

Shivaji University, Kolhapur



Accredited By NAAC With 'A' Grade

CHOICE BASED CREDIT SYSTEM SYLLABUS

Syllabus For

Bachelor of Science

Part – I (Sem I & II)

BIOTECHNOLOGY

(To be implemented from June, 2018 onwards)

Semester –I

Paper- I :- DSC-17-A Basics of Biotechnology-I

Credit - I		
	<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, peptidoglycan), biological functions of carbohydrates.</p>	15
Credit- II		
	<p>Protein :- Introduction, General structure of amino acids, Structure of peptide bond, Structural classification of amino acids based on R side chain, biological functions, structural levels of protein- Primary, Secondary, Tertiary (Myoglobin), Quaternary (Hemoglobin)</p> <p>Enzyme (basic concepts):- definition, concept of Holo enzyme, Apoenzyme, Coenzyme, Cofactor, Prosthetic group, Active site, Types- extracellular, intracellular, constitutive, inducible.</p>	15

Paper- II:- DSC-18-A Basics of Biotechnology-II

Credit-- I		
	<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, 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 – e.g. cholesterol Chemical and physical properties of lipid. Functions of lipids.</p>	16
Credit-- II		
	<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 – i) Compound Microscope ii) Electron Microscope- Scanning electron Microscope, Transmission Electron Microscope.</p> <p>Colorimeter:- Lambert-Beer's law principle, construction & working of Colorimeter</p>	14

Reference Books :-

- 1) Text book of biotechnology- Pradip parihar student ed. Jodpur (2004)
- 2) Biotechnology expanding horizons- B. D. Singh, Kalyani Publisher
- 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

Paper-III DSC-17-B :- Basics of Cell biology and Microbiology		
	Credit- I	
	<p>History of Cell biology :- 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. Structure and function of Cell organelles- ultra structure of cell membrane, cytosoles, golgibodies, 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
	Credit- II	
	<p>History of Microbiology :- 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 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 : i) Cell wall ii) Cell membrane iii) Capsule and slime layer iv) Flagella v) Pili vi) Nuclear material vii) Mesosome viii) Ribosome</p>	15
	Paper-IV DSC -18 B – Basics of Microbiology	
	Credit-I	
	<p>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. Methods for isolation of pure cultures- Streak plate, pour plate, spread plate. Microbial nutrition A. Microbial Nutrition 1) Nutritional requirements of microorganisms : Water; Micronutrients, Macronutrients- Carbon and Energy source; Oxygen and Hydrogen; Nitrogen, Sulphur and Phosphorous 2) Nutritional types of microorganism based on carbon and energy sources. Autotrophs- Photoautotrophs and Chemoautorpha, Heterotrophs- Photoheterotrophs and Chemoheterotrophs.</p>	15

	<p style="text-align: center;">Credit- II</p> <p>Concept of Sterilization:- Methods of sterilization a) Physical agents: i) temperature-dry heat, moist heat ii) Radiation- U.V, Gamma radiation iii) Bacteria proof filter- membrane filter. b) Chemical agents:- Phenol & Phenolic compounds, Alcohol, Heavy metals(e.g. mercury). c) Gaseous agents- Ethylene oxide, formaldehyde. Stains and staining procedures - A. Definition of dye and stain B. Classification of stains – Acidic, Basic and Neutral C. Principle, Procedure, Mechanism and application of staining procedures i) Simple staining ii) Negative staining iii) Differential staining : Gram staining and Acid fast staining.</p>	15
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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.

Practical syllabus

(Practical Examination to be conducted annually)

I) Lab.Exercercises in Cell Biology and Microbiology-

Sr No	Name of The Experiment
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.	Detection of enzyme activity- Amylase and Caseinase.
9.	Study of Mitosis.
10.	Isolation of Chloroplast.

II) Lab.Exercercises in Biochemistry

Sr No	Name of The Experiment
1	Preparation of Buffers
2	Preparation of Molar and Normal solutions - Molar solution of Sucrose - Normal solutions of alkali- NaOH and Acid- HCl
3	Study of Lambert-Beer's Law by Copper ammonia complex method.
4	Estimation of Glucose by DNSA Method(Graphical)
5.	Estimation of Protein- Casein by Biuret Method.(Graphical)
6.	Determination of Acid Value of Given oil sample.
7.	Isolation of Starch from Potato
8.	Isolation of Casein from Milk
9.	Estimation of DNA by Diphenyl Amine method.(by calculation)
10.	Estimation of RNA by Orcinol Method. (by calculation)
11.	Estimation of Reducing Sugar By Benedict's Method.

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) Chemical balance - 2
- 7) 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 of the practical examination.

(B) Each candidate must produce a certificate from the Head of the Department in her/his college, stating that he/she has completed in a satisfactory manner the practical course on lines laid down from time to time by 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% Practicals should be covered in practical examination.

- **OTHER FEATURES :**

- (A) LIBRARY :**

- Reference and Text Books, Journals and Periodicals, Reference Books. – List Attached

- (B) LABORATORY SAFETY EQUIPMENTS :**

- 1) Fire extinguisher
 - 2) First aid kit
 - 3) Fumigation chamber
 - 4) Stabilized power supply
 - 5) Insulated wiring for electric supply.
 - 6) Good valves & regulators for gas supply.
 - 7) Operational manuals for instruments.
 - 8) Emergency exits