals of Biotechnology- H.S. Chawala
5. Introduction to Biotechnology – B.D. Singh
6. Principle of gene manipulation – Old and primrose

Vivekanand College, Kolhapur (Empowered Autonomous Institute)

B.Sc.II BIOTECHNOLOGY (OPTIONAL)

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SEMESTER IV

2VSC03 BIT49- Techniques in Forensic Science

SN	Content	Credit
1	Demonstration of flow cytometer	
2	Alcohol estimation by specific gravity method	
3	Demonstration of HPLC	
4	Demonstration of GLC.	
5	Demonstration PCR	
6	Demonstration of karyotyping	
7	Demonstration of finger printing technique	
8	Blood type analysis.	
9	Fiber type analysis	
10	Southern blotting	
11	Demonstration of electron spectroscopy	

Vivekanand College, Kolhapur (Empowered Autonomous Institute)

B.Sc.II BIOTECHNOLOGY (OPTIONAL)

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SEMESTER IV

2DSC03 BIT49- DSC BIOTECHNOLOGY LAB 4

S.N.	Content	Credit
	Technique in r-DNA technology and immunology	
1	Restriction digestion of DNA	
2	Ligation of DNA	
3	DNA sequencing analysis by Autoradiogram	
4	Demonstration of DNA amplification by PCR	
5	Dot ELISA	
6	Quantitative Widal test	
7	Radial immuno diffusion assay	
8	Rapid plasma Reagan test	
9	Measurement of Cell micrometry	
10	Isolation and cultivation of pathogens causing Enteric fever to study its morphological and culture characters	
11	Demonstration of southern blotting	
12	Demonstration of Northern blotting	

SEMESTER IV

2 MIN03BIT41- Pharmaceutical biotechnology

CO1: Students are eligible to study impact of biotechnology on pharma industry

CO2: The course discusses different genetic manipulation method

CO3: This subject offers a detailed study basic principles of biochemical engineering

CO4: Students can understand application of fermentation technology in producing compounds of pharmaceutical interests

Unit	Content	Credit
1	Biotechnology in the Pharmaceutical Industry (Prebiotechnology products, impact of biotechnology, post biotechnology products: biologics and biopharmaceuticals)	08
2	Genetic manipulation methods: Genetic manipulation in bacterial, plant and animal cells: Natural recombination in bacterial cells, Principles of Recombinant DNA Technology; Vectors and types, expression systems, molecular biology methods to study recombinant biomolecules	07
3	Basic principles of biochemical engineering: Isolation, screening and maintenance of industrially important microbes; strain improvement for increased yield and other desirable characteristics	08
4	Application of fermentation technology in producing compounds of pharmaceutical interests: Therapeutic proteins, Vitamins, Amino acids, Monoclonal Antibodies	07

Reference:

Pharmaceutical Biotechnology-Rehan Uddin. Mukesh kumar Pathak

Pharmaceutical Biotechnology- Chandrakant Kokare

A text book of Pharmaceutical Biotechnology- Dr. U. Sai Jyoti

SEMESTER IV
2MIN03BIT42- Basics of genetic engineering

CO1: In genetic engineering different enzymes are studied

CO2: The course discusses different vectors .

CO3: This subject offers a detailed study of different DNA sequencing methods and probe and blotting techniques were studied

CO4: Students can understand PCR and Screening of transformed cells and applications of gene cloning as well as safety measures and biological risk for r-DNA work

Unit	Content	Credit
1	Introduction to Genetic engineering a. Nucleases – types and uses Restriction enzymes- Types- I,II III Recognition sequences, cleavage patterns Enzymes to modify ends of DNA- Alkaline phosphatase , S1 nuclease, DNA ligase, terminal transferase Adaptors , Linkers	08
2	Cloning Vectors- Plasmids (pBR322, pUC 18) Bacteriophages (λ phage) cosmids, phagemids (pEMBL8), Animal vectors, plant vectors (Ti and Ri) , Shuttle vectors (YAC and BAC)	07
3	DNA sequencing techniques- a. Maxam Gilbert method b. Sanger's method c. Automated sequencer Probes-Preparation, Labeling, and Applications Blotting techniques- a. Southern Blotting b. Northern Blotting c. Western Blotting	08
4	PCR- Concept types (Reverse Transcriptase- PCR, Real time PCR, Nested PCR, Hot start PCR, Multiple PCR, Colony PCR) application Screening of transformed cells- Colony hybridization, immunological screening, blue -white screening, insertional inactivation Safety measures and biological risk for r-DNA work- Hazards in genetic engineering.	07

- Reference :
1. Biotechnology – U.Styanarayana
 2. Biotechnology – R.C. Dubey
 3. Biotechnology – U.Styanarayanan
 4. Gene Biotechnology – S.N. Jogdan
 5. Fundamentals of Biotechnology- H.S. Chawala
 6. Introduction to Biotechnology – B.D. Singh
 7. Principle of gene manipulation – Old and primrose

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SEMESTER IV
2MIN03 BIT49- MIN BIOTECHNOLOGY LAB 4

S.N.	Content	Credit
	Technique in r-DNA technology and immunology	
1	Restriction digestion of DNA	
2	Ligation of DNA	
3	DNA sequencing analysis by Autoradiogram	
4	Demonstration of DNA amplification by PCR	
5	Dot ELISA	
6	Quantitative Widal test	
7	Radial immuno diffusion assay	
8	Rapid plasma Reagen test	
9	Measurement of Cell micrometry	
10	Isolation and cultivation of pathogens causing Enteric fever to study its morphological and culture characters	
11	Demonstration of southern blotting	
12	Demonstration of Northern blotting	
13	Demonstration of Western blotting	

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SEMESTER IV

S.N.	Content	Credit
1	Study Of human Genome Project.	
2	Protein Structure exploring database – Protein data bank (PDB).	
3	Use of RASMOL to 3 dimensional structure of protein.	
4	Getting Gene sequence from primary DNA sequence.	
5	Getting the Protein sequence from Protein database.	
6	Phylogenetic Tree using Clustal W	
7	Pair wise and Multiple sequence alignment	
8	Basic Biopython modules for handling sequence and structure data.	
9	In silico drug sequencing	
10	Homology modeling and validation	
11	Pharmacomodeling	
12	Molecular docking- protein modelling	

VIVEKANAND COLLEGE, KOLHAPUR
(EMPOWERED AUTONOMOUS INSTITUTE)

B.Sc. Part- II(Biotechnology Optional) (Semester-III /IV) Examination.....

Paper name and Number

Day:

Date: --/--/----

Time: 2 hours

Marks : 40

Instructions:

- 1) All the questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Draw neat labeled diagrams wherever necessary.

Q. 1. Select correct alternative (One mark each):

[8]

- | | | | |
|-------------|----------|----------|----------|
| i) ----- | | | |
| a) ----- | b) ----- | c) ----- | d) ----- |
| ii) ----- | | | |
| a) ----- | b) ----- | c) ----- | d) ----- |
| iii) ----- | | | |
| a) ----- | b) ----- | c) ----- | d) ----- |
| iv) ----- | | | |
| a) ----- | b) ----- | c) ----- | d) ----- |
| v) ----- | | | |
| a) ----- | b) ----- | c) ----- | d) ----- |
| vi) ----- | | | |
| a) ----- | b) ----- | c) ----- | d) ----- |
| vii) ----- | | | |
| a) ----- | b) ----- | c) ----- | d) ----- |
| viii) ----- | | | |
| a) ----- | b) ----- | c) ----- | d) ----- |

Q.2. Attempt any TWO (Eight marks each) :

[16]

- i)
- ii)
- iii)

Q.3. Attempt any FOUR (Four marks each):

[16]

- i)
- ii)
- iii)
- iv)
- v)
- vi)

VIVEKANAND COLLEGE, KOLHAPUR
(EMPOWERED AUTONOMOUS INSTITUTE)

PRACTICAL EXAMINATION PAPER NATURE (DSC)

Semester

1. Major Experiment	20
2. Minor Experiment	10
3. Spotting	10
4. Viva-voce	10
Total marks	50

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VIVEKANAND COLLEGE, KOLHAPUR
(EMPOWERED AUTONOMOUS)
PRACTICAL EXAMINATION PAPER NATURE VSC

Course	Experimental work	Journal assessment	Seminar/ Mini Project	Total Marks
VSC	20	05	-	25