



B
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SHIVAJI UNIVERSITY, KOLHAPUR.

Revised Syllabus of Bachelor of Science **Part - I (Sem.-I&II)**
(Entire) to be implemented from the academic year 2010-11
(i.e.June 2010) onwards.)

B. Sc. Semester- I
BIOTECHNOLOGY (ENTIRE)

Course Code	Title of the Course	Theory	Internal
BTE-101 Paper-I	Physical and Inorganic Chemistry	40	10
BTE-102 Paper-II	Basics in Physics	40	10
BTE-103 Paper-III	Plant Science	40	10
BTE-104 Paper-IV	Mathematical Methods	40	10
BTE-105 Paper-V	Biomolecules	40	10
BTE-106 Paper-VI	Basics in Cell Biology	40	10
BTE-107 Paper-VII	Basics in Microbiology	40	10
BTE-108 Paper-VIII	Computer Basics and Bioinformatics	40	10
BTE-109 Paper-IX	English for Communication-Paper I	40	10
BTE-111	Techniques in Chemistry	*Practical	-----
BTE-112	Laboratory Exercises in Microbiology	*Practical	-----
BTE-113	Laboratory Exercises in Plant Science	*Practical	-----
BTE-114	Methods in Mathematics and Statistics	*Practical	-----

[Note :- Practical Examination will be Annual]

BTE 101- Paper-I
Physical and Inorganic Chemistry

Topic No.		Lectures 45
	Unit- I	13
1.	Chemical Equilibrium	06
	1.1 Colligative properties- Definition, osmosis, osmotic pressure and reverse osmosis. 1.2 Common ion effect 1.3 pH and pOH, buffer capacity. 1.4 pH of buffers- Henderson equation for acidic and basic buffers with derivation. 1.5 Numerical problems.	
2.	Reaction Kinetics	07
	2.1 Introduction-Meaning and definitions of- rate constant, order and molecularity of reaction, activation energy. 2.2 Integrated rate expressions for zero, 1 st and 2 nd order reactions. 2.3 Characteristics of 1 st order reactions. 2.4 Catalysis- Definition, types of catalysis with example, characteristics of catalysis. 2.5 Elementary enzyme catalyzed reactions- Meaning and examples. 2.6 Numerical problem	
3.	Unit- II	11
	Thermodynamics	
	3.1 Introduction- Reversible and irreversible processes, internal energy. 3.2 Enthalpy, heat of reaction and its types, First Law- Statement and mathematical expression, Hess law. 3.3 Measurement of ΔH , Trouton's rule, Kirchoff's equation. 3.4 Second law- Statement, concept of entropy (Criteria for spontaneous and non-spontaneous processes). 3.5 Third law-Absolute entropies and their uses. 3.6 Gibbs and Helmholtz free energy functions-Criteria for thermodynamic equilibrium and spontaneity. 3.7 ΔG and K , ΔG and work function.. 3.8 Relation between ΔH and ΔG (Gibbs-Helmholtz equation). 3.9 Phase equilibria- Clapeyron-Clausius equation and its applications. 3.10 Numerical problems.	

	Unit- III	
4.	Electrochemistry (Reduction potentials to be used) 4.1 Introduction- Conductance- Definition and types. 4.2 Kohlrausch law- Statement and its applications. 4.3 Galvanic cells, half-cell potentials, emf.- meaning and definition. 4.4 Thermodynamics of electrode potentials, Nernst equation and its derivation, K from cell emf, determination of ΔG , ΔH and ΔS . 4.5 Types of electrodes, construction and working of calomel and glass electrodes. 4.6 Numerical Problems.	10
	Unit- IV	
5.	Structure and Bonding. 5.1 Introduction- Definition and formation of ionic and covalent bond with examples, e.g. NaCl, KCl, HCl, CH ₄ , Cl ₂ , H ₂ . 5.2 VBT- Postulates. 5.3 Cocept of Hybridization, sp, sp ² , sp ³ hybridization with respect to C ₂ H ₂ , C ₂ H ₄ , CH ₄ (Along with consequences with respect to bond length, bond angle, bond energy and shape of the molecule. 5.4 Dipole moment- Definition and significance. 5.5 Hydrogen bonding- Definition, intra and intermolecular hydrogen bonding with suitable example (Proteins, alcohols, Hydroxy acids, phenols). 5.6 Van der Waal's forces. 5.7 Essential and trace elements in biological processes (Mg and Fe). 5.8 Ionic solids- Definition and general characteristics, comparision between, ionic and covalent compounds.	11

References-(Use recent Editions)

- 1) University general chemistry - C. N. R. Rao, Macmillan.
- 2) Physical chemistry - R. A. Alberty, Wiley Eastern Ltd.
- 3) Quantum chemistry including molecular spectroscopy- B. K. Sen.
- 4) Organic chemistry - D. J. Cram and G. S. Hammond (Mcgraw-Hill).
- 5) A Guide-book to mechanism of organic chemistry-Peter Sykes-6th Edition.
- 6) Theoretical principles of inorganic chemistry- G.S. Manku
- 7) Physical chemistry by Sharma and Puri
- 8) Instrumental methods of chemical analysis- Chatwal & Anand
- 9) Instrumental methods of chemical analysis- B. K. Sharma
- 10) Organic chemistry VOL-II 5th Edition- I. L. Finar
- 11) An introduction to electrochemistry- Samuel Glasstone
- 12) The elements of physical chemistry – P.W. Atkins.

- 13) Essential of physical chemistry- B .S. Bahel. & G. D.Tuli.
 14) Principels of physical chemistry – S.H Maron & Pruton
 15) Concise inorganic chemistry – J.D. Lee
 16) Organic chemistry – Morrison & Boyd.

Topic No.	Lectures 45
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BTE 102 – (Paper-II)
Basics in Physics

1	<p style="text-align: center;">Unit- I</p> <p>Elasticity: Introduction, definitions of stress and strain in solids, types of strain and stress, Hooks law, definition of Young's modulus (Y), bulk modulus (K) and modulus of rigidity (η), relation between Y, η and K (without derivation), stress strain curve, importance of elasticity .</p>	7
2	<p style="text-align: center;">Unit- II</p> <p>Viscosity and Surface Tension Introduction, streamline and turbulent flows, concept of viscosity, coefficient of viscosity, effect of temperature and pressure on viscosity of liquids, concept of pressure energy and Bernoulli's theorem (without proof), Application of Bernoulli's theorem-venturimeter, Pitots tube (working only), review of surface tension, surface energy, capillary action, angle of contact, wetability, relation between surface tension, excess pressure and curvature (without derivation), factors affecting surface tension, methods of measurement of surface tension- Jaegers method (formula and working only), applications of surface tension.</p>	16
3	<p style="text-align: center;">Unit- III</p> <p>Sound waves: Introduction, mechanical and electromagnetic waves, transverse and longitudinal waves with characteristics, principle of superposition of waves (Statement only), phenomenon of beats and expression for frequency of beats, application of beats, audible, ultrasonic and infrasonic waves, properties of ultrasonic waves and their applications, Doppler effect and its applications.</p>	8
4	<p style="text-align: center;">Unit- IV</p> <p>Thermodynamics and Thermometry: Introduction, various temperature scales (Kelvin, Celsius, Fahrenheit, Reaumer and Rankin), thermal energy, platinum resistance thermometer-principle, construction and working,</p>	14

	seebeck effect (Neutral temperature, inversion temperature, thermo emf, thermo current), thermocouple, application of thermocouple as thermometer, thermister- NTC, PTC, application of thermister as thermometer. Thermodynamic system and thermodynamic variable (P,V,T and S), thermodynamic equilibrium, heat and work, First law of thermodynamics, discuss thermodynamic process - isothermal change, isochoric change, isobaric change, adiabatic change, Second law of thermodynamics, Carnot's engine and its efficiency, entropy, Andrews experiment, definition of critical isotherm, critical temperature (Tc), critical pressure (Pc), liquification of gases.	
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References:

1. Physics by Devid Hallday Roberet Resnik, (Vol-I and Vol-II) Wiley Eastern limited
2. Fundamental of mechanics, S. K. Saxena, Himalaya Publications
3. Perspectives of modern physics, Aurther Beiser, McGrawHill Publication
4. Heat and thermodynamics, Zemansky, McGrawHill Publication
5. Fundamentals of optics, Jenkins white, McGrawHill Publication
6. Text book of optics, N. Subrahmanyam Brijlal, S. Chand and Company Limited
7. Optics by Ajoy Ghatak, Tata McGrawHill Publication
8. Properties of matter, D. S. Mathur, Sha, alal Charetible trust
9. Solar energy, Suhas Sukatme, Tata McGrawHill Publication
10. Principle of electronics, V. K. Mehta, S. Chand and Company Limited
11. Digital principles and application, Malvino and Leach, Tata McGrawHill Publication
12. Elements of spectroscopy, Gupta, Kumar, Sharma, Pragati Prakashan
13. Introduction to atomic spectra, H. E. White, McGrawHill Publication
14. Biophysics, Vastala Piramal, Dominent Publishers and Distributor

BTE 103, (Paper-III) **Plant Science**

Topic No.		Lectures
	Unit- I	45
		12
1.	Plant Diversity	
	1.1 General Classification of Plant Kingdom.	01
	1.2 Algae – General characters and economic importance	02
	1.3 Fungi – General characters and economic importance	02
	1.4 General account of Lichens and its importance	01
	1.5 Bryophytes – General characters and economic importance	02
	1.6 Pteridophytes – General characters and economic importance	02
	1.7 Gymnosperms – General characters and economic importance	01
	Angiosperms – General characters and economic importance	01
	Unit- II	10
	Plant Taxonomy	

	2.1 Aims, objectives and functions of taxonomy.	02
	2.2 Binomial nomenclature and its significance	03
	2.3 Principles of ICBN	02
	2.4 Study of outline of Bentham and Hooker's system of classification	03
	Unit- III	10
3.	Organization Of Plant Body	
	3.1 Plant Tissues- Simple and complex	02
	3.2 Typical Flower – Floral whorls and functions.	01
	3.3 Development of male and female gametophyte.	02
	3.4 Pollination- types and advantages, fertilization	02
	3.5 Fruit- Formation, types:- Simple, aggregate, composite (one example of each), Parthenocarpy	02
	3.6 Seed –Formation and structure.	01
	Unit- IV	13
4.	A) Internal Organization Of Dicot and Monocot	05
	4.1 Primary structure, normal secondary growth and annual rings	03
	4.2 Periderm formation	02
	B) Plant Physiology	08
	4.3 Growth- Phases, growth curve	01
	4.4 Phytohormones- Role and practical applications.	02
	4.4 Photoperiodism	02
	4.5 Vernalization	01
	4.6 Dormancy, breaking of dormancy, germination, vigour and viability	02

Reference Books:

1. Devlin R.M. Fundamentals of plant physiology (MacMillan)
2. Malik C.P. Plant physiology, Kalyani publishers
3. Dube H.C. Text of fungi, bacteria and viruses.
4. Bold H.C. The Plant kingdom, Prentice - Hall India
5. Chopra G.L. i. Class book of algae, ii. Class book of fungi
6. Dutta A.C. A Class book of botany, Oxford University Press
7. Kumar H.D. Biodiversity and sustainable development (Oxford & IBH)
8. Mukherji H. Plant groups (New central book depot)
9. Parihar N.S. An Introduction to embryophyta (Central book depot)
10. Vasishtha P.C. Botany for degree students-Gymnosperms
11. Naik V.N. Taxonomy of angiosperms
12. Lawrence G.H. Taxonomy of flowering plants
13. Chopra G.L. Angiosperms (Systematic and life cycle)
14. Shivarajan V.V. Introduction to principles of taxonomy.
15. Pandey B.P. Text book of angiosperms
16. Eames A.J. and An introduction of plant anatomy, Mac Daniels L.H.

17. Esau K. Anatomy of seed plants
18. Esau K. Plant anatomy
19. Fahn A. Plant anatomy
20. Mathur R.C. Systematic botany

BTE104 – (Paper-IV)
Mathematical Methods

Topic No.		Lectures 45
1	<p style="text-align: center;">Unit- I</p> <p>Complex Numbers</p> <p>1.1 Introduction</p> <p>1.2 Operations on complex numbers.</p> <p>1.3 Complex conjugate, Modules and argument of complex number and simple examples on it.</p> <p>1.4 DE MOIVRE’S Theorem.</p> <p>1.5 Simple examples on above theorem</p> <p>1.6 n^{th} roots of a complex number and simple examples on it.</p>	10
2	<p style="text-align: center;">Unit- II</p> <p>Matrices</p> <p>2.1 Definition and types of Matrices</p> <p>2.2 Algebra of Matrices (addition, subtraction, scalar multiplication and multiplication of matrices)</p> <p>2.3 Examples on operation of Matrices</p> <p>2.4 Inverse of a matrix by a ad joint method</p> <p>2.5 Rank of a Matrix (Definition) and examples.</p> <p>2.6 System of Linear equation.</p> <p>i) Non homogenean</p> <p>ii) Homogenean</p> <p>With examples</p> <p>2.7 Eigen values and eigen vectors with simple examples.</p>	15
3	<p style="text-align: center;">Unit- III</p> <p>Differential equation</p> <p>3.1 Defination of ordinary differential equation and degree, order of differential equation</p> <p>3.2 Exact differential equation with simple examples.</p> <p>3.3 Linear differential equation $\frac{dy}{dx} + py = Q$ method of solution with simple examples.</p> <p>3.4 Bernoulli’s differential equation with examples.</p>	10

	3.5 Application of differential equation i) Growth and decay problems ii) Newton's law of cooling with examples.	
4	Unit- IV Partial differentiation 4.1 Introduction 4.2 Simple examples on evaluation of partial derivatives 4.3 Composite function with examples 4.4 Homogenous function (Definition) 4.5 Euler's theorem for first and second order. 4.6 Simple examples on above theorems. 4.7 Extreme values with examples. 4.8 Lagrange's method of undetermined multipliers (with proof) 4.9 Examples on above method.	10

Recommended book for mathematics:

- 1) Mathematics for biologists by Sujata Tapare (vision publication).

Reference books:

- 1) Algebra and geometry by G. V. Khumbojkar.
- 2) Calculus and differential equation (Phadake prakashan).
Prof. L. G. Kulkarni, Dr. P. B. Jadhav

BTE105 – (Paper-V) **Biomolecules**

Topic No		Lectures 45
1	Unit- I Origin of life: (Prebiotic world & chemical evolution), Urey Miller's experiment, unicellular organisms, multicellular organisms, Concept of biomolecules, molecular interactions biological functions, P^H , pK (H-H Equation), buffer (Acidic buffer, basic buffer, biological buffer systems)	11
	Unit- II Nucleic acids: Nucleosides, nucleotides, polynucleotide, DNA and its	

2	different forms (A, B, C, D, E, & Z), RNA and its types. Forces stabilizing nucleic acid structure.	11
3	<p style="text-align: center;">Unit- III</p> <p>Carbohydrates: Classification, glyceraldehydes, simple aldose & ketoses, confirmation of D-glucose, biological importance of carbohydrates, reactions of monosaccharide (Oxidation, reduction, alkali, osazone), monosaccharide other than glucose (Fructose), glycosidic bond, disaccharides (Sucrose, maltose, lactose), polysaccharides (Starch, glycogen, peptidoglycan.)</p>	12
4	<p style="text-align: center;">Unit- IV</p> <p>Lipids: Classification, fatty acids (Physical properties, chemical properties, sap value, acid value, iodine no., rancidity); Glycolipid, (Lecithin, cephalin, plasmogens, cardiolipins); Sphingolipids (Sphingomyelin, cerebrosides, gangliosides); Derived lipid, behavior of lipid in water, bile acid, bile salt, lipoprotein, liposome</p>	11

References:-

- 1) Biochemistry – Nelson & Cox
- 2) Biochemistry - Stryer
- 3) Enzymes - Trevor Palmer
- 4) Biochemistry - Voiet & Voiet
- 5) Biochemistry - J. L. Jain
- 6) Basic Biophysics- M. Daniel
- 7) Biochemistry - Powar and Chatwal
- 8) Protein Purification- Harris and Angel
- 9) Practical biochemistry – Keith Wilson And Walker
- 10) Principles of Biochemistry - T. N. Pattabriraman.
- 11) Biochemistry 3rd Edition – Hames & Hopper.
- 12) General Biochemistry – J. H. Well.
- 13) Biochemistry – J. H. Ottaway & D. K. Apps
- 14) Biochemistry – Trchan
- 15) Text Book of Biochemistry- R. A. Joshi.
- 16) Biochemistry – U. Satyanarayanan
- 17) Biochemistry a Functional Approach – Robert W McGilvery & Goldstein
- 18) Text Book of Biochemistry – A.V. S. S. Rama Rao
- 19) Clinical Biochemistry –Praful B. Godkar.

BTE 106-(Paper-VI) **Basics in Cell Biology**

Topic No		Lectures 45
1	<p style="text-align: center;">Unit- I</p> <p>Cell structure</p> <p>1.1 Cell theory-Definition, discovery, three assumptions of cell theory, exceptions, organismal theory , protoplasm theory</p> <p>1.2 Prokaryotic and eukaryotic cell, general structures of mycoplasma and blue green algae. General structure of plant & animal cell.</p> <p>1.3 Ultra structure & functions of cell organelles Mitochondria Chloroplast E.R. Golgi apparatus, complex Lysosome Peroxisome Ribosomes Proteosomes.</p>	11
2	<p style="text-align: center;">Unit- II</p> <p>Nucleus</p> <p>2.1 Ultra structure of nucleus</p> <p>2.2 Nuclear membrane, nucleopore complex,</p> <p>2.3 Chromosomes-organization, chromatin-euchromatin and heterochromatin</p> <p>2.4 Nucleosome- unit of chromatin</p> <p>2.5 Giant chromosomes-polytene and lampbrush</p>	11
3	<p style="text-align: center;">Unit- III</p> <p>Cytoskeletal assembly</p> <p>3.1 Introduction</p> <p>3.2 Cytoskeletal elements</p> <p>3.3 Microtubules-occurrence, structure, chemical composition, microtubule associated proteins, HMW proteins, DAU proteins MTOC , assembly and disassembly of microtubules, functions</p> <p>3.4 Microfilaments- occurrence, structure, chemical composition, functions</p> <p>3.5 Intermediate filaments(IF)- -occurrence, structure, chemical composition, types of IF, functions</p> <p>3.6 Organization of cilia and flagella</p>	12
4	<p style="text-align: center;">Unit- IV</p> <p>Membrane transport</p> <p>4.1 Membrane structure(in brief)</p> <p>4.2 Types of membrane transport Passive transport-simple diffusion, facilitated diffusion, osmosis. Active transport-primary and secondary transport Bulk transport-endocytosis and exocytosis</p>	11

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References:-

- 1) Molecular biology of cell-Albert
- 2) Molecular biology & cell biology – Lodish et al
- 3) Cell biology –De Robertis
- 4) Cell biology-Genetics, molecular biology-P.S. Warma & Agarwal
- 5) Genes Lewin
- 6) Cell biology –Gerald karp
- 7) Practical biochemistry – Keith, Wilson and Walker

BTE 107- (Paper-VII)
Basics in Microbiology

Topic No		Lecturers 45
1	<p style="text-align: center;">Unit- I</p> <p>History and scope of microbiology Microscopy-Antony Van Leeuwenhock, Robert Hooke Spontaneous generation theory Important contributions of -Louis Pasteur, Robert Koch, Joseph Lister, Alexander Flemming, Edward Jenner, John Tyndall Definition of microbiology and introduction to applied branches of microbiology- air, soil, water, sewage, food, milk, industrial, medical, biotechnology Major microbiological institutes in India</p>	10
2	<p style="text-align: center;">Unit- II</p> <p>Cytology of typical bacterial cell a] Morphology, size & arrangement of bacteria b] structures & functions of capsule & slime layer, flagella, pili, cell wall, cytoplasmic membrane, nuclear material, ribosomes, mesosomes, reserve food materials-volutin granules, PHB, glycogen, bacterial endospores Differences between prokaryotic & eukaryotic cells</p>	12
3	<p style="text-align: center;">Unit- III</p> <p>Viruses: General characteristics of viruses, Archaeobacteria, Rickettsiae, Actinomycetes, Chlamydia, Mycoplasma. cultivation of viruses life cycle of bacteriophages lytic cycle of T4 phage</p>	13

4	<p style="text-align: center;">Unit- IV</p> <p>Pure cultures techniques a] selective methods-chemical, physical & biological methods of selection b] methods of isolating pure cultures-streak, pour& spread plate</p> <p>Control of microorganisms a] definition of sterilization, disinfectant, antiseptics, germicide, antimicrobial agents b] physical agents-temperature-dry heat, moist heat, desiccation, osmotic pressure, radiations, filtration c] Chemical agents-phenol & phenolic compounds, alcohols, halogens, heavy metals & their compounds, gaseous agents</p>	10
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References:

- 1) General microbiology-Stanier
- 2) Introduction to microbiology-Ingraham
- 3) Brock biology of microorganisms-Madigan et al
- 4) Fundamentals of microbiology-Frobisher
- 5) Microbiology-Pelczar
- 6) General microbiology –Pawar & Daginawala
- 7) Text book of microbiology-Ananthanarayan

BTE 108 – (Paper-VIII)
Computer Basics and Bioinformatics

Topic No.		Lectures 45
1	<p style="text-align: center;">Unit- I</p> <p>Operating System: Definition, functions, process management, multiprogramming, multitasking, multiprocessing, time sharing, memory management, uniprogramming, memory model, multiprogramming, memory model, virtual memory, security, some popular O.S., Ms-DOS, Microsoft Windows, Unix</p>	12
2	<p style="text-align: center;">Unit- II</p> <p>Office Operation: Microsoft Word-concept of toolbar, character, paragraph & document formatting, drawing toolbar, Header, Footer, Document editing, Page setup, short cut Keys, Text and graphics Microsoft Excel-Concept of spreadsheet, Creating worksheet, Well formatted documents, concept of row, column, cell and formula bar, using function, using shortcuts, charts, conditional formatting PowerPoint-Slide presentation, slide layout, Design, custom animation.</p>	12
	Unit- III	

3	Database Management System -Need of database, data models- Hierarcical, Network, Relational, Object Oriented, Main components of DBMS-DDL, DML.	11
4	<p style="text-align: center;">Unit- IV</p> Bioinformatics -Introduction, Nature of Biological data, characteristics, Tools-Homology and similarity, Protein function analysis, structure analysis, sequence analysis, BLAST, FASTA, EMBOSS, Clustalw , Applications.	10

Reference Books

- 1) Computer Fundamentals by P. K. Sinha
- 2) C Application programs and Projects by Pramod Vasambekar
- 3) Use of Computer from Vision Publication
- 4) Let Us C by Kanetkar
- 5) Ansi C by Balgurusami

BTE 109 –Paper IX

English for Communication Paper-I

SEMESTER: I

Section I :- Communication Skills

- Unit 1 : How to Express Your Views and Opinions.
- Unit 2 : Talking About Personal Experiences.
- Unit 3 : Preparing a C.V. and Writing a Letter of Application

- ### **Section II :- Reading Comprehension Skill**
- Unit 7 : Forgetting -Robert Lynd
- Unit 8 : Wife's Holiday -R.K. Narayan
- Unit 9 : Man in the Future -Bill Williams
- Unit 10 : Prafulla Chandra Ray

Pattern of Question Paper Sem- I			
Q.1)	A)	Complete the following by choosing the correct option (Set to be on Reading skill Units)	05
	B)	Textual vocabulary Items Synonym – 1 Antonym – 1 Pairing the words (With meaning) – 1 Change the Grammar class-1 Word-formation-Affixation-1	05
Q.2	A)	Answer any Three of the following in 2 to 3 sentences (Out of 4) 1. 2. 3. 4.	06
	B)	Write short notes on any ONE of the following (Out of 2)	04
Q.3	A)	Express your agreement or disagreement on the following topics.	05
		(Unit no 1) B) Express your opinions or views on the following topic in 5 to 6 sentences.	05
Q.4		(Unit no 2)A) Narration OR	
		Piece of conversation regarding personal problems / experiences	05
		(Unit No.3) B) Write an application letter OR C.V. <i>Note:- A question should be set either on writing an application letter or C.V. only</i>	05

BTE 111 -Techniques in Chemistry

Sr. No.	Name of the Practical	Practicals
1.	Conductometry- (Any one)	01
	1.1 Determination of dissociation constant of a weak acid and study of effect of substituent on dissociation constant of weak acid.	01
	1.2 Verification of Onsager equation and to determine μ of strong electrolyte.	
2.	Chemical Kinetics	01
	2.1 Acid catalyzed hydrolysis of methyl acetate.	01

	2.2 Activation energy for an acid catalyzed hydrolysis of methyl acetate.	
3.	pH – metry 3.1 Determination of pH of fruit juice and soil sample. 3.2 Verification of Henderson equation by using acidic buffers.	01
4.	Thermo chemistry – Determination of heat of ionization of a weak acid.	01
5.	Organic Preparations-(Any Two) 5.1 m-dinitrobenzene 5.2 Methyl salicylate 5.3 Nitro salicylic acid	01
6.	Organic Estimations- (Any three) 6.1 Polarimeter – Determination of specific rotation of sucrose sample and hence Determination of unknown sucrose concentration from the sample. 6.2 Estimation of sap value of given oil sample. 6.3 Estimation of amount of sucrose from sample using Fehling reagent. 6.4 Estimation of acid value of oil sample	03
7.	Standardization of solutions 7.1 Preparation of standard potassium dichromate solution and determination of its normality using oxalic acid. 7.2 Preparation of dilute solution from given stock solution.	02
8.	Inorganic preparations (Any one) 8.1 Tetraamino copper (II) sulphate 8.2 Potassium trioxalato aluminate (III)	01
9.	Inorganic Estimation :- Estimation of amount of magnesium from talcum powder by complexometric titration.	01
10.	Verification of Beer-Lambert's Law using copper-ammonia complex.	01

Reference:- Chemistry

Text book of practical organic chemistry (4th Edition, Longman) – A .I. Vogel

BTE - 112 Laboratory Exercises in Microbiology

Sr. No.	Name of the Practical	Practicals
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		15
1.	Use , care and study of compound microscopy.	01
2.	Demonstration (Principle, working, constriction, & application) of <ol style="list-style-type: none"> 1. Hot air oven 2. Autoclave 3. Incubator 4. pH meter 5. Calorimeter 6. Seitz filter/syringe filter 7. Laminar air flow 8. Quebec colony counter 	01
3.	3.1 Microscopic examination of bacteria <ol style="list-style-type: none"> a. Monochrome staining. b. Gram staining c. Negative staining. d. Capsule staining. e. Cell wall staining. 3.2 Mounting and identification of Mold. <ol style="list-style-type: none"> a. <i>Aspergillus</i> b. <i>Penicillin</i> c. <i>Mucor</i> d. <i>Rizopus</i> 	04
4.	Preparation of culture media. <ol style="list-style-type: none"> a. Bacterial- <ol style="list-style-type: none"> i) Peptone water. ii) Nutrient broth. iii) Nutrient agar. iv) Mac Conkey's agar. b. Fungal- <ol style="list-style-type: none"> i) Sabouraud's agar ii) PDA 	02
5.	Isolation & enumeration of bacteria <ol style="list-style-type: none"> a. Streak plate technique. b. Spread plate technique Pour plate technique 	02
6.	Observation of motility by hanging drop techniques.	01
7.	To study growth curve of bacteria.	01
8.	Isolation, colony character, Gram staining & motility of <i>E. coli</i> , <i>Bacillus</i> .	02
9.	Visit to dairy industry	01

BTE 113- Laboratory Exercises in Plant Science

Sr. No.	Name of the Practical	Practicals 15
1.	Study of algae (<i>Nostoc</i> , <i>Sargassum</i> , <i>Spirulina</i>) & fungi (<i>Yeast</i> , <i>Puccinia</i> , <i>Tricoderma</i>)	02
2.	Study of bryophyte (<i>Funaria</i> , <i>Riccia</i> , <i>Anthoceros</i>) & pteridophyte (<i>Selaginella</i>)	02
3.	Study of gymnosperms (Pinus) & angiosperms (<i>Sunflower</i> , <i>Maize</i>)	02
4.	Plant anatomy – Dicot and monocot root, stem, leaf.	02
5.	Study of apical meristem (Stem and root)	01
6.	Study of typical flower & inflorescence	01
7.	Study of fruit types as per theory and seeds (Monocot & dicot)	01
8.	Breaking of seed dormancy	01
9.	Detection of seed viability and vigour.	01
10.	Bioassay of IAA, GA and cytokinines	02

BTE 114 - Methods in Mathematics and Statistics

Sr. No.	Name of the Practical	Practicals 15
	(Mathematics)	
1.	Applications of differential equation i) Growth & decay ii) Newton's law of cooling	02
2.	Eigen values & Eigen vectors	02
3.	Complex numbers: Geometrical representation of complex numbers (Argand's diagram) Graphical representation of $\overline{Z}, Z_1 + Z_2, Z_1 - Z_2, Z_1 \cdot Z_2, \frac{Z_1}{Z_2}$ $ Z - a = b.$	02
	(Statistics)	
4.	Frequency distribution – Graphical, Histogram, ogive curve [less & greater than].	02
5.	Measures of central tendency (Grouped and ungrouped) A. M., Median, Mode.	02
6.	Measures of Dispersion – Range, s. d., C. V. combined s. d.	01

7.	Correlation, Regression. Scattered diagram, Karl Pearson's correlation coefficient, eq ⁿ of Regression line.	02
8.	Testing of Hypothesis: Large sample test: Normal, proportion. Small sample test.: χ^2 , t, f.	02

Nature of question paper:

Annual Practical Examination

- A) Every candidate must produce a certificate from the Head of the Department in his college, stating that he has completed in a satisfactory manner a practical course on the lines laid down from time to time by the Academic Council on the recommendations of the Board of Studies and that the laboratory Journal has been properly maintained. Every candidate must have recorded his/her observations in the Laboratory journal and written a report on each exercise performed. Every journal is to be signed periodically by a member of the teaching staff and certified by the Head of the Department at the end of the year. Candidates are to produce their journals at the practical examination and such journals will be taken into account by the examiners in assigning marks.
- B) The practical examination will be of 6 hours duration and will be conducted on two successive days (3 hours per day)

Distribution of Marks for Practical Examination:

1. Biochemical Techniques:

One major experiment	10 marks
One minor experiment	05 marks
 2. Microbiological Techniques:

One major experiment	10 marks
One minor experiment	05 marks
 3. Biophysics/Biostat/computer 10 marks
 4. Oral on Practicals 05 marks
 5. Journal 05 marks
- Total Marks: 50 marks

Note: Experiments may be arranged as per convenience of the examiner.

B. Sc.Part -II Semester- II
BIOTECHNOLOGY (ENTIRE)

Course Code	Title of the Course	Theory	Internal
BTE-201 Paper-X	Organic and Inorganic Chemistry	40	10
BTE-202 Paper-XI	Applied Physics	40	10
BTE-203 Paper-XII	Animal Science	40	10
BTE-204 Paper-XIII	Statistical Methods	40	10
BTE-205 Paper-XIV	Proteins and Enzymes	40	10
BTE-206 Paper-XV	Advances in Cell Biology	40	10
BTE-207 Paper-XVI	Techniques in Microbiology	40	10
BTE-208 Paper-XVII	Computer Programming	40	10
BTE-209 Paper-XVIII	English for Communication- Paper-II	40	10
BTE-211	Techniques in Biochemistry	*Practical	-----
BTE-212	Laboratory Exercises in Cell Biology	*Practical	-----
BTE-213	Laboratory Exercises in Animal Science	*Practical	-----
BTE-214	Computer Applications in Biology	*Practical	-----

[Note :- Practical Examination will be Annual]

BTE 201- Paper-X
Organic and Inorganic Chemistry

Topic No.		Lectures 45
	Unit- I	
1.	Mechanistic Basis of Organic Reactions	13
	1.1 SN ¹ and SN ² mechanisms (Hydrolysis of t-butyl halide and	

	primary alkyl halide) with energy profile diagram. 1.2 Elimination reactions- E1 and E2 mechanisms (Dehydration of alcohol), Hoffman's and Saytzeff's rules- statements and justifications. 1.3 Addition reactions- Electrophilic addition reactions in alkenes (Markovnikoff and anti-Markovnikoff additions), nucleophilic addition reactions of carbonyl compounds (cyanohydrin formation). 1.4 Concept of an aromaticity. 1.5 Mechanism of SE reactions in benzene- Nitration, sulphonation, halogenation, diazotization, Friedel-Craft's alkylation and acylation reactions. 1.6 Orientation effects as exemplified by various functional groups. (Nitro and -OH group) 1.7 Structure- reactivity correlation w.r.t. inductive, mesomeric, and steric effects. 1.8 Tautomerism.	
	Unit-II	10
2.	Stereochemistry	
	2.1 Geometrical isomerism in alkenes. 2.2 Optical activity-Polarimeter, specific rotation. 2.3 Chirality- Chiral molecules, symmetry elements, asymmetric carbon, compounds with one and two chiral centers, diastereomers. 2.4 E-Z and R-S nomenclatures. 2.5 Stereospecific and stereoselective reactions with example of an enzymatic reaction. 2.6 Numerical Problems	
	Unit- III	
3.	Chemistry of Natural Products	05
	3.1 Terpenoids -Isoprene rule, structure determinations of citral. 3.2 Natural Pigments - Carotenoids and their functions in Plants, structural details of chlorophyll. 3.3 Alkaloids - Basic structure, classification with suitable examples..	
4.	Chromatography	06
	4.1 Introduction- Definition, classification. 4.2 Principle, Technique and application of paper chromatography and TLC.	
	Unit- IV	

5.	UV-Visible Spectroscopy 5.1 Introduction. 5.2 Electronic Transitions and designation of UV-bands. 5.3 General applications, spectrum, isolated double bonds, conjugated dienes, carbonyl compounds, aromatics. 5.4 Analytical uses. 5.5 Lambert-Beer's law 5.6 Instrumentation with respect to colorimeter and single beam spectrophotometer. 5.7 Applications of UV and Visible spectroscopy.	11
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References-(Use recent Editions)

- 1) University General Chemistry - C. N. R. Rao, Macmillan.
- 2) Physical Chemistry - R. A. Alberty, Wiley Eastern Ltd.
- 3) Quantum Chemistry Including Molecular Spectroscopy- B. K. Sen.
- 4) Organic Chemistry - D. J. Cram and G. S. Hammond (Mcgraw-Hill).
- 5) A Guide-book to Mechanism of Organic Chemistry-Peter Sykes-6th Edition.
- 6) Theoretical Principles of Inorganic Chemistry- G.S. Manku
- 7) Physical Chemistry by Sharma and Puri
- 8) Instrumental methods of chemical analysis- Chatwal & Anand
- 9) Instrumental methods of chemical analysis- B. K. Sharma
- 10) Organic Chemistry VOL-II 5th Edition- I. L. Finar
- 11) An introduction to electrochemistry- Samuel Glasstone
- 12) The elements of physical chemistry – P.W. Atkins.
- 13) Essential of physical chemistry- B .S. Bahel. & G. D.Tuli.
- 14) Principels of Physical Chemistry – S.H Maron & Pruton
- 15) Concisein Inorganic chemistry – J.D. Lee
- 16) Organic Chemistry – Morrison & Boyd.

BTE 202 – Paper-XI **Applied Physics**

Topic No.	SECTION-I Topics	Lectures 45
	Unit-I	
1	Optics correlated with microscopy: Concept of interference and diffraction, Diffraction gratin (Description only), concept of polarization and plane polarized light, production of polarized light by absorption, reflection, refraction and scattering, Nicol prism, definition of optical activity, LASER- LASER action (Energy level diagram), properties of LASER, applications of LASER.	10
	Unit- II	
2	Bioelectricity Introduction, electricity observed in living systems-examples, origin of bioelectricity, resting potential and action potential, Nernst equation, conduction velocity, origin of compound action potential, Electrocardiogram (ECG), Electroencephalogram (EEG), Electromyogram (EMG), Electroculogram(EOG),	13
	Unit- III	
3	Semiconductor Devices and Digital Electronics Light Emitting Diode (LED), seven segment display, photodiode, optocoupler, spectral distribution of solar energy, solar cell-construction, working efficiency and fill factor, applications of solar cell. Binary and BCD number system, Basic logic gates OR, NOR, AND, NANA and NOT, Demorgans theorem, various waveforms used in electronics- square wave, sine wave, triangular wave, saw tooth wave and stairs case.	10
	Unit- IV	
4	Atomic structures and X-rays Introduction, J. J. Thomson atomic model, Rutheford atomic model and Bohr model, Limitations of Bohr atomic model, Energy level diagram of Hydrogen atom,, Quantum numbers, Nuclear models and forces(Liquid drop modem and shell model), production of x-rays and its properties, Continuous and characteristics X-ray spectrum, Brags law, Applications of X-rays	12

References:

1. Physics by Devid Hallday Roberet Resnik, (Vol-I and Vol-II) Wiley Eastern limited
2. Fundamental of Mechanics, S.K.Saxena,Himalaya Publications
3. Perspectives of modern physics, Aurther Beiser, McGrawHill Publication
4. Heat and Thermodynamics,Zemansky, McGrawHill Publication
5. Fundamentals of optics,Jenkins white, McGrawHill Publication
6. Text book of optics, N.Subrahmanyam Brijlal, S.chand and Company Limited
7. Optics by Ajoy Ghatak ,Tata McGrawHill Publication
8. Properties of Matter, D.S.Mathur,Sha,alal Charetible trust
9. Solar Energy, Suhas Sukatme,Tata McGrawHill Publication
10. Principle of electronics, V.K.Mehta, S.chand and Company Limited
11. Digital Principles and application, Malvino and Leach,Tata McGrawHill Publication
12. Elements of Spectroscopy, Gupta,Kumar,Sharma, Pragati Prakashan
13. Introduction to Atomic spectra, H.E.White ,McGrawHill Publication
14. Biophysics, Vastala Piramal, Dominent Publishers and Distributor

BTE 203 – Paper-XII
Animal Science

Topic No.		Lectures 45
	Unit- I	12
1.	1.1. General classification of animal kingdom. 1.2. Non-chordates –Study of phylum Porifera, Ceolenterata, Platyhelmenthes, Nemathelmenthes, Arthropoda, Mollusca & Echinodermata – General characters with representative examples- Sycon, Hydra, Liver fluke/ Taenia, Earthworm / Nereis, Cockroach, Pearl oyster / Pila, Starfish 1.3. Chordates:- Study of class Pisces, Amphibia, Reptilia & Mammalia – General characters with representative examples – Lebeo, Frog, Cobra, Alligator, Fowl and Rat	02 06 04
	Unit- II	11
2.	Host Parasite Relationship	
	2.1 Protozoan parasite- Plasmodium 2.2 Nematode parasite- Ascaris 2.3 Plathelminthes parasite- Liver fluke, & Tape worm- Teania solium	02 03 06
	Unit- III	12
3.	3.1 Tissues i) Epithelial ii) Muscular iii) Nervous iv) Connective tissue- Blood (Plasma, Serum, Clotting), Bone, Cartilage.	05

	3.2. Histological Architecture i) Skin ii) Tooth iii) Liver iv) Kidney v) Uterus	07
	Unit- IV	10
4.	Applied zoology 8.1 Vermiculture 8.2 Apiculture 8.3 Sericulture 8.4 Pearl culture 8.5 Pisci culture	 02 02 02 02 02

Reference Books :

1. Kotpal – Invertebrates
2. Kotpal – Chordates
3. Shukla and U. Pandey- Applied Zoology.

BTE204 – Paper-XIII **Statistical methods**

	SECTION II	Lectures 45
1	Unit- I Introduction to statistics and collection of data. 1.1 Meaning of statistics 1.2 Scope of statistics in Biological and medical sciences 1.3 Primary and Secondary data 1.4 Classification of data, Inclusive and Exclusive methods, Discrete and Continuous frequency distribution. 1.5 Cumulative frequencies 1.6 Graphical representation :- Histogram and ogive curves	09
2	Unit- II Measures of central tendency and measures of dispersion 2.1 Concept of measures of central tendency 2.2 Definitions of A.M., Median, Mode, Quartiles, Weighted mean, Examples on ungrouped and grouped data.	13

	2.3 Properties of A.M. (statement only) 2.4 Methods of obtaining mean & quartiles graphically 2.5 Concept of measures of dispersion . Absolute and Relative measures of dispersion. 2.6 Definitions of Range, Q.D, S.D and variance , coefficient of variation. Examples on grouped and ungrouped data	
3	<p style="text-align: center;">Unit- III</p> <p>Correlation and Regression</p> 3.1 Concept of correlation between two variables and types of correlation. 3.2 Method of obtaining correlation (i) by scattar diagram method ii) By Karl Pearson Correlation coefficient iii) By Spearman's Rank correlation coefficient with and without tie. Properties of correlation coefficient. 3.3 Examples on ungrouped data 3.4 Concept of regression, Lines of regression Regression coefficients and properties without proof. 3.5 Examples on ungrouped data. 3.6 Idea of multiple and partial correlation	10
4	<p style="text-align: center;">Unit- IV</p> <p>Probability and Sampling</p> 4.1 Definition of sample space, Outcomes, events, exhaustive events, Mutually exclusive events, Equally likely events, certain events impossible events. 4.2 Definition of probability, Limits of probability. Probability of complementary event, Additive law of probability. Simple illustrative examples. 4.3 Definition of conditional probability, Multiplicative law of probability, Independent events, Simple illustrative examples. 4.4 Idea of population and sample. Simple Random Sampling and Stratified Random sampling. Advantages and disadvantages of both the methods. 4.5 Testing of hypothesis Simple and composite hypothesis, Null and alternative hypothesis, types of errors, Critical region, Acceptance region, level of significance. 4.6 Tests of significance: Chi square tests, t tests and F	13

	test.	
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Recommended books for statistics:

- 1) Goon A. M., Gupta M. K. and Dasgupta B.:
Fundamentals of mathematical statistics vol. I & II. World Press, Calcutta.
- 2) Gupta & Kapoor: Fundamental of mathematical statistics.
- 3) Thingale T. K. and Dixit P. G. (2003): A text book of paper- I for B.Sc. I, Nirali Publication, Pune.
- 4) Waiker and Lev: Elementary Statistical methods.
- 5) Rohatgi V. K. and Sauh A. K. Md E. (2002)
An Introduction to probability and statistics (John Wiley & Sons-Asia).
- 6) Thigale T. K. and Dixit P. G. (2003): A text book Of paper II for B.Sc. I.
- 7) Meyer P. L. (1970): Introductoryto probability and statistical Application.
Addision wesly.
- 8) Cochran, W.G.: Sampling Techniques, Wiley Estern Ltd., New Delhi.
- 9) Des Raj : Sampling theory

BTE 205 – Paper-XIV **Proteins and Enzymes**

		Lectures 45
1	<p style="text-align: center;">Unit- I</p> <p>Protein: Amino acid classification (Side chain, nature of R group, incorporation in proteins), structure & properties of amino acids, acid base behavior and reactions, zwitterions, peptide bond, Determination of primary structure (Sanger's method, Edman's method, Dansyl chloride, Dabsyl chloride), Forces stabilizing secondary structure, Ramchandran plot, Tertiary structure (Describe different bonds) Quaternary structure Hb & antibody)</p>	13
2	<p style="text-align: center;">Unit- II</p> <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, paper electrophoresis, centrifugation (Basics, Principal, Svedberg's constant)</p>	10
3	<p style="text-align: center;">Unit- III</p> <p>Enzymes: Introduction, IUB classification, active site, energy of activation, transition state hypothesis, lock and key hypothesis, induced fit hypothesis, allosteric enzymes, enzyme inhibition, MM equation, Line weaver- Burk plot, Eadie-Hofstee plot.</p>	12

4	<p style="text-align: center;">Unit- IV</p> <p>Co-enzymes: Thiamine, riboflavin, niacin, pyridoxol phosphate, lipoic acid, panthothenic acid, folic acid. (Introduction, structure, chemistry, sources, daily requirement, deficiency, biological functions)</p>	10
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References:-

- 1) Biochemistry – Nelson & Cox
- 2) Biochemistry - Stryer
- 3) Enzymes - Trevor Palmer
- 4) Biochemistry - Voiet & Voiet
- 5) Biochemistry - J.L.Jain
- 6) Basic Biophysics- M. Daniel
- 7) Biochemistry - Powar and Chatwal
- 8) Protein Purification- Harris and Angel
- 9) Practical biochemistry – Keith Wilson And Walker
- 10) Principles of Biochemistry - T. N. Pattabriraman.
- 11) Biochemistry 3rd Edition – Hames & Hopper.
- 12) General Biochemistry – J. H. Well.
- 13) Biochemistry – J. H. Ottaway & D. K. Apps
- 14) Biochemistry – Trchan
- 15) Text Book of Biochemistry- R.A. Joshi.
- 16) Biochemistry – U. Satyanarayanan
- 17) Biochemistry a Functional Approach – Robert W McGilvery & Goldstein
- 18) Text Book of Biochemistry – A.V.S.S. Rama Rao
- 19) Clinical Biochemistry –Praful B. Godkar.

BTE 206- Paper-XV
Advances in Cell Biology

		Lectures 45
1	<p style="text-align: center;">Unit- I</p> <p>Secretary pathway and protein trafficking</p> <p>1.1 secretary pathway-ER associated ribosomal translation, co translational vectoral transport of nascent polypeptide chain to ER lumen</p> <p>1.2 Transport to Golgi apparatus, secretary granules</p> <p>1.3 Transport of proteins to- mitochondria, chloroplast, peroxisomes, nucleus</p>	13
2	<p style="text-align: center;">Unit-II</p> <p>Cell signaling</p> <p>2.1 Introduction, general principles of cell signaling</p>	10

	2.2 Types of cell signaling-contact dependent signaling, autocrine, paracrine, synaptic, endocrine, gap junctions, combinatorial signaling 2.3 cell surface receptor proteins , Ion channel linked receptors, G-protein linked receptors, enzyme linked receptors , 2.4 signaling through G-protein linked receptors.	
3	<p style="text-align: center;">Unit- III</p> Cell division cycle 3.1 Introduction, definition, phases of cell cycle 3.2 Control of cell cycle 3.3 Molecular events of cell cycle-CDK and cyclins, s-phase, CDK cyclins complex, M-phase CDK cyclins complex, anaphase promoting complex. 3.4 programmed cell death 3.5 Cancer -types, characteristics of cancer cells, causes of cancer, tumour suppressor genes, p 53	12
4	<p style="text-align: center;">Unit- IV</p> Mechanism of cell division 4.1 Introduction types of cell division-amitosis, mitosis and meiosis 4.3 Mitosis-history, steps involved in mitosis, factors affecting mitosis, unique features of M-phase 4.4 Meiosis -history, steps involved in meiosis, significance 4.5 Role of spindle fibres in chromosome separation. 4.6 Condensation of chromosome. 4.7 Synaptonemal complex.	10

References:-

- 20) Molecular biology of cell-Albert
- 21) Molecular biology & cell biology – Lodish et al
- 22) Cell biology –De Robertis
- 23) Cell biology-Genetics, molecular biology-P.S. Warma & Agarwal
- 24) Genes- Lewin
- 25) Cell biology –Gerald karp
- 26) Practical biochemistry – Keith Wilson and Walker

BTE 207- Paper-XVI
Techniques in Microbiology

Topic		Lectures
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No.		45
1	<p style="text-align: center;">Unit- I</p> <p>Microbial growth: Definition of growth, phases & growth curve a] Continuous culture b] Synchronous growth c] Diauxic growth Effect of environmental factors on growth-temperature, pH., osmotic pressure, hydrostatic pressure, surface tension, heavy metals, ultra violet light.</p>	11
2	<p style="text-align: center;">Unit- II</p> <p>Microscopy a] general principles of microscopy (concept of optics, resolving power of microscope working distance.) b] study of compound microscope & electron microscope Stains & staining procedures a] definition of dye & stain b] classification of stains- acidic, basic, neutral c] theories, procedures & mechanism of simple staining, negative staining, differential staining-Gram staining. Microbial nutrition a] nutritional requirements b] classification on the basis of C & energy source c] bacteriological media-natural, synthetic, semisynthetic, differential, enriched, enrichment, selective, living media</p>	12
3	<p style="text-align: center;">Unit- III</p> <p>Techniques in microbiology Principle, working & application of a) Laminar air flow b) Outline of lyophilization technique Techniques in microbial filtration, vacuum filtration, gravity, membrane, micro, nano, reverse osmosis</p>	11
4	<p style="text-align: center;">Unit- IV</p> <p>Soil microbiology Definition of soil, layers, Soil micro flora, humus formation Milk microbiology Definition and composition, sources of microbes</p>	11

References:

- 1) General microbiology-Stanier
- 2) Introduction to microbiology-Ingraham
- 3) Brock biology of microorganisms-Madigan et al
- 4) Fundamentals of microbiology-Frobisher

- 5) Microbiology-Pelczar
- 6) General microbiology -Pawar&Daginawala
- 7) Text book of microbiology-Ananthanarayan

BTE 208 – Paper-XVII
Computer Programming

		Lectures 45
	Unit- I	
1	Introduction to Programming Algorithm, Flowchart, Pseudocode	10
	Unit- II	
2	Fundamentals of C Character set, keywords, identifiers, data types, constants, symbolic constants, escape sequences, variables. arithmetic, relational & logical operators, type conversions in expressions.	10
	Unit- III	
3	Input/output Printf(), scanf(), getchar(), putchar(), gets(), puts(), enum, sizeof() operator Formatting input/output.	10
	Unit- IV	
4	Control Structures & Array If, if..else, nested if, switch statement, while loop , do.. while loop , for loop, continue & break statement Array- declaration, initialization of One dimensional & two dimensional array, character array, strlen(), strcpy(), strcmp(), strcat().	15

Reference Books

- 1) Computer Fundamentals by P. K. Sinha
- 2) C Application programs and Projects by Pramod Vasambekar
- 3) Use of Computer from Vision Publication
- 4) Let Us C by Kanetkar
- 5) Ansi C by Balgurusami

BTE 209 –Paper-XVIII
English for Communication Paper-I
SEMESTER: II

Section I :- Communication Skills

- Unit 1 : How to Express Your Views and Opinions.
Unit 2 : Talking About Personal Experiences.
Unit 3 : Preparing a C.V. and Writing a Letter of Application

Section II :- Reading Comprehension Skill

- Unit 7 : Forgetting -Robert Lynd
Unit 8 : Wife's Holiday -R.K. Narayan
Unit 9 : Man in the Future -Bill Williams
Unit 10 : Prafulla Chandra Ray

		Pattern of Question Paper Sem- II	
Q.1)	A)	Complete the following by choosing the correct option (Set to be on Reading skill Units)	05
	B)	Textual vocabulary Items Synonym – 1 Antonym – 1 Pairing the words (With meaning) – 1 Change the Grammar class-1 Word-formation-Affixation-1	05
Q.2	A)	Answer any Three of the following in 2 to 3 sentences (Out of 4) 1. 2. 3. 4.	06
	B)	Write short notes on any ONE of the following (Out of 2)	04
Q.3	A)	(Unit no 4)Write apiece of Telephonic conversation based on a particular situation.	05
	B)	Write an email or fax	05
Q.4	A)	Read the following passage and make notes out of it. Suggest suitable title. OR	
		(Unit No.5) Study the following notes and expand them into a passage.	05

	(Unit No.6) B) Study the following pie-diagram/table/flowcharts/tree diagram and write a paragraph with the help of it.	05
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BTE 211 -Techniques in Biochemistry

Sr. No.	Name of the Practical	Practicals
1.	Preparation of buffers (Phosphate buffer, acetate buffer) and determination of pH with pH meter	01
2.	General test for carbohydrates and detection of unknown carbohydrate (Glucose, fructose, maltose, sucrose, xylose and starch)	03
3.	Estimation of reducing sugar from apple juice by Benedict's Method.	01
4.	Spot test for amino acids (Arginine, methionine, cystine, tyrosine, histidine, proline, tryptophan)	02
5.	Quantitative method for amino acid by Ninhydrin method.	01
6.	Protein estimation (Biuret method)	01
7.	Estimation of cholesterol (Iron reagent).	01
8.	Isolation and characterization of casein from milk.	01
9.	Qualitative assay of α amylase using starch as substrate.	01
10.	Isolation and characterization of starch from potatoes.	01
11.	Estimation of Glucose by 3,5 Dinitro salicylic acid method	01
12.	Formal titration for estimation of aminoacids	01

Reference:- Chemistry

Text book of practical organic chemistry (4th Edition, Longman) –
A. I. Vogel

Reference:- Biochemistry

1. Practical biochemistry - J. Jayaraman
2. Practical Biochemistry - David Plummer
3. Medical Microbiology - Cruickshank vol. II
4. Stains and staining - Desai & Desai

BTE - 212 Laboratory Exercises in Cell Biology

Sr. No.	Name of the Practical	Practicals 14
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1.	Study of prokaryotic cells structures using photographs and slide preparation.	01.
2.	Study of eukaryotic cells structures using photographs and slide preparation.	01.
3.	Isolation of nucleus.	01.
4.	Isolation of chloroplast.	01.
5.	Isolation of mitochondria.	01.
6.	Isolation of giant chromosomes using <i>Drosophila/Chironomous</i> larvae.	01.
7.	Use of dialysis to separate smaller molecules than larger molecules.	01.
8.	Study of methodology of cell lysis.	01.
9.	Effect of temperature/ organic solvent on membrane permeability of cells.	01.
10.	Demonstration of Golgi apparatus by silver nitrate method.	01.
11.	Demonstration of lysosomes.	01.
12.	Study of Mitosis.	01.
13.	Study of Meiosis	02.
14.	Study of plasmolysis.	01.

BTE 213- Laboratory Exercises in Animal Science

Sr. No.	Name of the Practical	Practicals 15
1.	Classification and Identification of Non-chordates & Chordates. (One animal each). Non- chordates- Sycon, Hydra, Liver fluke/ Taenia, Earthworm / Nereis, Cockroach, Pearl oyster/Pila, Starfish/ Chordates- Lebeo, Frog, Cobra, Alligator, Fowl and Rat.	02
2	Dissection of Labeo- Visceral organs like Gill, Digestive tract,	02

	Heart, Kidney, air bladder.	
3.	Rat Dissection (Only Demonstration) Visceral organs- Heart, Liver, Stomach, Duodenum, Intestine, Kidney, Testis, Ovary, Pancreas, Salivary gland.	01
4.	Study of Plasmodium, Ascaris, Liver Fluke, Taenia- Salium.	01
5.	Blood slide Preparation and Identification of Blood cells.	01
6.	a) Blood Cell Count. i) Differential count of W. B. Cs. ii) Total count of W. B. Cs and R. B. Cs. b) Preparation of Haemin Crystals c) study of Bone Marrow cells	03
7.	Histology of Skin, Tooth, Liver, Kidney, Uterus.	01
8.	Demonstration of – i) Vermiculture Technique ii) Bee Keeping- Study of Instruments iii) Sericulture - Study of different Stages. Pisciculture - Study of Instruments	02
9.	Study Tour (Biodiversity/Sericulture/ Apiculture/ Vermicomposting process/ Microbial industry/ Tissue culture.)	02

BTE 214 – Computer applications in Biology

		15
1.	Study of commands of word.	01
2.	Creation of worksheet with graphs.	01
3.	Power Point presentation.	02
4.	Write program to convert temperature in Celsius into Fahrenheit.	01
5.	Write program to find area of circle.	01
6.	Write program to find given number is even or odd.	01
7.	Write program to display Fibonacci series.	01
8.	Write program to find class from given marks of subject.	01
9.	Write program to print sum of 1 to n numbers.	01
10.	Write program to display number, square & cube upto given number.	01
11.	Write program to sort elements of array.	01
12.	Write program for addition of two matrix.	02
13.	Introduction to biological database.	01

Nature of question paper:

Annual Practical Examination

- A) Every candidate must produce a certificate from the Head of the Department in his college, stating that he has completed in a satisfactory manner a practical course on the lines laid down from time to time by the Academic Council on the recommendations of the Board of Studies and that the laboratory Journal has been properly maintained. Every candidate must have recorded his/her of the Department at the end of the year. Candidates are to produce their journals at the practical examination and such journals will be taken into account by the examiners in assigning marks.
- B) The practical examination will be of 6 hours duration and will be conducted on two successive days (3 hours per day) observations in the Laboratory journal and written a report on each exercise performed. Every journal is to be signed periodically by a member of the teaching staff and certified by the Head

Distribution of Marks for Practical Examination:

1. Biochemical Techniques:
 - One major experiment 10 marks
 - One minor experiment 05 marks
 2. Microbiological Techniques:
 - One major experiment 10 marks
 - One minor experiment 05 marks
 3. Biophysics/Biostat/computer 10 marks
 4. Oral on Practicals 05 marks
 5. Journal 05 marks
- Total Marks: 50 marks

Note: Experiments may be arranged as per convenience of the examiner.

Equivalence of the Pre-revised & revised course

Pre-revised course		Revised course	
Bb-101	Fundamental of Chemistry	BTE-101, Paper-I BTE-201, Paper-X	Physical and Inorganic Chemistry Organic and Inorganic Chemistry
Bb-102	Fundamentals of Physics	BTE-102, Paper-II BTE-202, Paper-XI	Basics in Physics Applied Physics
Bb-103	Basic Biosciences	BTE-103, Paper-III BTE-203, Paper-XII	Plant Science Animal Science
Bb-104	Mathematical & Statistical	BTE-104, Paper-IV	Mathematical Methods

	Methods for biologist	BTE-204, Paper-XIII	Statistical Methods
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Nature of Question Paper		
Q.No.1	Multiple Choice based objective type question (four options for each question be given)	8 Marks
Q.No. 2	Attempt any two of the following (out of three)	16 Marks
Q.No. 3	Shot notes (4 out of 6)	16 Marks
	Total	40 Marks

Bb-105	Fundamentals of Biological Chemistry	BTE-105, Paper-V BTE-205, Paper-XIV	Biomolecules Proteins and Enzymes
Bb-106	Cell Biology	BTE-106, Paper-VI BTE-206, Paper-XV	Basics in Cell Biology Advances in Cell Biology
Bb-107	Microbiology	BTE-107, Paper-VII BTE-207, Paper-XVI	Basics in Microbiology Techniques in Microbiology
Bb-108	Use of Computers	BTE-108, Paper-VIII BTE-208, Paper-XVII	Computer Basics and Bioinformatics Computer Programming

Nature of Question Paper for all (Theory) papers U.G. Courses under Under Faculty of Science.