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

VIVEKANAND COLLEGE
KOLHAPUR
(EMPOWERED AUTONOMOUS)
Estd. 1964

Shri Swami Vivekanand Shikshan Sanstha's

VIVEKANAND COLLEGE, KOLHAPUR

(AN EMPOWERED AUTONOMOUS INSTITUTE)

DEPARTMENT OF BIOTECHNOLOGY OPTIONAL

Three/Four- Years UG Programme

Department/Subject Specific Core or Major (DSC)

NEP- 2.0

Curriculum, Teaching and Evaluation Structure

(as per NEP-2020 Guidelines)

for

B.Sc.-III Biotechnology Optional

Semester-V & VI

(Implemented from academic year 2026-27 onwards)

VIVEKANAND COLLEGE ESTD. JUNE 1964 KOLHAPUR-416 003

Departmental Teaching and Evaluation scheme

Third Year Semester-V & VI

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-V										
1	DSC-IX	2DSC03BIT51	Biochemical techniques	2	-	40	10	-	50	2
2	DSC-X	2DSC03ELE52	Environmental Biotechnology	2	-	40	10	-	50	2
3	DSC-XI	2DSC03BIT53	Plant tissue culture	2	-	40	10	-	50	2
4	DSE-I	2DSE03BIT51	Fermentation technology-I	2	-	40	10	-	50	2
		2DSE03BIT52	Applied methods in Biotechnology -I							
5	FP	2FPR03BIT51	Field Project	2	-			50	50	2
6	DSC-PR-V	2 DSC03BIT59	DSC Biotechnology Lab-5	-	16	-	-	100	100	8
Semester –V Total				**10**	**16**	**160**	**40**	**150**	**350**	**20**
Semester-VI										
1	DSC-XII	2DSC03BIT61	Gene technology and Bioinformatics	2	-	40	10	-	50	2
2	DSC-XIII	2DSC03BIT62	Animal tissue Culture	2	-	40	10	-	50	2
3	DSC-XIV	2DSC03BIT63	Cell Metabolism Virology	2	-	40	10	-	50	2
4	DSE-II	2DSE03BIT61	Fermentation technology-II	2	-	40	10	-	50	2
		2DSE03BIT62	Stem cell technology							
5	VSC-PR-II	2VSC03BIT69	Applied techniques in Biotechnology	-	4	-	-	25	25	2
6	OJT	2OJT03BIT61	On Job Training	2	-			50	50	2
7	DSC-PR-VI	2DSC03BIT69	DSC BiotechnologyLab-6	-	16	-	-	100	100	8
Semester –VI Total				**10**	**20**	**160**	**40**	**175**	**375**	**20**

Semester -V

B.Sc. III (Biotechnology Optional), Semester: V

DSC-IX: 2DSC03BIT51: Biochemical techniques Credits: 02

Theory: 30 hrs. **Marks-50**

Course Outcomes: After the completion of the course the student should be able to -

CO1: understand the fundamentals of chromatographic methods for biotechnology

CO2: apply fundamental knowledge of spectroscopies for biochemical measurements

CO3: understand the principles, types, and applications of electrophoresis.

CO4: understand the concept of tracer technique, measurement and applications of radioactivity.

Unit	Syllabus	Lectures
Unit 1	**Basics of Chromatography** Principle, Methodology and applications of 1. Gel filtration chromatography 2. Ion exchange Chromatography 3. Affinity Chromatography 4. Gas Liquid Chromatography **5.** High Performance Chromatography	10
Unit 2	**Spectroscopic method – Principle, instrumentation, and applications** 1. Fluorescence Spectroscopy 2. Atomic Spectroscopy 3. Infrared Spectroscopy 4. Mass Spectroscopy	10
Unit 3	**Electrophoresis** Definition, general principle of electrophoresis. Supporting media used in electrophoresis- agarose and poly acryl amide gel. Electrophoresis of protein – Methodology and applications of SDS-PAGE and silver staining Methodology and applications of isoelectric focussing	09
Unit 4	**Tracer techniques** Concept of tracer technique, radioactivity measurement units, Properties of alpha beta and Gamma radiation. Radioactivity measurement methods-1, Gas ionization method 2. Gas excitation method 3. Autoradiography Applications of radioisotopes in biological system.	09

Reference Books:

1. Practical Biochemistry principles and techniques – Wilson andWalkar
2. Protein purification –Robert Scoop
3. Biophysical Chemistry –Nath Upadhyay
4. Textbook of Biotechnology- R.C.Dubey
5. Textbook of Biotechnology- B.D.Singh

B.Sc. III (Biotechnology Optional), Semester: V

DSC-X: 2DSC03BIT52: Environmental Biotechnology Credits: 02

Theory: 30 hrs. **Marks-50**

Course Outcomes: At the end of the course, a student will be able to:

CO1: Understand different energy sources, different effects of pollution.

CO2: Study of waste water treatment and applications.

CO3: understand and implement of Bioremediation and Bioleaching.

CO4: Study of formulation of various bio fertilizers to avoid chemical fertilizer.

Unit	Contents	Lectures
1	1. Conventional and Nonconventional fuel and environmental impact 2. Modern fuel-Biogas, Bioethanol, and Biodiesel production 3. Global environmental problems - Greenhouse effect, ozone depletion, acid rain	09
2	**Waste water treatment** 1. Primary treatment - Screening, grinding, grit removal, flocculation, sedimentation, coagulation 2. Secondary treatment - Aerobic (Trickling filter, activated sludge, stabilization pond) and Anaerobic (Up-flow anaerobic sludge digestion) 3. Tertiary treatment - chemical, precipitation	09
3	1) **Bioremediation-** Define, Types, Examples - hydrocarbon, dye, heavymetals, pesticides 2) Bioremediation in Agriculture (Composting and vermicomposting) Concept of Bio pesticides, Bio sorption, Phytoremediation 3) **Bioleaching-** Types, Chemistry, and examples - Copper and Uranium	09
4	**Introduction to Bio fertilizer-** Inoculants of *Rhizobium, Azotobacter, Frankia,* Cyanobacteria, Phosphate solubilizing bacteria (PSB) with methods of applications.	10

Reference Books:

1. Environmental biotechnology- InduShekhar Thakur.
2. Environmental biotechnology- Chattergy.
3. Environmental biology -Verma& Agarwal.
4. Environmental chemistry-B.K.Sharma.
5. Environmental Pollution- Peavy& Rowe.
6. Environmental problems & solutions- Asthana & Asthana.
7. Environmental science-SiagoCanninhham.
8. Environmental biotechnology-S.N.Jogdand

B.Sc. III (Biotechnology Optional), Semester: V

DSC-XI: 2DSC03BIT53: Plant tissue culture

Credits: 02 **Theory: 30 hrs.** **Marks-50**

Course Outcomes: At the end of the course, a student will be able to:

CO1: understand the scope and applications of plant tissue culture.

CO2: apply practical applications of tissue and organ culture.

CO3: understand different tissue culture techniques like callus, Somatic embryogenesis and suspension

CO4: create awareness of clonal propagation and organogenesis. Somaclonal variation protoplast culture

Unit	Contents	Lectures
Unit 1	**1. Concept & Historical Background** Conventional and Non-conventional methods for crop improvement, Landmarks in plant tissue culture. Concept of cell theory, Cellular totipotency, Differentiation, Dedifferentiation, Redifferentiation, Regeneration. **2. Scope, recent advances & applications of Plant Tissue Culture(PTC)** 3. Infrastructure & organization of Laboratory, Different work areas, Equipment & Instruments required	10
Unit 2	**1. Media & culture preparation-** Role of micro & macronutrients, vitamins, amino acid, hormones, activated charcoal and solidifying agents. Culture Conditions - pH, Temperature, Humidity. **2. Aseptic Techniques** Sterilization of Media, Reagent & Glassware, Surface sterilization of explants **3. Practical applications of tissue and organ culture** - Application in agriculture, application in horticulture and forestry, pharmaceuticals, research, paleobotany, applications in industries, transgenic plants	10
Unit 3	**1. Callus Culture** Introduction, principle, morphology & internal structure, protocol, factors affecting. **2. Somatic embryogenesis** Introduction, principle, protocol, factors affecting, applications. **3. Suspension Culture** Introduction, principle, protocol, growth measurement, synchronization, applications.	09
Unit 4	**1. Pathways for clonal propagation and Organogenesis** Introduction, principle, protocol, factors affecting, applications **2. Haploid culture:** Introduction, principle, protocol, applications, advantages of pollen culture over anther culture **3. Concept of Soma clonal Variation Concept Protoplast culture**	09

Reference Books:

1. Introduction to plant tissue culture-M.K.Razdan

2. Plant tissue culture – Theory & practice- S.S.Bhojwani &M.K.Razdan

3. Crop improvement in biotechnology- H.S.Chawala

4. Plant tissue culture-Kalyankumar Dey

5. Textbook of Biotechnology – R.C. Dubey

B.Sc. III (Biotechnology Optional) Semester: V

DSE-I: 2DSE03BIT51: Fermentation technology-I

Credits: 02 **Theory: 30 hrs.** **Marks-50**

Course Outcomes: At the end of the course, a student will be able to:

CO1: understand the concept of Bioprocess engineering and fermentation technology

CO2: understand the medium optimization and strain improvement.

CO3: describe types of fermentation and product recovery by downstream processing.

CO4: understand Ladder programming and design basic PLC circuits for entry-level PLC applications

Unit	Contents	Lectures
Unit 1	**Concept of Bioprocess Engineering and FermentationTechnology** **Basic design of fermenter:** Construction materialsand accessories associated with it **Types of Fermenters-** Tube tower fermenter, Bubblecap fermenter, Fluidized bed fermenter, Airlift fermenter **Fermentation medium**: Constituents of medium like carbon source, nitrogen source, amino acids, vitamins, minerals, water,buffers, antifoam agents, precursors, inhibitors, inducers, alternative sources, and monitoring of different parameters **Sterilization Concept**: Fermentation media, equipment, and air	06
Unit 2	**Medium optimization Strains of Industrially important microorganisms** Desirable characteristics of an industrial strain Principles and methods of primary and secondary screening Inoculum development- Master, working, seed culture Pure culture techniques & strain improvement by mutation,genetic engineering and genetic recombination Preservation & maintenance of industrially important micro-organisms Culture Collection Centers in India	10
Unit 3	**Types of fermentations:** Batch, Continuous and Solid-statefermentation **Scale Up:** Bench Studies, Pilot studies, Industrial scale **Downstream Processing:** Methods, principle, types, examples of fermentations, factors affecting, merits and demerits of large- scale operations 1. Filtration, Ultrafiltration, Nano filters 2. Liquid-liquid extraction, solvent extraction 3,. Chromatography: Ion exchange, Affinity, Gel filtration 4. Distillation 5. Crystallization 6. Drying 7. Reverse Osmosis	10
Unit 4	**Use of computers in fermentation** **Qualitative and quantitative assays** Physicochemical Assays: Gravimetric, spectrophotometric,chromatographic Microbiological Assays: Diffusion assay, turbid metric assay Metabolic Assays: Endpoint, enzymatic assay	12

Reference Books:

1. Comprehensive Biotechnology Volume 3 – Murray Moo- Young
2. Principles of Fermentation Technology-Whittaker
3. Industrial Microbiology- Prescott & Duns
4. Industrial Microbiology- A.H. Patel
5. Industrial Microbiology - Pepler and Perlm

B.Sc. III (Biotechnology Optional) Semester: V

DSE-I: 2DSE03BIT52: Research methodology for Biotechnology- I

Credits: 02 **Theory: 30 hrs.** **Marks-50**

Course Outcomes: At the end of the course, a student will be able to:

CO1: understand the concept of research

CO2: to aware students, skills of writing research article.

CO3: describe tools and techniques of research

CO4: understand research methodology in Biotechnology.

Unit	Contents	Lectures
Unit 1	**What is research?** Purpose of research, Classification of research, Fundamentals of research methods, Writing a research proposal, Problem Identification: Review of literature, broadening knowledge base in the specific research area, bringing clarity and focus to the research problem, Writing a research proposal, Writing a research report. Identifying variables: What is a variable? The difference between a concept and a variable, Converting concepts into variables, Types of variable, Types of measurement scale.	09
Unit 2	**Writing of Research Report**: Format and style. Review of related literature its implications at various stages of research. (Formulation of research problem, hypothesis, interpretation and discussion of results). Major findings, Conclusions and suggestions. Citation of references and Pribliography	07
Unit 3	**Use of tools / techniques for Research: methods-** to search required information effectively, Reference Management Software like Zotero/Mendeley, Software for paper formatting like LaTeX/MS Office, Software for detection of Plagiarism	08
Unit 4	**Research Methodology in Biotechnology** Ultraviolet-visible absorption spectroscopy: Principle, Instrumentation and application. Elimentary idea about X-ray crystallography, API- Electrospray and MALDI TOF	06

Reference Books:

1. Comprehensive Biotechnology Volume 3 – Murray Moo- Young
2. Principles of Fermentation Technology-Whittaker
3. Industrial Microbiology- Prescott & Duns
4. Industrial Microbiology- A.H. Patel
5. Industrial Microbiology - Pepler and Perlman

B.Sc. III (Biotechnology Optional), Semester: V
DSC-PR-V: 2DSC03ELE59

DSC-Biotechnology Optional Lab-5

Credits: 08 **Practical: 240 hrs.** **Marks: 100**

(Practical: Four lectures of 60 minutes four times in a week per batch)

A	**Techniques in Biochemical techniques**	
1	Purification of protein by gel filtration chromatography	
2	Purification of protein by ion exchange chromatography	
3	Estimation of alcohol by potassium dichromate method	
4	Alcohol estimation by Specific gravity bottle	
5	Estimation of citric acid from lemon juice	
6	Immobilization of inverses by using sodium alginate, study of inverses activity by DNSA method	
B	**Techniques in Environmental Biotechnology**	
7	Determination of BOD	
8	Determination of COD	
9	Isolation of *Rhizobium* from root nodules	
10	Isolation of *Azotobacter* from soil	
11	Isolation of Phosphate Solubilizing Bacteria (PSB) from soil	
12	Determination of hardness of water	
13	Determination of the oligodynamic effect of copper on pathogen	
14	Determination of total dissolved solid from waste water sample	
C	**Techniques in plant tissue culture**	
15	Laboratory Organization and general techniques in PTC	
16	Preparation of MS media, stock solution and medium	
17	Aseptic seed germination	
18	Micropropagation stage I- Initiation of micropropagation Shoot tip culture, auxiliary bud culture	

19	Micro propagation stage II- structure and multiplication of culture	
20	Callus culture techniques- Initiation of culture and callus morphology	
21	Suspension culture technique- Initiation of culture, growth requirement	
22	Anther Culture technique	
D1	**Techniques in fermentation technology -1**	
23	Screening of Amylase Producers from Soil	
24	Screening of antibiotic Producers from Soil	
25	Isolation of vitamin B12 auxotrophic mutant	
26	Isolation of lactic acid bacteria from fermented food	
27	Standard plate count of spoiled cheese	
D2	**Techniques in research methodology**	
28	Demonstration of SDS –PAGE of protein	
29	Separation of plant pigments by adsorption chromatography	
30	Demonstration of MALDITOP	
31	Demonstration of UV visible spectrophotometer	
32	Demonstration of Soxhlet apparatus	

Distribution of Marks for Practical Examination (LAB):
DSC-PR-V: 2DSC03BIT59: DSC-Biotechnology Optional Lab-5

Group	A	B	C	D	Journal	Industrial Visit/ Seminar	Total
Marks	20	20	20	20	10	10	**100**

Semester -VI

B.Sc. III (Biotechnology Optional), Semester: VI

DSC-XII: 2DSC03BIT61: Gene technology and Bioinformatics

Credits: 02 **Theory: 30 hrs.** **Marks-50**

Course Outcomes: After the completion of the course the student should be able to -

CO1: To understand important techniques in gene technology

CO2: To learn about different therapies in gene technology

CO3: To learn about applying Biotechnology in silico i.e. via Bioinformatics

CO4: : After completing the course students are eligible to work in molecular diagnostic and Bioinformatics laboratory

Unit	Contents	Lectures
Unit 1	**DNA fingerprinting** – Introduction, Genetic marker, Use of minisatellite and microsatellite, Multilocus and single locus probes, Scheme for DNA fingerprinting and applications	06
Unit 2	**Gene targeting** - Method and application **Types of gene therapy** – Somatic gene Germ line Methods of gene transfer (Virus vector, non-viral approach Limitation **Antisense therapy** - Introduction, Principle, Application	08
Unit 3	**Bioinformatics** Computer use in Biology- Internet, Networking- HTTP, HTML, WAN , LAN, MAN Information resource- National Center for Biotechnology Information (NCBI), European Bioinformatics Institute (EBI), Sequence retrieval system- Entrez, DBGet Genomics- Human Genome Project- Goal, Application, Introduction to nucleic acid database- Gene Bank, EMBL , DDBJ	08
Unit 4	**Introduction to Proteomics, Primary protein sequence database**– SWISS-PROT, PIR, MIPS, NRL-3D, TrEMBL **Introduction to secondary protein sequence database-** PROSITE, PROFILE, PRINT, Pfam, BLOCK, IDENTITY **Other databases** - Literature database, Pub Med **Introduction to structural database-** Protein databank (PDB) , **Introduction to Molecular docking , Homology modelling**	08

Reference Books:

1. Practical Biochemistry principles and techniques – Wilson and Walkar
2. .Biotechnology -S.N.Jogdan
3. Introduction to Bioinformatics – Rastogi.
4. Introduction to Bioinformatics- T. K. Attwood
5. .Gene Manipulation – Old and Primrose

DSC-XIII: 2DSC03BIT62:Animal tissue culture

Credits: 02 **Theory: 30 hrs.** **Marks-50**

Course Outcomes: After the completion of the course the student should be able to -

CO1: understand the need of animal tissue culture

CO2: To learn about the cultivation of animal tissues *in vitro*

CO3: To gain knowledge about how to prepare and maintain animal tissues using various media

CO4: Construct to design the commercial Animal tissue culture Laboratory

Unit	Contents	Lectures
Unit 1	**Historical Background-** Landmarks in Animal Tissue Culture Scope, recent advances & applications of ATC **Overview of ATC Lab Infrastructure-**, Substrate for cell growth, equipment required for animal cell culture (Laminar air flow, CO2 incubator, Centrifuge, Inverted microscope).	04
Unit 2	**Sterilization Glassware, Equipments & culture media** Glassware sterilization, reagent and media sterilization, sterility testing. **Culture media** Natural media, synthetic media (serum-containing media, serum free media, balanced salt solution, media constituent, complete culture media, physicochemical properties of media).	06
Unit 3	**Conceptual Background** Biology and Characterization- Characteristics of cultured cells, cell adhesion, cell proliferation, cell differentiation, metabolism of culturedcells, Initiation of cell culture, Evolution and development of cell lines	12
Unit 4	**Basic technique of mammalian cell culture** Isolation of tissue, disaggregation of tissue, measurement of viability, primary cell culture, Cell lines, Maintenance of cell culture, Subculture,Stem cell cultures. Scale up in monolayer- Roller bottle culture, Spinner Culture, Microcarrier culture **Organ and Histotypic Culture:** Types and maintenance of organ and histotypic culture,	16

Reference Books:

1. Textbook of biotechnology- R.C.Dubey
2. Biotechnology- B.D.Singh
3. Animal cell culture- Fresheny.
4. Biotechnology- U.Sattanarayan
5. Principles and practice of Animal tissue culture – Sudha Gangal

DSC-XIV: 2DSC03 BIT63: Cell metabolism and virology

Credits: 02 **Theory: 30 hrs.** **Marks-50**

Course Outcomes: After the completion of the course the student should be able to -

CO1: To acquire knowledge regarding biomolecules and their metabolism.

CO2: to learn about various metabolic pathways

CO3:tostudynucleicacidandproteinmetabolism

CO4: understand viruses and study of different cultivation methods

Unit	Contents	Lectures
1	**General Metabolism-** Introduction, Definition, Reactions of Metabolic Pathways. Methods for the study of Metabolic Pathways by using radioisotopes, by using mutants, and *in vitro* studies. **Metabolism of Carbohydrates** 1- Carbohydrate metabolism- Reactions, Energetics Significance. Of glycolysis 2. Reactions, the significance of Pentose Phosphate Pathway 3- Reactions & Energetics of TCA Cycle.	10
2	**Lipid Metabolism** Biosynthesis of Saturated Fatty acid Palmitic Acid2 β-Oxidation of Fatty acid - Palmitic Acid **Respiratory Electron Transport Chain** Component of ETC Mechanism of ATP generation – Chemical coupling hypothesis, Chemiosmotic hypothesis.	09
3	**Protein and Nucleotide Metabolism.** Urea cycle **Purine biosynthesis (Denovo and Salvage pathway)** Purine degradation Pyrimidine biosynthesis Pyrimidine degradation Regulation of purine and pyrimidine metabolism	09
4	**Virology-** Introduction, Types of viruses on the basis of Host & type of Nucleic acid General Characteristics of Viruses. General Structures of Viruses- TMV, Adenovirus, T4 Bacteriophage- Reproduction of viruses- .1- Adeno virus .2- Bacteriophages- T4, 3. λ- Phage Isolation & Cultivation of Plant & Animal Viruses- Tissue Culture & Embryonated Eggs	10

Reference Books:

1. Biochemistry – LubertStrayer.
2. Principles of Biochemistry- Lehninger.
3. Virology- Luria & Delbruck.
4. . Fundamentals of Biochemistry- J.L.Jain S.Chand

DSE-II: 2DSE03BIT61: Fermentation technology -II

Credits: 02 **Theory: 30 hrs.** **Marks-50**

Course Outcomes: After the completion of the course the student should be able to –

CO1: gain knowledge about the different fermentation methods.

CO2: study the different fermentation product

CO3: explore study of IPR and patenting

CO4: students are eligible to work in the production department in the fermentation industry

Unit	Contents	Lectures
Unit 1	**Production of primary metabolites** Organic acid- Citric Acid, Lactic acid Amino acid- L lysine Enzyme- Asparginase, amylase **Production of secondary metabolites** Antibiotics- Penicillin, Streptomycin	09
Unit 2	**Production of fermented foods** Cheese Vinegar Beer Red wine Bread Mushroom cultivation **Microbial biomass production** Probiotics SCP- *Spirulina*	09
Unit 3	**Production of Recombinant- products:** Recombinant and synthetic vaccines, Growth hormones. Insulin **Intellectual Property Rights**: Introduction Patents: Introduction, criteria, and process of patenting, trademark, trade secrets, copyrights	10
Unit 4	**Fermentation economics** Introduction to Good Manufacturing Practices (GMP) Introduction to Quality Control (QC) and QualityAssurance (QA)Introduction to Biosafety Levels (BSL) I, II, III	10

Reference Books:

1. Comprehensive Biotechnology Volume 3 – Murray Moo- Young

2 Basic Biotechnology - Colin Ratledge & Bijon Kritinsen

3. Industrial Microbiology – Casida

4. Principles of Fermentation Technology-Whittaker

5. Industrial Microbiology- Prescott & Duns

6. Industrial Microbiology- A.H. Patel

7. Industrial Microbiology - Pepler and Perlman

DSE-II: 2DSE03BIT62: Stem Cell technology

Credits: 02 **Theory: 30 hrs.** **Marks-50**

Course Outcomes: After the completion of the course the student should be able to –

CO1: gain knowledge about Stem cell types ,mechanism of self renewal and differentiation.

CO2: study the use of stem cell research and its potential implications .

CO3: Students can develop analytical and critical thinking skills to design , conduct and analyze experiments in stem cell research

CO4: to prepare for careers in stem cell research , biotechnology or related fields such as research scientists ,corporate professionals ,or healthcare professionals

Unit	Contents	Lectures
Unit 1	Stem cells-Introduction Definition and basics of stem cells Classification of stem cells different types of stem cells human embryonic stem cells, adult stem cells etc. Sources of Stem cells Fetus and various adult tissues.- Advantages of stem cells	09
Unit 2	Blastocyst culture – various stages of embryonic development. In vitro fertilization Xeno-free derivation of stem cells- Alternative feeder cells and feeder free culture	09
Unit 3	Cryopreservation of stem cells- Conventional slow-freezing method and vitrification method. Properties of stem cells self renewel, clonality and plasticity.- Pluripotent nature of stem cells- Extrinsic and Intrinsic factors. Cellular models to study pluripotent nature of stem cells	10
Unit 4	Characterization of human embryonic stem cells- expression of cell surface marker, karyotyping etc. Stem cells and their developmental potential Characteristics of stem cells- transdifferentiation of stem cells. Controlled differentiation of human embryonic stem cells, Application of stem cells	10

Reference Books-

1. Practical Biochemistry principles and techniques – Wilson and Walkar
2. Protein purification –Robert Scoop
3. Biophysical Chemistry -–Nath Upadhyay
4. Textbook of Biotechnology- R.C.Dubey
5. Textbook of Biotechnology- B.D.Singh

B.Sc. III (Biotechnology Optional), Semester: VI

DSC-PR-VI: 2DSC03BIT69: DSC-Biotechnology Optional Lab-6

Credits: 08 **Practical: 240hrs.** **Marks: 100**

(Practical: Four lectures of 60 minutes four times in a week per batch)

A	**Techniques in Gene technology and Bioinformatics**	
1	Determination of molecular weight of DNA	
2	Transformation of *E. coli*	
3	Browsing and understanding of NCBI web pageIntroduction of literature database - Pubmed	
4	Study of DNA amplification by | thermocycler	
5	Protein structure exploring database – Protein Data Bank (PDB) and use of Rasmol to three dimensional structure of protein	
6	Study of Human genome project	
7	Study of restriction fragment length polymorphism (RFLP)	
8	Study of Random Amplified Polymorphic DNA	
9	Extraction of RNA sequence	
10	Calculate molecular weight and isoelectric point (PI/MW)	
B	**Techniques in Metabolism and Virology**	
11	Isolation of coli phages	
12	ELISA (Enzyme-Linked Immunosorbent Assay):Detecting viral antigens or antibodies.	
13	Viral Genetics: 1.Sequencing: Determining the nucleotide sequence of viral genomes	
14	Extraction of total lipid from egg yolk	
15	Estimate blood glucose level by GOD-POD method	
16	Study of sugar fermentation by microorganisms	
17	Isolation and fractionation of egg lipids by tlc	
C	**Techniques in Animal tissue culture**	
18	ATC laboratory design and equipment used in ATC	
19	Animal cell culture media preparation of media	
20	Study of sterilization techniques in animal tissue culture	
21	Preparation of sera	
22	Cell counting and viability	
23	Dpph radical scavenging assay	
24	Animal handling and care	
25	Culture of virus in chick embryo	
D1	**Techniques in Fermentation technology -2**	
26	Penicillin bioassay	
27	Vitamin Bioassay	
28	Amylase production by Koji fermentation	
29	Wine production from fruit	

30	Production of bioethanol	
D2	**Stem cell technology**	
31	Stem cell banking concept	
32	Demonstration of forms of stem cell	

Distribution of Marks for Practical Examination (LAB):

Group	**A**	**B**	**C**	**D**	**Journal**	**Industrial Visit/ Seminar**	**Total**
Marks	20	20	20	20	10	10	**100**

B.Sc. III (Electronics), Semester: VI

VSC-PR-V: 2VSC03BIT69: Applied techniques in Biotechnology

Credits: 02 **Practical: 60hrs.** **Marks-25**

(Practical: Four lectures of 60 minutes per week per batch)

S.N.	Content	T.P
1	MPN TEST Most Probable Number	
2	Preparation of Hanks Balanced salt solution.	
3	Separation of proteins by affinity column chromatography.	
4	To study growth curve of microorganisms.	
5	Preparation of Competent Cells.	
6.	To prepare CTAB buffer and reagents used in plant genomic DNA isolation	
7	To isolate the genomic DNA from given leaf sample using CTAB buffer	
8.	Demonstration of mass spectrophotometer	
9	Demonstration of NMR spectrophotometer	
10	Demonstration of Florescence spectrophotometer	

Marks Distribution of VSC-PR-V: 2VSC03ELE69: Computer Network-II Lab

Practical Work	Journal/Report	Total
20 Marks	05 Marks	25 Marks

Nature of Question Paper:

Seat No.	

Ques. paper code	

VIVEKANAND COLLEGE, KOLHAPUR

(AN EMPOWERED AUTONOMOUS INSTITUTE)

B.Sc. Part- III (Biotechnology Optional) (Semester-V) Examination.....

Course Code and Name:

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 labelled diagrams wherever necessary.

4) Use of log table/calculator is allowed.

Q.1. Select correct alternative (One mark each): **[8]**

i) Xyzabcdefghijklmnop ————

a) ——— b) ——— c) ——— d) ———

ii) Xyzabcdefghijklmnop ————

a) ——— b) ——— c) ——— d) ———

iii) Xyzabcdefghijklmnop ————

a) ——— b) ——— c) ——— d) ———

iv) Xyzabcdefghijklmnop ————

a) ——— b) ——— c) ——— d) ———

v) Xyzabcdefghijklmnop ————

a) ——— b) ——— c) ——— d) ———

vi) Xyzabcdefghijklmnop ————

a) ——— b) ——— c) ——— d) ———

vii) Xyzabcdefghijklmnop ————

a) ——— b) ——— c) ——— d) ———

viii) Xyzabcdefghijklmnop ————

a) ——— b) ——— c) ——— d) ———

Q.2. Attempt any TWO (Eight marks each): **[16]**

i) Xyzabcdefghijklmnop.

ii) Xyzabcdefghijklmnop.

iii) Xyzabcdefghijklmnop.

Q.3. Attempt any FOUR (Four marks each): **[16]**

i) Xyzabcdefghijklmnop.

ii) Xyzabcdefghijklmnop.

iii) Xyzabcdefghijklmnop.

iv) Xyzabcdefghijklmnop.

v) Xyzabcdefghijklmnop.