

"Education for Knowledge, Science and Culture"
Shikshanmaharashi Dr. Bapuji Salunkhe



Vivekanand College, Kolhapur (Autonomous)

Department of Biotechnology (Optional)

**B.Sc. Part I
Semester I & II**

Sr. No.	Semester	Paper	Name Of Paper	Total Marks
1	Semester I	Paper I	Basics of Biotechnology I	100
		Paper II	Basics of Biotechnology II	
2	Semester II	Paper III	Microbiology	100
		Paper IV	Basics Cell biology and genetics	

**CBCS Syllabus to be implemented from
September 2021 onwards**



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

Shri Swami Vivekanand Shikshan Sanstha's
VIVEKANAND COLLEGE, KOLHAPUR (AUTONOMOUS)
Department of Biotechnology Optional
Academic year 2021-22 B.Sc. I Biotechnology Optional

COS for Semester I And II

Semester	Course outcome
Semester I	
Paper I	DSC-1009A Paper I Basics of Biotechnology I At the end of this course students will able to; CO 1: Describe various proteins w.r.t. their structural level. CO 2: Classify types of vitamins & able to state their deficiency syndromes. CO 3: Specify types of Diabetes, causes, and remedies. CO 4: Qualitative and quantitative analysis of biomolecules
Paper II	DSC-1009A Paper-II Basics of Biotechnology II At the end of this course students will able to; CO 1: Isolate & purify particular protein. CO2: Explain the principle of centrifugation. CO 3: Understand the working of Microscope. CO 4: Discuss the instrumentation & working of UV visible spectroscopy
Semester II	
Paper -III	DSC-1009 B Paper -III Microbiology At the end of this course students will able to; CO 1: Elucidate the harmful activities of bacteria. CO 2: Design media to culture specific bacterial strain. CO 3: Conclude importance of sterilization CO 4: Compare various types of staining.
Paper -IV	DSC-1009 B Basics of Cell biology and genetics At the end of this course, students will able to; CO 1: List various cell organelles with functions. CO 2: Differentiate Prokaryotic & Eukaryotic cells. CO 3: Elaborate the Mendelian Genetics. CO 4: Predict how crossing over helps in species diversity & evolution




HEAD
DEPARTMENT OF BIOTECHNOLOGY (OPTIONAL)
VIVEKANAND COLLEGE, KOLHAPUR
(AUTONOMOUS)

VivekanandCollege(Autonomous), Kolhapur

CHOICE BASED CREDIT SYSTEM SYLLABUS

ForBachelor of SciencePart - I

BIOTECHNOLOGY (Optional)

Introduction

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. I. 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.



Objectives :-

- 1) To make the students knowledgeable with respect to the subject and its practicable Applicability. Due to which student become familiar with different techniques in biotechnology at under graduate level
- 2) To promote understanding of basic and advanced concepts in Biotechnology.
- 3) To expose the students to various emerging areas of Biotechnology, (Medical 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.



Semester I- Paper I- Basics of Biotechnology I		
UNIT I		Lectures (30)
1	<p>Biotechnology: definition, history, Branches, scope</p> <p>Amino acids and Protein :-Introduction, General structure of amino acids, Structural classification of amino acids based on R side chain, single letter code, Reaction of amino acids ,Structure of peptide bond, biological functions of protein , structural levels of protein- Primary, Secondary, Tertiary (Myoglobin), Quaternary (Hemoglobin)</p> <p>Vitamins- Introduction, Types , Roles, Deficiency</p>	15
UNIT II		
2	<p>Carbohydrate: :- General classification of carbohydrates, ring formation in monosaccharide, mutarotation , formation of glycosidic bond, study with respect to structure ,chemical properties, hydrolysis of disaccharides (e.g. sucrose, maltose ,lactose,),oligosaccharides, polysaccharides (e.g. starch, glycogen, Cellulose) biological functions of carbohydrates.</p> <p>Diabetes militias causes ,type, remedies</p> <p>Lipid :- Definition, Fatty Acids , types, Classification of lipids- Simple lipid- (triacylglycerols & waxes) Compound lipid- (phospholipids, sphingolipids, cerebrosides, Lipoproteins), Derived lipid – e.g. cholesterol Properties of lipid. Functions of Lipids.</p>	15



Paper II Basis of Biotechnology II		
Unit I		Lect.(30)
<p>Protein Purification: Method of cell disruption (Blenders, grinding with abrasives, presses, enzymatic method, sonication); Salt participation- Salting in, salting out, organic solvent precipitation, dialysis, ultra filtration.</p> <p>Centrifugation- Basic principles, RCF, Sedimentation coefficient, Svedberg's constant, Types of centrifuge: Desktop, High speed and Ultracentrifuge, Preparative centrifugation: Differential and density gradient centrifugation</p>		15
Unit II		
<p>Microscopy: a) General principles of microscopy- Image formation, magnification, numerical aperture, resolving power of microscope and working distance. b) Ray diagram, special features, applications and comparative study of compound microscope and Electron Microscope (Scanning and Transmission Electron Microscope).</p> <p>UV-visible spectroscopy and Colorimetry-</p> <p>Introduction to spectroscopy, properties of electromagnetic radiation (UV and Visible range, Electromagnetic spectrum, Electronic Transitions, Principle, Instrumentation with respect to colorimeter and single beam spectrophotometer. Principle, Instrumentation, Applications of UV and Visible spectrophotometer and colorimeter Lambert-Beer's law,</p> <p>A. Concept of Sterilization:- Methods of sterilization</p> <p>a) Physical agents: i) temperature-dry heat, moist heat ii) Radiation U.V, Gamma radiation iii) filters- membrane filter.</p> <p>b) Chemical agents:- Phenol & Phenolic compounds, Alcohol, Heavy metals (e.g. mercury).</p> <p>c) Gaseous agents- Ethylene oxide, formaldehyde</p>		15



Reference Books :-

1. Text book of biotechnology- Pradip parihar student ed. Jodpur (2004)
2. Biotechnology expanding horizons- B. D. Singh, Kalyani Publishe
3. Elements of biotechnology- P. K. Gupta, Rastogi publications.
4. Biotechnology- V. Kumarsan, Saras publication.
5. A text book of biological chemistry- M. S.Yadav, Dominant publishers.
6. Outline of biochemistry- Conn & Stumph
7. Principles of Biochemistry- Jeffory, Zubey
8. Biochemistry- Lubert Stryer
9. Textbook of Biotechnology – R. C. Dubey. 10) Biochemistry by Lehninger
10. Biochemistry – U. Satyanarayana
11. Biochemistry –Glick & Pasterneck
12. Practical Biochemistry principles and techniques – Willson and Walker
13. Protein purification by Robert Scope
14. Biophysical chemistry- Nath Upadhyay



Semester II- Paper III-Microbiology		
Unit I		Lectures(30
<p>History of Microbiology: - Contributions of Anton van Leeuwenhoek, Alexander Fleming, Louis Pasteur, Robert Koch, Joseph Lister.</p> <p>Introduction to types of Microorganisms – Bacteria, Algae, Fungi, Protozoa and Viruses, Beneficial and harmful activities of microorganisms, Applied Branches of Microbiology</p> <p>Morphology and cytology of Bacteria</p> <p>A. Morphology of Bacteria – i) Size, ii) Shape, iii) Arrangements</p> <p>B. Cytology of Bacteria – Structure of Typical Bacterial Cell.</p> <p>a) Structure and functions of Bacterial cell parts</p> <p>i) Cell wall ii) Cell membrane iii) Capsule and slime layer iv) Flagella v) Pili vi) Nuclear material vii) Mesosome viii) Ribosome</p>	15	
Unit II		
<p>A. Culture media and pure culture techniques: Common components of media and their functions Peptone, Yeast extract, NaCl, Agar and Sugar</p> <p>B. Culture media - a) Living Media (Lab. animals, plants, bacteria, embryonated eggs, tissue cultures), b) Non living media – i) Natural, ii) Synthetic, iii) Semi synthetic, iv) Differential, v) Enriched, vi) Enrichment, vii) Selective.</p> <p>C. Methods for isolation of pure cultures- Streak plate, pour plate, spread plate.</p> <p>D. Stains and staining procedures -</p> <p>a. Definition of dye and stain</p> <p>b. Classification of stains – Acidic, Basic and Neutral</p> <p>d. Principle, Procedure, Mechanism and application of staining procedures</p> <p>i) Simple staining</p> <p>ii) Negative staining</p> <p>iii) Differential staining: Gram staining and Acid fast staining</p>	15	



Paper II-Basics in Cell biology & Genetics		
	Unit I	Lectures(30)
1	<p>History of Cell biology :- Introduction of cell and concept of prokaryotic and Eukaryotic cell. Cell biology before 19th century, cell biology in 19th century, formulation of cell theory, protoplasm theory, germplasm theory, cell biology in 20th century- organismal theory, Branches of Cell Biology.</p> <p>Structure and function of Cell organelles- ultra structure and function of cell membrane, golgibodies, Endoplasmic reticulum (rough & smooth) Ribosome, cytoskeleton structure(actin, microtubules), Mitochondria, chloroplast, Lysosomes, peroxisomes, Nucleus.</p> <p>Cell division and cell cycle- phases of cell cycle, Mitosis.Meosis</p>	15
UNIT II		
	<p>Mendels law of Inheritance – principal of segregation, Independent assortment, Dominance, Mendelian genetics in humans.</p> <p>Varity of gene expression – modifiers, suppressors, pleiotropic gene, multiple allele. Interaction of gene- Epstasis, complimentary gene, duplicate gene.</p> <p>Linkage definition, coupling and repulsion hypothesis, linkage groups. Crossing over –Mechanism and theory. Structural and numerical changes in chromosomes. Extra chromosomal inheritance-mitochondrial and plastids.</p>	15

Reference Books-

1. Fundamentals of Microbiology- Frobisher
2. Microbiology-Pelczar.
3. General Microbiology- Stanier.
4. Text book of Microbiology- Ananthnarayan & Panikar.



5. Cell and molecular biology- Arumugham
6. Cell and molecular biology- De Robertis
7. Cytology genetics and evolution- Agarwal and Varma
8. Cell biology- C. B. Pawar
9. Cell- Cooper.
10. Cell biology- Gilard Karp
11. Biology of Microorganisms- Brock
12. Cell biology – Albert Brown

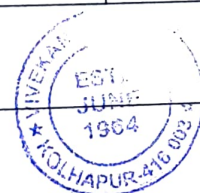


Practical syllabus

(Practical Examination to be conducted annually)

Lab.Exercises in Basics of Biotechnology Credit -1

S N	Title	Hr. Allotted
1	Preparation of Molar and Normal solutions Molar solution of Sucrose. Normal solutions Molar solution of alkali-NaOH and Acid HCL Preparation of Buffers	
2	Isolation of casein from milk	
3	Study of Lamberts Beer's Law by copper sulphate method.	
4	Estimation of glucose by DNSA method (Graphical)	
5	Isolation of starch from potato	
6	Determination of acid value of given fat	
7	Estimation of DNA by Diphenylamine method (by calculation)	
8	Estimation of RNA by Orcinol method (By calculation)	
9	Estimation of reducing sugar by Benedict's method	
10	Identification of given amino acid by paper chromatography	
11	Estimation of protein by Biuret method (Calculation)	
	Lab.Exercises in cell biology and Microbiology	
1	Use, care and study of Compound Microscope	
2	. Preparation of Culture media -Peptone water,Nutrient broth and Nutrient Agar -MacConkey's Agar ,Sabroud's Agar Starch Agar ,Milk Agar	
3	Microscopic Examination of Bacteria 1. Monochrome staining 2. Negative Staining 3. Gram's Staining Hanging drop technique- Motility.	
4	Isolation, colony characters ,Gram's staining and motility of Bacteria isolated from- - Air-(solid impaction technique)	



	Water- (dilution and spreading plate technique.)	
5	Enumeration of Bacteria from soil by total viable count- Pour plate technique.	
6	Mounting and identification of mould- <i>Penicillium</i> , <i>Aspergillus</i>	
7.	Demonstration of some lab equipments:- Autoclave, Hot air Oven, Incubator, LAF, Centrifuge, Colorimeter, Water bath, Colony Counter, Water distillation unit	
8	Sums of Medellin genetics	
9	Study of mitosis	
10	Isolation of chloroplast	
11	Study of effect of organic solvent and temperature membrane permeability	

Books recommended for Practical

- 1) Stains and Staining procedures by Desai and Desai.
- 2) Introduction to Practical Biochemistry by D. Plummer, J Wiley and Sons.
- 3) Bacteriological techniques by F. J. Baker.
- 4) Introduction to Microbial techniques by Gunasekaran.
- 5) Biochemical methods by Sadashivan and D. Manickam.
- 6) Laboratory methods in Biochemistry by J. Jayaraman.
- 7) Experimental Microbiology – Patel & Patel



List of minimum equipments-

- 1) Hot air oven - 1
- 2) Incubator - 1
- 3) Autoclave - 1
- 4) Refrigerator - 1
- 5) Medical microscopes - 10 nos. for one batch
- 6) Digital weighing balance - 1
- 7) Digital 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.

(B) Each candidate must produce a certificate from the Head of the Department in her/his college, stating that he/she has completed satisfactory practical course online laid down from 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 80% Practical should be covered in practical examination.



Nature of Question paper and distribution of marks for Practical Examination

Q.1 One major practical(Biochemistry)	10M
Q.2 One Miner Practical (Biochemistry)	05 M
Q.3 One major practical (Cell biology and Microbiology)	10M
Q.4One Miner Practical (Cell biology and Microbiology)	05 M
Q.5 Spotting	10M
Q.6 Journal	10M



SCHEME OF MARKING FOR (THEORY)

Sem	Core Course	Marks	Evaluation	Sections	Answer Books	Standard of passing
1	DSC-9A	80	Semester wise	Two sections each of 40 marks	As per instruction	35% (28 marks)
2	DSC-9B	80	Semester wise	Two sections each of 40 marks	As per instruction	35% (28 marks)

SCHEME OF MARKING (CIE) Continues Internal Evaluation

Sem	Core Course	Marks	Evaluation	Sections	Answer Books	Standard of passing
1	DSC-9A	20	Semester wise	One	As per instruction	35% (7marks)
2	DSC-9B	20	Semester wise	One	As per instruction	35% (7marks)

SCHEME OF MARKING (PRACTICAL)

Sem	Course	Marks	Evaluation	Section	Standard of passing
I & II	DSC 9A & DSC 9B	50	Annual	As per instruction	35% (18marks)

*A separate passing is mandatory

