



Vivekanand College (Autonomous), Kolhapur

**B.Sc. Part – I (Biotechnology-Optional) CBCS
Syllabus**

VIVEKANAND COLLEGE, KOLHAPUR

B.Sc. Part – I (Biotechnology-Optional) CBCS Syllabus

(With effect from June, 2018)

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Vivekanand College(Autonomous), Kolhapur

CHOICE BASED CREDIT SYSTEM SYLLABUS

For Bachelor of Science Part - 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 humanhealth.

Vivekanand College(Autonomous), Kolhapur
Biotechnology (Optional)

B.Sc. Part - I Syllabus
CBCS Pattern
In force from June -2018

General Structure:

1. There will be one theory papers for each semester of 80 marks each and internal examination of 10 marks for each paper.
2. The medium of instruction shall be English.
3. There will be annual practical examination. Practical will be of 50 marks . Practical exam was conducted on techniques of biochemistry microbiology and cell biology marks are reserved for journal. The duration of practical examination will be of six hours.

Sr.No.	Name of the Subject	Subject code	Sem I	Sem II
1	Biotechnology (Optional)	9	DSC-9A	DSC-9B
			Paper Titles	
			Basics of Biotechnology	Basics of Cell biology and Microbiology

**Vivekanand College(Autonomous), Kolhapur B. Sc. Part I
(Biotechnology)CBCSSyllabus with effect from June ,2018
Semester :I Biotechnology – Paper I
BIOTECHNOLOGY DSC-9A : Basics Of Biotechnology
Semester I
Credit -4**

Sr.No.	Units	Lectures
	SECTION –I	
1	<p>Biotechnology: definition, history of biotechnology, scope & importance of biotechnology, branches of biotechnology, biotechnology in India, Commercial potentials of Biotechnology, Achievements of Biotechnology, Misuse of Biotechnology, Prevention of misuse of Biotechnology, Future of Biotechnology.</p> <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>	15
2	<p>Nucleic acids: Definition ,Structure of nitrogenous bases ,pentose sugar and phosphoric acid .nucleosides, nucleotides, polynucleotides, Forms of DNA- A,B,D,Z. Watson and Crick’s structural model of DNA,</p> <p>RNA: Chemical composition , structure and functions of mRNA, rRNA, tRNA. Forces stabilizing nucleic acid structure.</p> <p>Lipid :- Definition, Classification of lipids Simple lipid- (triacylglycerols & waxes) Compound lipid- (phospholipids, sphingolipids, cerebrosides), Derived lipid – e.g.cholesterol Chemical and physical properties of lipid. Functions of lipids.lipid profile test</p>	15

	SECTION II	
1	<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 aminoacids ,Structure of peptide bond, biological functions of protein , structural levels of protein- Primary, Secondary ,Tertiary(Myoglobin) ,Quaternary(Hemoglobin) .</p> <p>Enzyme (basic concepts):- definition , history of enzymes concept of Holo enzyme, Apoenzyme, Coenzyme,Cofactor,Prosthetic group, Enzyme Types- extracellular, intracellular, constitutive, inducible and zymogen forms of enzyme</p>	15
2	<p>Basic Biophysical techniques</p> <p>A. - General Principles of Microscopy – Image formation, Magnification,Numerical aperture (uses of oil immersion objective), Concept of Resolving power and Working distance.</p> <p>B. Ray diagram, principle and applications of –</p> <p>i) Compound Microscope ii) Electron Microscope- Scanning electron Microscope, Transmission Electron Microscope.</p> <p>C .Photometry :- 1. concept of spectrum . Concept of photometry .Lambert-Beer's law.</p> <p>2. Principle, construction & working of Colorimeter and U.V. visible spectrophotometer.</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.
- 11) Biochemistry – U. Satyanarayana
- 12) Biochemistry –Glick & Pasterneck

**Vivekanand College(Autonomous), Kolhapur B. Sc. Part I
(Biotechnology)CBCSSyllabus with effect from June ,2018**

Semester :I Biotechnology – Paper I I

**BIOTECHNOLOGY DSC-9B : Basics Of Cell biology and
Microbiology**

Semester II

Credit -4

Sr.No,	Units	Lectures
	SECTION –I	
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 cell theory, protoplasm theory, germplasm theory, cell biology in 20th century- organismal theory, Branches of Cell Biology, Scope of cell biology.</p> <p>Structure and function of Cell organelles- ultra structure of cell membrane, golgi bodies, Endoplasmic reticulum (rough & smooth) Ribosomes, cytoskeleton structure (actin, microtubules), mitochondria, chloroplast, lysosomes, peroxisomes, Nucleus. Cell division and cell cycle- phases of cell cycle, Mitosis.</p>	15
2	<p>History of Microbiology :- Contributions of Anton van Leeuwenhoek, Alexander Fleming, Louis Pasteur, Robert Koch, Joseph Lister. 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 A. Morphology of Bacteria – i) Size, ii) Shape, iii) Arrangements B. Cytology of Bacteria – Structure of Typical Bacterial Cell. a) Structure and functions of :Bacterial cell parts i) Cell wall ii) Cell membrane iii) Capsule and slime layer iv) Flagella v) Pili vi) Nuclear material vii) Mesosome viii) Ribosome</p>	15

1	SECTION II	
	<p>A. Microbial Nutrition</p> <p>1) Nutritional requirements of microorganisms :Water; Micronutrients, Macronutrients- Carbon and Energy source; Oxygen and Hydrogen; Nitrogen, Sulphur and Phosphorous</p> <p>2) Nutritional types of microorganism based on carbon and energy sources Autotrophs- Photoautotrophs and Chemoautotrophs, Heterotrophs- Photoheterotrophs and Chemoheterotrophs</p> <p>B. Culture media- Definition of culture media, Common components of media and their functions- Peptone, Yeast extract, NaCl, Agar and Sugar, Types: non living media- natural, synthetic, semi-synthetic & differential, enriched, enrichment & selective, living media.</p> <p>c. Methods for isolation of pure cultures- Streak plate, pour plate, spread plate.</p>	15
2	<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> <p>B. Stains and staining procedures -</p> <p>A. Definition of dye and stain</p> <p>B. Classification of stains – Acidic, Basic and Neutral</p> <p>C. 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

Reference books:-

1. Cell and molecular biology- Arumugham
2. Cell and molecular biology- De Robertis
3. Cytology genetics and evolution- Agrwal and Varma
4. Cell biology- C. B. Pawar
5. Fundamentals of Microbiology- Frobisher
6. Microbiology-Pelczar.
7. General Microbiology- Stanier.
8. Text book of Microbiology- Ananthnarayan & Panikar.
9. Cell- Cooper.
10. Cell biology- Gilard Karp
11. Biology of Microorganisms- Brock
12. Cellbiology – Albert Brown

Practical syllabus

(Practical Examination to be conducted annually)

Lab.Exercises in Basics of Biotechnology

Credit -1

Sr.No.	Name of The Experiment	Lectures
1	Preparation of Molar and Normal solutions Molar solution of Sucrose Normal solutions of alkali- NaOH and Acid- HCL Preparation of Buffer	
2	Isolation of casein from milk	
3	Study of Lambert-Beer's Law by Copper ammonia complex method	
4	Estimation of glucose by DNSA method (Graphical)	
5	Isolation of starch from potato	
6	Determination of acid value of given fat	
7	Isolation of casein from milk	
8	Estimation of DNA by Diphenylamine method (By Calculation)	
9	Estimation of RNA by Orcinoil Method (By Calculation)	

10	Estimation of reducing suger by Benedicts method	
11	Identification of given amino acid by paper chromatography	
12	Estimation of protein by Biuret method(Graphical)	

Lab exercises for Cellbiology and Microbiology

Credit -1

Se.No.	Title Of Practical	Lectures
1	Use, care and study of Compound Microscope	
2	Demonstration of some lab equipments:- Autoclave, Hot air Oven, Incubator, LAF, Centrifuge, Colorimeter, Water bath, Colony Counter, Water distillation unit.	
3	. Microscopic Examination of Bacteria 1. Monochrome staining 2. Negative Staining 3. Gram's Staining 4. Hanging drop technique- Motility.	
4	. Preparation of Culture media -Peptone water,Nutrient broth and Nutrient Agar -MacConkey's Agar ,Sabroud's Agar Starch Agar ,Milk Agar	
5	Isolation, colony characters ,Gram's staining and motility of Bacteria isolated from- - Air-(solid impaction technique) - Water- (dilution and spreading plate technique.)	
6	Enumeration of Bacteria from soil by total viable count- Pour plate technique.	
7	Mounting and identification of mould- <i>Penicillium</i> , <i>Aspergillus</i>	

8	Study of mitosis	
9	Isolation of Chloroplast	
10	Study of effect of organic solvent and temperature membrane permeability	

Books recommended for Practicals

- 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.4 One Miner Practical (Cell biology and Microbiology)	05 M
Q.5 Spotting	10M
Q.6 Journal	10M

HEME 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)

HEME 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)

HEME OF MARKING (PRACTICAL)

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

Q. 2. Attempt any two.

(16 Marks)

- i.
- ii.
- iii..

Q. 3. Attempt any four.

(16 Marks)

- i.
- ii.
- iii..
- iv.
- v.
- vi.

SECTION II

Q. 4. Choose the correct alternative and rewrite the sentences. (8 Marks)

- 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. 5. Attempt any two.

(16 Marks)

- i.
- ii.
- iii..

Q. 6. Attempt any four.

(16 Marks)

- i.
- ii.
- iii..
- iv.
- v.
- vi.

Instructions to paper setters : Equal weight age should be given to all units

For Continues Internal Evaluation : (20 Marks)

Mandatory 1) Presenty----- (5 marks)

Select any one for B.Sc.I -----(15 marks)

- 1) Unit test
- 2) Home assignment
- 3) Project
- 4) Seminar

*Yet it is not finalized