

**"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

To be implemented from Academic Year 2024-25



Vivekanand College, Kolhapur (Empowered Autonomous)

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

Sr. No.	Course Abbr.	Course code	Course Name	Teaching Scheme Hours/week		Examination Scheme and Marks				Course Credits
				TH	PR	ESE	CIE	PR	Marks	
Semester-III										
1	DSC-V	DSC03BIT31	Fundamentals of enzyme technology	2	-	40	10	-	50	2
2	DSC-VI	DSC03BIT32	Fundamentals of Molecular Biology	2	-	40	10	-	50	2
3	MIN-V	MIN03BIT31	Basics of enzymology	2	-	40	10	-	50	2
4	MIN-VI	MIN03BIT32	Basics of Molecular Biology	2	-	40	10	-	50	2
5	VSC-PR-II	VSC03BIT39	Serological techniques	-	4	-	-	25	25	2
6	DSC-PR-III	DSC03BIT39	DSC- Biotechnology Lab-3	-	8	-	-	50	50	4
7	MIN-PR-III	MIN03BIT39	MIN-Biotechnology Lab-3	-	4	-	-	25	25	2
Semester -III Total				8	16	160	40	100	300	16
Semester-IV										
1	DSC-VII	DSC03BIT41	Fundamentals of immune technology	2	-	40	10	-	50	2
2	DSC-VIII	DSC03BIT 42	Fundamentals of Genetic engineering	2	-	40	10	-	50	2
3	MIN-VII	MIN03BIT41	Pharmaceutical biotechnology	2	-	40	10	-	50	2
4	MIN-VIII	MIN03BIT42	Basic of Genetic engineering	2	-	40	10	-	50	2
5	VSC-PR-III	VSC03BIT49	Techniques in Forensic Science	-	4	-	-	25	25	2
6	DSC-PR-IV	DSC03BIT49	DSC Biotechnology Lab-4	-	8	-	-	50	50	4
7	MIN-PR-IV	MIN03BIT49	MIN Biotechnology Lab-4	-	4	-	-	25	25	2
Semester -IV Total				8	16	160	40	100	300	16



Vivekanand College, Kolhapur (Empowered Autonomous)

B.Sc.II BIOTECHNOLOGY (OPTIONAL)

CBCS syllabus with effect from July 2024
Course outcome for major minor and open elective

	DSC0BIT31- Fundamentals of enzyme technology
	CO1: Enzyme Technology deals with the study of the detailed structure & and function of Enzymes. Understand use of biosensors in daily life. 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.
	DSC0BIT32- Fundamentals of molecular biology
	CO1: Molecular Biology gives knowledge about the structure and function of the macromolecules, essential to life. Molecular Biology gives detailed knowledge of biological and/or medicinal processes through the investigation of the underlying molecular mechanisms. 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 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
	MIN03BIT31-BASICS OF ENZYMOLOGY
	CO1: Enzyme Technology deals with the study of the detailed structure & and function of Enzymes. Understand use of biosensors in daily life. 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.
	MIN03 BIT32- Basics of molecular biology
	CO1: Molecular Biology gives knowledge about the structure and function of the macromolecules, essential to life. Molecular Biology gives detailed knowledge of biological and/or medicinal processes through the investigation of the underlying molecular mechanisms. 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 able to



	<p>describe and explain processes and their meaning for the characteristics of living organisms.</p> <p>CO3: Students will gain insight into the most significant molecular and cell-based 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>
	DSC03BIT41- Fundamentals of immune technology
	<p>CO1: The immune system governs defence against pathogens and is of importance for the development of autoimmune diseases, allergy and cancer.</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>
	DSC03BIT42- 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 studied</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>
	MIN03BIT41- 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>
	MIN03BIT42- Basics of genetic engineering
	<p>CO1: In genetic engineering different enzymes are studied</p> <p>CO2: The course discusses different vectors .</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>



Vivekanand College, Kolhapur (Empowered Autonomous)

B.Sc.II BIOTECHNOLOGY (OPTIONAL)

CBCS syllabus with effect from July 2024
SEMESTER III

DSC0BIT31- Fundamentals of enzyme technology

CO1: Enzyme Technology deals with the study of the detailed structure & and function of Enzymes. Understand use of biosensors in daily life.

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	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) 6. 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 Km 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
4	Types of enzyme 3.1 Allosteric enzyme – Mode of action by Symmetry and Sequential model 3.2 Ribozyme Structure and function 3.3 Isozyme- Example Lactate dehydrogenase structure and function other examples of Isozyme, Other clinically important Isoenzymes	07

5



4	<p>Immobilization of enzyme and Biosensor</p> <p>a Advantages of immobilization of enzyme</p> <p>b. disadvantages of immobilization of enzyme</p> <p>c. Application of immobilized enzyme</p> <p>d. Methods of immobilization--Physical adsorption, Covalent bonding, Entrapment, Encapsulation, Cross-linking</p> <p>4.2. Biosensor-</p> <p>1) Definition, Components, Features Types of Biosensor</p> <p>2) Enzyme electrode(glucose oxidase)</p> <p>3) Bacterial electrode / Cell based electrode</p> <p>4) Enzyme immunosensor</p>	08
---	--	----

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



Vivekanand College, Kolhapur (Empowered Autonomous)

B.Sc.II BIOTECHNOLOGY (OPTIONAL)

CBCS syllabus with effect from July 2024
SEMESTER III

DSC0BIT32- Fundamentals of Molecular biology

CO1: Molecular Biology gives knowledge about the structure and function of the macromolecules, essential to life. Molecular Biology gives detailed knowledge of biological and/or medicinal processes through the investigation of the underlying molecular mechanisms.

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 Concept of Nucleic acid, components of nucleic acid .2 Nucleoside , Nucleotide, polynucleotide .3 Structure of DNA by Watson and Crick .4 Forms of DNA .5 Forms of RNA(mRNA ,rRNA,tRNA) .6 Forces stabilizing structure of DNA .7 DNA replication in prokaryotes - 1. Rolling circle model and 2. θ mode of replication .8 DNA replication in eukaryotes - Mechanism of replication and inhibitors of replication	07
2	.1 Genetic Code and its properties 2.2 Transcription a. Prokaryotic transcription - Initiation, elongation, termination b. Eukaryotic transcription - Initiation, elongation, termination and c. post transcriptional modification d. Inhibitors of transcription	08
3	Translation a. Translation in Prokaryotes - Initiation, elongation, termination b. Translation in Eukaryotes- Initiation , elongation, termination c. post translational modification	07

7



	d. Inhibitors of translation	
4	<p>Gene regulation and Expression in prokaryotes</p> <p>4.1 Operon Model- Lactose operon</p> <p>Structure and role of Lac repressor and inducer.</p> <p>4.2 DNA damage mutation and repair Mechanism-</p> <p>I. DNA damage by Physical, chemical and biological agent</p> <p>II. DNA repair mechanism by</p> <p>1. Photo reactivation</p> <p>2. Excision Repair- Base excision and nucleotide excision repair</p> <p>3. SOS repair system</p> <p>III. Mutation - types of Mutation</p> <p>1) Spontaneous Mutation - Origin of spontaneous mutation</p> <p>I) Substitution II) Spontaneous Deamination</p> <p>IV) Frameshift Mutation</p> <p>2) Induced Mutation - Chemical Mutagens</p> <p>a. Base Analogues</p> <p>b. Chemicals changing the specificity of hydrogen bonding</p> <p>c. Alkylating agents</p> <p>d. Intercalating Agents</p> <p>V. Expression of Mutation - I) Reversion II) Suppression</p>	08

Reference

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



Vivekanand College, Kolhapur (Empowered Autonomous)

B.Sc.II BIOTECHNOLOGY (OPTIONAL)

CBCS syllabus with effect from July 2024
SEMESTER III

MIN03BIT31-BASICS OF ENZYMOLOGY

CO1: Enzyme Technology deals with the study of the detailed structure & and function of Enzymes. Understand use of biosensors in daily life.

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	Unit 1 Basics of Enzyme 1.1 Introduction and definition and history 1.2 Enzyme classification - According to international Union of Biochemistry (IUB) and its feature 1.3 Active site of enzyme – Mechanism of action by Lock and key and Induced fit hypothesis 1.4 Concept of Coenzyme, Cofactor, Haloenzyme, Apoenzyme 1.5 Factors affecting enzyme activity- Temperature, pH, Enzyme concentration, Substrate concentration	08
2	Unit 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 by Lineweaver Burk plot 2.2 Regulation of enzyme activity Types of inhibition	07
3	Unit 3-Types of enzyme 3.1. Allosteric enzyme Mode of action by Symmetry and Sequential model 3.2 Ribozyme Structure and function 3.3 Isozyme- Example Lactate dehydrogenase structure and function Other examples of Isoenzyme	08
4	Unit 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. 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



Vivekanand College, Kolhapur (Empowered Autonomous)
B.Sc.II BIOTECHNOLOGY (OPTIONAL)
CBCS syllabus with effect from July 2024
SEMESTER III

MIN03 BIT32- Basics of Molecular biology

CO1: Molecular Biology gives knowledge about the structure and function of the macromolecules, essential to life. Molecular Biology gives detailed knowledge of biological and/or medicinal processes through the investigation of the underlying molecular mechanisms.

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	1.1 DNA replication in prokaryotes – Rolling circle model and θ mode of replication 1.2 DNA replication in eukaryotes – Mechanism of replication	08
2	1. Genetic Code and its properties 2. Transcription a. Prokaryotic transcription – Initiation, elongation, termination b. Eukaryotic transcription - Initiation, elongation, termination	07
3	Translation a. Translation in Prokaryotes – Initiation, elongation, termination b. 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
4. Genetics- Strickberger
5. Cell biology, Genetics, Molecular Biology Evolution and Ecology- S.Chand



Vivekanand College, Kolhapur (Empowered Autonomous)
B.Sc.II BIOTECHNOLOGY (OPTIONAL)
CBCS syllabus with effect from July 2024
SEMESTER III

VSC03 BIT39- SEROLOGICAL TECHNIQUES

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



Vivekanand College, Kolhapur (Empowered Autonomous)
 B.Sc.II BIOTECHNOLOGY (OPTIONAL)
 CBCS syllabus with effect from July 2024
 SEMESTER III

DSC03 BIT39 - DSC BIOTECHNOLOGY LAB -3

	Name of Practical	Credits
	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)

B.Sc.II BIOTECHNOLOGY (OPTIONAL)

CBCS syllabus with effect from July 2024

SEMESTER III

MIN03BIT39- MIN BIOTECHNOLOGY LAB -3

	Name of Practical	Credits
	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)

B.Sc.II BIOTECHNOLOGY (OPTIONAL)

CBCS syllabus with effect from July 2024

SEMESTER IV

DSC03BIT41- Fundamentals of immune technology

CO1: The immune system governs defence against pathogens and is of importance for the development of autoimmune diseases, allergy and cancer.

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 affecting antigenicity. 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 - Principle, mechanism, application of a. agglutination b. Precipitation c. Complement fixation d. ELISA(Sandwich)	4.1 07



	4.2 Introduction to some disease causing pathogens-Enteric fever- <i>Salmonella typhi</i> Urinary tract infection-(UTI)- <i>Escheria coli</i> , <i>Pseudomonas aerogenosa</i>	
--	--	--

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
6. Immunology and serology- Ashim Charkravar
7. Immunology - Nandini Shetty



SEMESTER IV

DSC03BIT42- Fundamentals of genetic engineering

CO1: In genetic engineering different enzymes are studied

CO2: The course discusses different vectors and cDNA and genomic library are studied

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	<p>Introduction to Genetic engineering a. Nucleases - types and uses</p> <p>1.1 Restriction enzymes- Types- I,II III Recognition sequences, cleavage patterns</p> <p>1.2 Enzymes to modify ends of DNA- Alkaline phosphatase, S1 nuclease, DNA ligase, terminal transferase Adaptors, Linkers</p>	08
2	<p>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)</p> <p>2.2 Construction of c-DNA library, genomic DNA library</p>	07
3	<p>3.1 DNA sequencing techniques- a. Maxam Gilbert method b. Sanger and Nicolson method c. Automated sequencer</p> <p>3.2 Probes-Preparation, Labeling, and Applications</p> <p>3.3 Blotting techniques- a. Southern Blotting b. Northern Blotting c. Western Blotting</p>	08
4	<p>4.1 PCR- Concept types (Reverse Transcriptase- PCR, Real time PCR, Nested PCR, Hot start PCR, Multiple PCR, Colony PCR) application</p> <p>4.2 Screening of transformed cells- Colony hybridization, immunological screening, blue -white screening. insertional inactivation</p> <p>4.3 Applications of gene cloning 1. Production of r- Insulin 2. Production of r- Somatostatin 4.4 Safety measures and biological risk for r-DNA work- Hazards in genetic engineering</p>	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)

B.Sc.II BIOTECHNOLOGY (OPTIONAL)

CBCS syllabus with effect from July 2024

SEMESTER IV

MIN03BIT41- Pharmaceutical biotechnology

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

CO2: The course discusses different genetic manipulation methods

CO3: This subject offers a detailed study of 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

MIN03BIT42- 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, DNAligase, terminal transferase Adaptors , Linkers	08
2	Cloning Vectors- Plasmids (pBR322, pUC 18) Bacteriophages (λ phage) cosmids, phgemids (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 Blottingb. Northern Blotting c. WesternBlotting	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



Vivekanand College, Kolhapur (Empowered Autonomous)

B.Sc.II BIOTECHNOLOGY (OPTIONAL)

CBCS syllabus with effect from July 2024

SEMESTER IV

VSC03 BIT49- Techniques in Forensic Science

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



Vivekanand College, Kolhapur (Empowered Autonomous)

B.Sc.II BIOTECHNOLOGY (OPTIONAL)

CBCS syllabus with effect from July 2024

SEMESTER IV

DSC03 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	



Vivekanand College, Kolhapur (Empowered Autonomous)

B.Sc.II BIOTECHNOLOGY (OPTIONAL)

CBCS syllabus with effect from July 2024

SEMESTER IV

MIN03 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	



VIVEKANAND COLLEGE, KOLHAPUR
(EMPOWERED AUTONOMOUS)

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)

PRACTICAL EXAMINATION PAPER NATURE DSC

Semester

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

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

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

