BT-201N	CELL BIOLOGY (B.Tech. Biotechnology Semester III)					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**-**	**75**	**25**	**100**	**3 Hrs.**
Purpose	**To familiarize the students with the basics of Cell Biology.**					
Course Outcomes						
CO1	**Students will learn basic principles of cell biology especially the structure and functions of Biological Membranes.**					
CO2	**Students will come to know about various cellular organelles and their integrated functioning. Will be able to learn basic knowledge of concepts that leads to development of life and different processes related to these developments.**					
CO3	**This unit will enable the students to learn the concept of inhibition and activation of biological phenomenon by simple methods.**					
CO4	**Students will be able to use simple methods of engineering and mathematics like using graphs and osmotic diffusion and many more like that to solve scientific biological aspects. They will be able to gain knowledge of different factors affecting the normal functioning of muscular and nervous system.**					

UNIT I

1. Cell: An introduction, classification of organisms by cell structure, cytosol, compartmentalization of eukaryotic cells, cell fractionation.
2. Cell membrane and permeability: Chemical components of biological membranes, organization and fluidity of membrane components, the membrane as a dynamic entity, cell signaling, cell recognition and membrane transport.

UNIT II

3. Cytoskeleton and cell motility: Structure and functions of microtubules, microfilaments, intermediate filaments.
4. Structure and Functions of Cellular Organelles: Endoplasmic reticulum, golgi complex, lysosomes, vacuoles and microbodies, ribosomes,mitochondria,plastids**.**

UNIT III

5. Nucleus: Structure, cell-cycle (interphase and M phases), regulation of cell cycle.
6. Extracellular matrix: Composition, molecules that mediate cell adhesion, membrane receptors for extracellular matrix macromolecules, regulation of receptor expression and function.

UNIT IV

7. Muscle contraction: Different muscle types in the body, structural proteins of muscles, energetics and regulation of muscle contraction.
8. Neurons and neurotransmission: Resting potential, action potential, synaptic transmission, neurotransmitters and receptors, the generation of action potential by sensory stimuli and mechanism of nerve-impulses.

Text Books:

1. Cell Biology: Organelle structure and function, Sadava, D E.(2004) Panima pub., New Delhi.

References Books:

1. Molecular Biology of cell, 4th ed. Alberts, Bruce *(et. al)(2002)* Garland Science Publishing, New York..
2. Cell Biology- Smith and Wood by Chapman and Hall.
3. Cell and Molecular Biology, 8th ed. Robertis, EDP De and Robertis, EMF De (2002) Lippincot Williams and Wilkins Pvt. Ltd.,(International Student Edition) Philadelphia.
4. Molecular Cell Biology 4th ed. Lodish, Harvey and .Baltimore, D(2000) W.H. freeman & Co. New York

Note: Question Paper will consist of four units. Eight questions will be set in the question paper by selecting two from each unit. The students will be required to attempt five questions, selecting atleast one from each uni

BT-203N	MICROBIOLOGY (B.Tech. Biotechnology Semester III)					
Lecture	Tutorial	Practical	Theory	Sessional	Total	Time
3	1	-	75	25	100	3 Hrs.
Purpose	To familiarize the students with the basic of Microbiology					
Course Outcomes						
CO1	Student to learn the history and classification of microbiology					
CO2	To learn microbial nutrition and various microbiological techniques					
CO3	Able to understand microbial growth and Genetics					
CO4	Student will able to know about various microbial diseases and fermentation products					

UNIT - I

1. History and scope of Microbiology: Development of Microbiology, various branches of microbiology and applications of microbiology.
2. Classification of Microorganisms:Microbial Taxonomy- criteria used including molecular approaches. Microbial phylogeny and current classification of bacteria.

UNIT - II

3. Microbial Diversity: Morphology and cell structure of major groups of microorganisms e.g. bacteria. fungi, algae, protozoa and viruses.
4. Cultivation and microbial nutrition of Microorganism: Methods of isolation, purification and preservation. Pure culture technique and sterilization methods.Requirement for C, N, S and growth factors.Nutritional categories of microorganisms.

UNIT - III

5. Microbial Growth and Metabolism: Growth curve (normal and biphasic) and generation time. Measurement of growth.Synchronous, batch and continuous cultures.Metabolic pathways- catabolic, anabolic and amphibolic.Microbial fermentation and its types.
6. Microbial Genetics: Transposable elements, Bacterial plasmids. Bacterial recombination: transformation, transduction and conjugation. Formation of endospores and mechanism of sporulation.

UNIT - IV

7. Environmental microbiology: Normal and contaminating microflora of water, soil and air. Methods to study water and air pollution.Major water, air and soil borne microbial diseases.
8. Food Microbiology: Definition, important fermented foods and beverages: An overview (curd, cheese, beer, wine). Factors effecting spoilage of food and food preservation methods. Methods to study food quality,

Text Book:

1. Microbiology 5th Edition. Prescott, L.M.; Harley, J.P. and Klein, D.A.(2003) McGraw Hill, USA.
2. Microbiology. Pelczar Jr., M.J.; Chan, E.C.S. and Krieg, N.R. (1993) Tata McGraw Hill, New Delhi.

References Books:

3. Modern Food Microbiology. Jay, J.M. (1996) CBS Publishers and Distributors, New Delhi.
4. Food Microbiology 2nd ed, Adam, M. R. and Moss (2003) Panima Pub, New Delhi.

Note: Question Paper will consist of four units. Eight questions will be set in the question paper by selecting two from each unit. The students will be required to attempt five questions, selecting atleast one from each unit.

BT-205N	BIOCHEMISTRY (B.Tech. Biotechnology Semester III)					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**-**	**75**	**25**	**100**	**3 Hrs.**
Purpose	**To introduce the students with basics of Biochemistry**					
Course Outcomes						
COI	**The students will be able to understand the structure and functions of carbohydrates and proteins**					
COII	**The students will be able to learn structure and functions of lipid and nucleic acids along with basic concepts of enzymes**					
COIII	**The students will be able to write major pathways of carbohydrates and lipid metabolism**					
CO IV	**To make the students understand synthesis and degradation of pyrimidine nucleotides**					

UNIT – I

1.**Amino acids & Proteins** –Structure and properties of amino acids. Essential and non-essential amino acids.Peptide bonds.Types of proteins and their classification.Forces stabilizing protein structure and shape. Different levels of structural organization of proteins

2.**Carbohydrates-Structure and functions:** Structures and properties of monosaccharides, oligosaccharides and polysaccharides. Ring structure and mutarotation. Homo- andhetero-polysaccharides. Mucopolysaccharides

UNIT – II

3.**Lipids-Structure and functions:** Classification of lipids and their general functions. Essential fatty acids.Hydrolysis of fats, Saponification value, Rancidity of fats, Iodine number and Acid value.Cholesterol-its structure and biological functions.

4.**Nucleic Acids-Structure and functions:** Structure and properties of purine and pyrimidine basis. Nucleosides and nucleotides.Biologically important nucleotides.

5.**Enzymes:** Nomenclature and classification of Enzymes. Activation energy and rate of reaction.Basic concept of holoenzymes, apoenzymes, cofactors, coenzymes, prosthetic groups, metalloenzymes, Definitions of enzyme activity, specific activity and enzyme specificity.Enzyme inhibition and concept of allostery. Michaelis-Menten equation.

UNIT-III

6. **Integration of metabolisim** – Basic concepts and importance of metabolism

7 **Carbohydrate Metabolism:** Glycolysis and TCA cycle. Pentose phosphate pathway and its significance.Gluconeogenesis pathway.Biosynthesis of lactose, sucrose and starch.Glycogenolysis, glycogenesis and control of glycogen metabolism.Maintenance of blood glucose level.Energetics and regulation of carbohydrate metabolism.Glyoxylate cycle.

8. **Lipid Metabolism:** Beta -oxidation of saturated fatty acids, oxidation of unsaturated and odd carbon fatty acids. Kitogenesis and its importance.Degradation of triacylglycerols by lipases.Biosynthesis, elongation and desaturation of saturated fatty acids.Biosynthesis of triacylglycerols, phospholipids and cholesterol

UNIT –IV

9.**Amino Acid Metabolism:** General reactions of amino acids metabolism- transamination, oxidative and non-oxidative deamination and decarboxylation. General pathways of amino acids degradation.Urea cycle and its regulations.

10.**Nucleic Acid Metabolism:** Catabolism, *de novo*-biosynthesis and salvage pathway .

Formation of deoxyribonucleotides. Importance of nucleotides

11. **Mitochondrial oxidative phosphorylation:** Mitochondrial electron transport chain. Hypotheses of mitochondrial oxidative phosphorylation.Inhibitors and uncouplers of oxidative phosphorylation.

Text Books

1Biochemistry, 4th edition, by L. Stryer (1995). W.H. Freeman & Co. NY

2 Lehninger: Principles of Biochemistry, 3rd edition, by David L. Nelson and M.M. Cox (2000) Maxmillan/ Worth publishers

References Books:

1.Biochemistry, 4th edition, by G. Zubay (1998). Wm.C. Brown Publishers.

2.Biochemistry, 2nd edition, by Laurence A. Moran, K.G. Scrimgeour, H. R. Horton, R.S. Ochs and J. David Rawn (1994), Neil Patterson Publishers Prentice Hall.

3.Biochemistry, 2nd edition, by R.H. Garrett and C.M. Grisham (1999) . Saunders college Publishing, NY.Sons, NY.

4.Fundamentals of Biochemistry by Donald Voet and Judith G Voet (1999) , John Wiley & Sons, NY

5.Harper's Biochemistry, 25th edition, by R.K. Murray, P.A. Hayes, D.K. Granner, P.A. Mayes and V.W. Rodwell (2000). Prentice Hall International.

Note: Question Paper will consist of four units. Eight questions will be set in the question paper by selecting two from each unit. The students will be required to attempt five questions, selecting atleast one from each unit.

BT-207N	GENETICS (B.Tech. Biotechnology Semester III)					
Lecture	Tutorial	Practical	Theory	Sessional	Total	Time
3	1	-	75	25	100	3 Hrs.
Purpose	To familiarize the students with theoretical and practical aspects of Genetics					
Course Outcomes						
CO1	Students will be able to implicate simple mathematical calculations like ratios, probability, and sum and product rules to biological phenomenon. They can identify the complex phenomenon and can formulate the already existing to develop solutions for different biological aspects.					
CO2	Covers the harmful and beneficial factors included in the mutations concept which in turn have hazardous impact on environment.					
CO3	This unit will enable the students to apply simple mathematical calculations to natural biological phenomenon as in gene mapping and they will be able to develop new software's which can solve these phenomenon					
CO4	Students will be able to use derivation and integration phenomenon along with mathematical calculation to solve inheritance pattern in general which can be applied to solve scientific biological aspects.					

UNIT -I

1. Principles of Heredity and Variation: Mendel and his experiments, monohybrid crosses, incomplete dominance and codominance, dihybrid crosses, multiple alleles(blood group systems), epistasis, lethal genes. Probability in prediction and analysis of genetic data.Pedigree analysis.

2. Genes and Chromosomes: General features of chromosomes, cell division, sexual reproduction. Chromosomal theory of inheritance, sex determination.Sex-linked, sex-limited and sex-influenced inheritance.Variation in chromosome number and structure.

UNIT- II

3. Molecular organization of chromosomes: Genome size and evolutionary complexity, supercoiling of DNA, structure of bacterial chromosome, structure of eukaryotic chromosome.

4. Gene Mutation and DNA Repair: Classification of mutations, spontaneous mutations, induced mutations, application of induced mutations, detection of mutations, site-directed mutagenesis, mechanisms of DNA repair.

UNIT - III

5. Gene Linkage and Chromosome Mapping: Linkage and recombination of genes in a chromosome, crossing over and genetic mapping, gene mapping by 2-point and three point test crosses.

6. Somatic Cell Genetics : Somatic cell hybrids production and gene mapping.

UNIT - IV

7. Population Genetics and Evolution : Allele frequencies and genotype frequencies, random mating and Hardy-Weinberg principle. Inbreeding. Genetics and evolution
(Mutation and migration, natural selection, random genetics drift).

8. Quantitative Genetics : Quantitative inheritance, causes of variation.

Text Books:

1. Basic Genetics. (2000) Miglani, G.S., Narosa Publishing House, New Delhi.
2. Fundamentals of Genetics. Singh,B.D., KalyaniPublishers,New Delhi.

References Books:

1. Genetics: Analysis of Genes and Genomes.5th edition (2001) Hartl, D.L. and Jones, E.W., Jones and Bartlet Publishers, Boston.

2. Genetics. 5th edition (1998) Russell, P.J., Addison Wesley Longman, Inc., California.
3. Genetics: Analysis and Principles. (1999) Brooker, R.J. McGraw Hill, New York.

Note: Question Paper will consist of four units. Eight questions will be set in the question paper by selecting two from each unit. The students will be required to attempt five questions, selecting atleast one from each unit.

BT-211N	MICROBIOLOGY LAB (B.Tech. Biotechnology Semester III)					
Lecture	Tutorial	Practical	Practical/Viva-voce	Sessional	Total	Time
-	-	3	60	40	100	3 Hrs.
Purpose	To learn working of instruments and their principles to study of biological phenomenon.					
Course Outcomes						
CO1	Students will be able to operate microscopes and staining methods					
CO2	Learning of Culture Media Preparation for Microbial Growth					
CO3	Students will learn Pure Culture Techniques for maintenance and preservation of microbes.					
CO4	Students will learn various aspects of Biochemical Tests used in Microbial Taxonomy					

LABORATORY EXPERIMENTS

1. Microscopy: Use of microscopes, microscopic examination of microorganisms.
2. Micrometry: Microscopic measurement of microorganisms.
3. Staining methods.
4. Preparation of culture media.
5. Isolation and enumeration of microorganisms from different sources.
6. Pure culture techniques- Streak plate, pour plate, spread plate.
7. Measurements of growth and study of effect of various factors on growth of microorganisms-temperature, pH, salt concentration, U.V and R.H.
8. Biochemical tests useful in bacterial taxonomy.
9. Water Microbiology- BOD, multiple-tube fermentation test.
10.Milk Microbiology- SPC, testing the quality of milk.

TextReferences Books:

1. Experiments in Microbiology, Plant Pathology and Biotechnology. 4th Edition.Aneja, K.R. (2003)New Age International Publishers, New Delhi**.**
2. Microbiology- a laboratory manual. 4th edition.Cappuccino J. and Sheeman N. (2000) Addison Wesley, California.
3. Environmental Microbiology – A Laboratory Manual Pepper. I.L.; Gerba, C.P. and Brendecke, J.W.(1995) Academic Press, New York.

BT-213N	BIOCHEMISTRY LAB (B.Tech. Biotechnology Semester III)					
Lecture	**Tutorial**	**Practical**	**Practical/Viva-voce**	**Sessional**	**Total**	**Time**
-	-	3	60	40	100	3 Hrs.
Purpose	**To learn working of instruments and their principles to study of biological phenomenon.**					
Course Outcomes						
CO1	**Students will be able to learn qualitative and quantitative estimation of biomolecules**					
CO2	**Learning of various Enzyme Assays**					
CO3	**Students will learn effect of environmental factors on enzyme activity**					
CO4	**Students will learn biochemical tests used in Clinical Biochemistry**					

LABORATORY EXPERIMENTS

1. Qualitative tests for amino acids, proteins, Lipids and carbohydrates.
2. Quantitative estimation of proteins, Lipids and carbohydrates.
3. Assay of any commonly occurring enzyme.
4. Effect of pH, temperature, enzyme concentration and protein denaturation on an enzyme activity.
5. Determination of Km and Vmaxof any commonly occurring enzyme.
6. Biochemical analysis of urine and blood(pH, Uric acid, creatinine, proteins and carbohydrates).

Text/ Reference Books:

1. Principles and techniques of Practical Biochemistry: K. Wilson and J. Walker (1994), Cambridge University Press, Cambridge.
2. Introductory practical Biochemistry by S.K. Sawhney and Randhir Singh (2000), Narosa Publishing House, New Delhi.
3. An introduction to Practical Biochemistry by David T. Plummer (1988), McGraw- Hill, Book company, UK.

MPC-202N	ENERGY STUDIES (B Tech All Branches Semester III/IV)					
Lecture	Tutorial	Practical	Theory	Sessional	Total	Time
3	-	-	75	25	100	3 Hrs.
Purpose	To make the students conversant with the basics concepts and conversion of various form of Energy					
Course Outcomes						
CO1	An overview about Energy , Energy Management, Audit and tariffs					
CO2	Understand the Layout and working of Conventional Power Plants					
CO3	Understand the Layout and working of Non Conventional Power Plants					
CO4	To understand the role of Energy in Economic development and Energy Scenario in India					

UNIT-I

Introduction: Types of energy, Conversion of various forms of energy,Conventional and Non-conventional sources, Need for Non-Conventional Energy based power generation.
Energy Management: General Principles of Energy Management, Energy Management Strategy.
Energy Audit: Need, Types, Methodology and Approach.

UNIT-II

Conventional Energy sources: Selection of site**,** working of Thermal, Hydro, Nuclear and Diesel power plants and their schematic diagrams & their comparative advantages- disadvantages.

UNIT-III

Non Conventional Energy sources: Basicprinciple, site selection of Solar energy power plant, photovoltaic technologies, PV Systems and their components, Wind energypower plant , Bio energy plants ,Geothermal energy plantsand tidal energy plants.MHD

UNIT-IV

Energy Scenario: Lay out of power system, Role of Energy in Economic development, energy demand, availability and consumption, Commercial and Non-commercial energy, Indian energy scenario, long term energy scenario, energy pricing, energy sector reforms in India, energy strategy for the future.

References:

1. Energy Studies-Wiley Dream tech India.
2. Non-conventional energy resources- Shobhnath Singh, Pearson.
3. Soni,Gupta,Bhatnagar: Electrical Power Systems – DhanpatRai& Sons
4. NEDCAP: Non Conventional Energy Guide Lines
5. G.D. Roy :Non conventional energy sources
6. B H Khan :Non Conventional energy resources - McGraw Hill
7. Meinel A B and Meinal M P,Addison:Applied Solar Energy- Wesley Publications
8. George Sutton: Direct Energy Conversion -McGraw

Note: Question Paper will consist of four units. Eight questions will be set in the question paper by selecting two from each unit. The students will be required to attempt five questions, selecting atleast one from each unit.