Master Degree in Biomedical Science
M.Sc. (Biomedical Science) Semester I

Course Code	PT01CBMC51	Title of the Course	Cell and Molecular Biology
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	1. Provide understanding about the structure and function of various cell organelles. 2. Familiarize with the handling of microscope. 3. Augment understanding of central dogma. 4. Become proficient about the general principles of gene organization its expression in prokaryotic and eukaryotic organisms as well as various levels of gene regulation

Course Content		
Unit	Description	Weightage* (%)
1.	An overview of cell organization; Structure of pro-and eukaryotic cell. Experimental approaches for studying cells: Various types of light microscopy, Electron microscopy, fixation and staining, cytochemical methods and cell fractionation (flow cytometry).	25
2.	Cell organization: Structure and functions of membranes- various transport mechanisms and transports, nucleus Chloroplast, Mitochondria, Endoplasmic reticulum, Golgi complex, Ribosomes, Lysosomes, Peroxisomes and Glyoxysomes. The cytoskeleton and cell motility – Microtubules, Microfilaments and Intermediate filaments. Cell cycle and cell division. Basic histology of various tissues.	25
3.	Nucleic acids as carries of genetic information; Physical properties and structure of DNA and RNA. Replication of DNA: Enzyme and proteins involved in replication. DNA repair mechanisms.	25
4.	Transcription of DNA, post transcriptional modifications of RNA and control of transcription. Genetic code and its properties. Translation of RNA in pro and eukaryotes. Control of translation and protein targeting.	25

Teaching-Learning Methodology	• Regular class room teaching will be done with following tools: a) Conventional black board and chalk. b) ICT tools such as projectors, smart boards, etc will also be used for better explanation of scientific components.

	• Appropriate reference materials will also provided to the students as and when required from departmental library resources.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Acquire knowledge on the Structure and function of various cell organelles.
2.	Learn sample preparation for microscopy and handling of microscope.
3.	Gain detailed understanding of central dogma.
4.	Understand general principles of gene organization and expression in prokaryotic and eukaryotic organisms as well as various levels of gene regulation

Suggested References:	
Sr. No.	References
1.	Molecular biology of the cell: Bruce Alberts et.al.
2.	Cell and molecular biology: Gerald Karp, John Wiley
3.	Cell and molecular biology: De Robertis and De Robertis, Lee and Febiger
4.	Molecular cell biology: Lodish et.al.

On-line resources to be used if available as reference material
On-line Resources: https://www2.estrellamountain.edu/faculty/farabee/biobk/BioBookCELL2.html https://microbenotes.com/cell-organelles/#ribosomes https://majkf.files.wordpress.com/2010/08/molecular_cell_biology_lodish_5th_ed.pdf https://nptel.ac.in/courses/102/106/102106025/

Master Degree in Biomedical Science
M. Sc. (Biomedical Science) Semester

Course Code	PT01CBMC52	Title of the Course	Instrumentation
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	1. Provide insight into various microscopic, chromatographic and spectroscopic techniques 2. Familiarize with various analytical techniques and their application in biomedical science/ research. 3. Explain concept of transduction and methods of extracting information about biosensors, application of medical sensors and their classification for the measurement of various parameter including various transducers and electrodes

Course Content		
Unit	Description	Weightage* (%)
1.	Visualization techniques: Principle of working and applications of bright field microscopy, phase contrast microscopy, fluorescence microscopy, confocal microscopy, scanning and transmission electron microscopy, scanning tunneling microscopy, atomic force microscopy. Principle and applications of cytophotometry and flow cytometry. Formatting	25
2.	Separation and analytical techniques: Basic principle and application of centrifugation, chromatography and electrophoreses Principle, instrumentation and applications of UV, Visible, IR including FTIR and ATR), AAS, NMR, fluorescence and CD spectroscopy	25
3.	Medical Sensors and their classification: Medically significant measure and, sensing methods for biological signals; Sensor characteristics: linearity, repeatability, hysteresis, drift; Sensor models in the time and frequency domains; Sensors for physical measurands: strain, force, pressure, acceleration, flow, volume, temperature and biopotentials. Sensors for measurement of chemicals: potentiometric sensors, ion selective electrodes, ISFETS; Amperometric sensors, Clark Electrode; Catalytic biosensors, immunosensors	25
4.	Transducers for Biomedical Applications. Sources of Bioelectric potentials; Resting and Action Potentials, Propagation of Action	25

	Potentials, The Bioelectric Potentials Electrodes, electrodes theory, Bio-potential Electrodes, Bio Chemical Transducers, Imaging techniques used to study Cardio vascular system	

Teaching-Learning Methodology	• Regular class room teaching will be done with following tools: a. Conventional black board and chalk. b. ICT tools such as projectors, smart boards, etc will also be used for better explanation of scientific components. • Appropriate reference materials will also provided to the students as and when required from departmental library resources.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	The principles of various microscopic, chromatographic and spectroscopic techniques.
2.	Will be able to understand principle of various analytical techniques and their application in biomedical science/ research.
3.	Understand the concept of transduction and methods of extracting information from biosensors and Gain knowledge in the state of the art of biological and medical sensors and their classification for various parameter measurements including various transducers and electrodes

Suggested References:	
Sr. No.	References
1.	Instrumental methods of analysis: D A Skoog, Krishna
2.	Instrumentation: Chatwal and Anand

3.	Biomedical Instrumentation and Measurements: Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer
4.	Modern experimental Biology: Boyer
5.	An introduction to practical Biochemistry: Plummer

On-line resources to be used if available as reference material
On-line Resources: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5206469/ https://www.rfwireless-world.com/Articles/Medical-sensor-basics-and-medical-sensor-types.html https://www.intechopen.com/books/advances-in-bioengineering/biomedical-sensor-device-and-measurement-systems https://nptel.ac.in/courses/102/103/102103044/

Master Degree in Biomedical Science
M.Sc. (Biomedical Science) Semester I

Course Code	PT01CBMC53	Title of the Course	Enzymology
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	The objective of the paper is to 1. Explain relationship between the structure and function of enzymes. 2. Enable students to understand mechanism of enzyme action and various factors that control enzyme activity. 3. Provide understanding of enzyme kinetics and role of coenzymes/co-factors and an overview of Industrial application of enzymes.

Course Content		
Unit	Description	Weightage* (%)
1.	Introduction to enzymology and historical developments in enzymology Enzyme Structure and classification. Practical Enzymology: Enzyme Activity, assay, factors affecting enzyme activity, progress curve, rate enhancement, enzyme activators, coenzyme and cofactors, Enzyme specificity Enzyme purification: Objectives and strategy, separation techniques, test of purity, case study	25
2.	Equilibrium and Steady state kinetics, significance of Km, Vmax & Kcat, and enzyme efficiency Multisubstrate kinetics: General rate equation, compulsory order, random order and ping- pong mechanisms and their primary and secondary plots. Enzyme inhibition and its kinetics: Reversible and irreversible inhibition, competitive, non- competitive and uncompetitive, mixed, partial, substrate and allosteric inhibition. Thermal kinetics: Effect of temperature on reaction rate, enzyme stability, Arrhenius equation and activation energy.	25
3.	Mechanism of Enzyme Action: Enzyme mechanisms: Factors affecting catalytic efficiency, Mechanism of Lysozyme, Chymotrypsin, Carboxypeptidase, Restriction endonuclease, Aspartate transcarbomylase. Allosteric enzymes and sigmoidal kinetics: Protein ligand binding, Co-operativity, MWC & KNF	25

	models, Multienzyme enzyme complexes	
4.	Methods to study enzymes and its mechanisms Enzyme engineering: Chemical modification of enzymes: methods of modification of primary structure, catalytic and allosteric properties, use of group specific reagents. Enzymes in non-conventional media, Enzymes as analytical reagents. Isoenzymes and its physiological significance, Ribozymes and Abzymes	25

Teaching-Learning Methodology	• Regular class room teaching will be done with following tools: a. Conventional black board and chalk. b. ICT tools such as projectors, smart boards, etc will also be used for better explanation of scientific components. • Appropriate reference materials will also provided to the students as and when required from departmental library resources.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Clarify relationship between the structure and function of enzymes.
2.	To understand mechanism of enzyme action and various factors that control enzyme activity.
3.	Obtain understanding of enzyme kinetics and role of coenzymes/co-factors and an overview of Industrial application of enzymes.

Suggested References:	
Sr. No.	References
1.	Fundamentals of Enzymologist: Nicholes C. Price and Lewis Stevens,
2.	Enzyme Structure and mechanism: Alan Fersht
3.	Understanding Enzymes: Trevor Palmer
4.	The chemical kinetics of enzyme action: K.J. Laider and P. S. Bunting

On-line resources to be used if available as reference material
On-line Resources:-- https://nptel.ac.in/courses/102/102/102102033/ https://ocw.mit.edu/high-school/biology/exam-prep/chemistry-of-life/enzymes/#9 https://nptel.ac.in/content/storage2/courses/104103018/pdf/mod3.pdf

Master Degree in Biomedical Science
M.Sc. (Biomedical Science) Semester I

Course Code	PT01CBMC54	Title of the Course	Practical based on PT01CBMC51 and PT01CBMC52
Total Credits of the Course	06	Hours per Week	4hr

Course Objectives:	The objective of the paper is to 1. Provide knowledge about Practical based on PT01CBMC51 and PT01CBMC52 2. Get familiar with basic instrumental techniques.

Course Content		
Unit	Description	Weightage* (%)

1.	1. Separation of amino acids by TLC 2. DNA estimation by DPA method 3. RNA estimation by orcinol method 4. Isolation of chromosomal DNA 5. Separation of proteins by PAGE 6. Estimation of Protein By Folin-Lowry Method 7. Estimation of Reducing Sugar By Dns Method 8. Localization of Cell Organelle 9. Vital staining of mitochondria using JENUS GREEN B 10. Mitosis–Squash preparation of Onion root-tip 11. Meiosis-Squash preparation of anther lobes 12. LVDT transducer 13. Introduction to Microscopy 14.To study the different organelles in the cell 15. Preparation of Buffer 16. Demonstration of HPLC 17. Determination of molecular weight of polymer by GPC and Particle size analyzer 18. Visit to research Lab 19. Biochemical calculations, Preparation of molar, normal solutions 20. Orientation to laboratory instruments: pH meter, visible spectrophotometer, centrifuge, water bath, incubator/shaker, autoclave, hot air oven. General laboratory safety instructions and good laboratory practices. Arrangements of lab chemicals	100

Teaching-Learning Methodology	Practical sessions will be conducted in a suitably equipped laboratory either individually or in groups depending on the nature of exercise as well as availability of infrastructure

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Practical Examination (As per CBCS R.6.8.3)	30%
2.	University Practical Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Basic DNA, RNA estimation, Protein estimation learning
2.	Understand Isolation of DNA from the Bacteria and Blood samples.
3.	Know about the different sophisticated instrument operation

Suggested References:	
Sr. No.	References
1.	Biochemical methods: S. Sadasivam & A. Manickam
2.	Molecular Cloning: A Laboratory Manual: Joe Sambrook

On-line resources to be used if available as reference material
On-line Resources: https://www.academia.edu/43705166/Molecular_Cloning_A_Laboratory_Manual_Third_Edition http://mbvi-au.vlabs.ac.in/ http://cbi-au.vlabs.ac.in/ http://cbii-au.vlabs.ac.in/

Master Degree in Biomedical Science
M.Sc. (Biomedical Science) Semester I

Course Code	PT01CBMC55	Title of the Course	Practical based on PT01CBMC53and PT01CBMC51
Total Credits of the Course	06	Hours per Week	4hr

Course Objectives:	The objective of the paper is to 1. Provide knowledge about Practical based on PT01CBMC53 and PT01CBMC51 2. Get familiar with basic instrumental techniques.

Course Content		
Unit	Description	Weightage * (%)
1.	1. Determination of Invertase activity 2. Effect of enzyme concentration on enzyme catalyzed reaction 3. Effect of pH on enzyme catalyzed reaction 4. Effect of temperature on enzyme catalyzed reaction 5. Effect of time on enzyme catalyzed reaction 6. Effect of substrate concentration on enzyme catalyzed reaction and determination of Km and Vmax of enzyme 7. Demonstration of immobilization of enzyme/whole cell using appropriate method 8. Determination of hemoglobin 9. Determination of RBCs by hemocytometer 10. Determination of WBCs by hemocytometer 11. Differential count 12. Estimation of cholesterol. 13. Estimation of creatinine in serum. 14. Measurement of blood glucose by using glucometer (biosensor based technique) 15. Measurement of Blood pressure by digital sphygmomanometer. 16. Measurement of heart rate by stethoscope. 17. Measurement of lung capacity (pulmonary function) by spirometer 18.Titration of amino acid and calculate pKa value	100

Teaching-Learning Methodology	Practical sessions will be conducted in a suitably equipped laboratory either individually or in groups depending on the nature of exercise as well as availability of infrastructure

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Practical Examination (As per CBCS R.6.8.3)	30%
2.	University Practical Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Basic methods for the determination of Enzyme activity at different temperature, Time and pH
2.	Learn about different body parameters like heart rate, Blood pressure, respiratory capacity
3.	Learn the different techniques for Blood sample examination

Suggested References:	
Sr. No.	References
1.	Biochemical methods: S. Sadasivam & A. Manickam
2.	Experimental Microbiology: Rakesh J patel and Kiran R Patel

On-line resources to be used if available as reference material
On-line Resources: http://cbii-au.vlabs.ac.in/

SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar, Gujarat
(Reaccredited with 'A' Grade by NAAC (CGPA 3.11)
Syllabus with effect from the Academic Year 2024-2025

Master Degree in Biomedical Science
M.Sc. (Biomedical Science) Semester II

Course Code	PT01CBMC56	Title of the Course	Comprehensive Viva
Total Credits of the Course	01	Hours per Week	1hr

Course Objectives:	The objective of the viva is to 1. To check the in-depth knowledge gain by the students throughout the semester

Course Content		
Unit	Description	Weightage * (%)
1.	Evaluation of knowledge gained from three core, one elective and two practical by conducting comprehensive viva	50

Teaching-Learning Methodology	Internal Continuous Assessment in the form of Viva-voce

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	University Examination	100

Course Outcomes: Having completed this course, the learner will be able to	
1.	Will be able to defend the questions related to core and elective papers studied during semester-I

Suggested References:	
Sr. No.	References

	NIL
On-line resources to be used if available as reference material	
On-line Resources: ---	

SARDAR PATEL UNIVERSITY
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Syllabus with effect from the Academic Year 2024-2025

Master Degree in Biomedical Science
M. Sc. (Biomedical Science) Semester I

Course Code	PT01EBMC51	Title of the Course	Human Physiology
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	The objective of the paper is to 1. To acquaint the students with human physiology, a science of mechanical, physical, and biochemical functions. 2. They will know complex connection between physiology, medicine, and health, 3. Gain knowledge on how the human body adapts to stresses, physical activity, and disease.

Course Content		
Unit	Description	Weightage* (%)
1.	Digestive system – Composition, functions and regulation of saliva, gastric, pancreatic intestinal and bile secretions – digestion and absorption of carbohydrates, lipids, proteins nucleic acids, minerals and vitamins.Gastro-Intestinal Hormones The Muscular System – Types of muscles and their functions. Physiology of muscle contraction in striated and non-striated muscle	25
2.	Homeostasis and the organization of body fluids, Control of Homeostasis, Positive and negative Feedback systems, and Homeostatic Imbalances. An overview of human circulatory system. Anatomy of heart, cardiac cycle, cardiac output, blood pressure and regulation, ECG. The arterial system, venous system, the microcirculation and mechanics of capillary fluid exchange. Control of blood flow to the tissues. Portal circulations. Arterial pressure and its regulation. Blood-components and functional significance. Blood buffer systems, Blood coagulation and factors involved in coagulation. Laboratory tests to measure coagulation and thrombolysis. Hemopoiesis and blood groups, Disorders of circulatory system: coagulation disorders, hypertension, thalassemia andanemia.	25

3.	Excretory system – structure of Kidney, types of nephrons, formation of urine, glomerular filtration, GFR, tubular reabsorption of glucose. Renal and pulmonary control of blood pH, renal clearance. Blood supply to kidneys, Micturition, Hormonal control of urine formation.	25
4.	Nervous System- Structure of neuron, function and organization of nervous system, Blood- brain barrier, Neurotransmitters, Nerve impulse transmission. Reproductive physiology – secretion and function of reproductive hormones, pregnancy and lactation. Hormonal disturbances.	25

Teaching-Learning Methodology	• Regular class room teaching will be done with following tools: a. Conventional black board and chalk. b. ICT tools such as projectors, smart boards, etc will also be used for better explanation of scientific components. • Appropriate reference materials will also provided to the students as and when required from departmental library resources.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Understand human physiology, a science of mechanical, physical, and biochemical functions.
2.	They will know complex connection between physiology, medicine, and health,
3.	Know how the human body adapts to stresses, physical activity, and disease.

Suggested References:	
Sr. No.	References

1.	Text book of Medical Physiology : A. C. Guyton and J. E. Harcourt
2.	Text book of Medical Physiology: Ganong.
3.	Principlesofanatomyandphysiology:GerardTortoraandBryanDerrickson,

On-line resources to be used if available as reference material
On-line Resources:-- https://dth.ac.in/medical/courses/anatomy/6/7/index.php https://nptel.ac.in/courses/104/105/104105032/

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Master Degree in Biomedical Science
M.Sc. (Biomedical Science) Semester I

Course Code	PT01EBMC52	Title of the Course	Biomolecule and Bioenergetics
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	The objective of the paper is to **1.** Understand the nature of various biomolecules present in living cells. **2.** Make aware about the different properties of carbohydrates, proteins, lipids, cholesterol, DNA, RNA, glycoproteins and glycolipids and their importance in biological systems. 3. Gain knowledge about processes which cell uses for energy transformation in order to carry out different physiological function.

Course Content		
Unit	Description	Weightage* (%)
1.	Carbohydrates and glycobiology : Monosaccharide - structure of aldoses and ketoses, ring structure of sugars, conformations of sugars, mutarotation, anomers, epimers and enantiomers, structure of biologically important sugar derivatives, oxidation of sugars. Formation of disaccharides, reducing and non-reducing disaccharides. Polysaccharides – homo- and hetero-polysaccharides, structural and storage polysaccharides. Structure and role of proteoglycans, glycoproteins and glycolipids (gangliosides and lipopolysaccharides). Carbohydrates as informational molecules, working with carbohydrates, Industrial importance of carbohydrate.	25
2.	Amino acids: Structure and classification, physical, chemical and optical properties of amino acids, Classification of amino acids, Protein sequencing and alignment Building blocks of lipids - fatty acids, glycerol, ceramide. Storage lipids - triacyl glycerol and waxes, Structural lipids in membranes – glycero-phospholipids, galactolipids and sulpholipids, sphingolipids and sterols, structure, distribution and role of membrane lipids. Lipids as signals, cofactors and pigments	25

	Nucleic acids: Structure of major species of RNA - mRNA, tRNA and rRNA. Nucleic acid chemistry – UV absorption, effect of acid and alkali on DNA.	
3.	Acid-Base Equilibrium & Henderson and Hasse bach equation, Buffers and their importance, pKa of amino acid and their relevance, Importance of discontinuous buffer system used in SDSPAGE. Common reaction mechanism in biological reaction: Peptide bond formation, oligonucleotide and oligosaccharide synthesis, disulphide bond, group-specific chemical modification for amino acid.	25
4.	Bioenergetics: The laws of thermodynamics, concept of entropy and free energy; ATP synthesis and hydrolysis, Biological oxidations—oxygenases, hydrolases, dehydrogenases, free energy changes and redox potentials, Gibbsenergy, The mitochondrial respiratory chain, order and organization of carriers, proton gradient, iron sulphur proteins, cytochromes and their characterization (Animals, Plants, and Bacteria), ATP- synthetase complex, Chemi osmotic theory of Energy Coupling, Inhibitors of ETC, Regulation of body temperature.	25

Teaching-Learning Methodology	• Regular class room teaching will be done with following tools: a. Conventional black board and chalk. b. ICT tools such as projectors, smart boards, etc will also be used for better explanation of scientific components. • Appropriate reference materials will also provided to the students as and when required from departmental library resources.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Provides an exposure to the nature of various biomolecules present in living cells.
2.	Makes the student to understand the properties of carbohydrates, proteins, lipids, cholesterol, DNA, RNA, glycoproteins and glycolipids and their importance in biological systems.
3.	Offers contemporary knowledge about processes which are used by cell for energy transformation for the different physiological function.

Suggested References:	
Sr. No.	References
1.	Chemistry of Biomolecules : S. P. Bhutani,
2.	Lehninger'sPrinciplesofBiochemistry:D.L.NelsonandM.M.Cox,Macmillan
3.	Biochemistry: Lubert Stryer W H Freeman & Co.
4.	Harper's Biochemistry: R.K. Murray and others

On-line resources to be used if available as reference material
On-line Resources:-- https://nptel.ac.in/courses/102/104/102104063/ https://www.boyertownasd.org/cms/lib/PA01916192/Centricity/Domain/743/C.%20Chapter%204-Lesson%204.3-What%20Is%20Bioenergetics.pdf

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Master Degree in Biomedical Science
M.Sc (Biomedical Science) Semester I

Course Code	PT01EBMC53	Title of the Course	Introduction of Biostatistics and Bioinformatics
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	The objective of the paper is to • Make students aware about importance of statistics in research • Understand different statistical methods used to analyze and interpret the scientific data • Familiarize with different bioinformatics tools and computational biology • Explain how bioinformatics plays important role in studying drug action and drug discovery.

Course Content		
Unit	Description	Weightage* (%)
1.	Statistical Methods: Definition and scope of Statistics, concepts of statistical population and sample. Data: quantitative and qualitative, attributes, variables, scales of measurement, ordinal, interval and ratio. Presentation: tabular and graphical, including histogram	25
2.	Descriptive statistics: Measures of Central Tendency: mathematical and positional. Measures of Dispersion: range, quartile deviation, meandeviation, standard deviation, coefficient of variation, Moments, absolute moments, factorial moments, Regression and Correlation; t-test	25
3.	Basics of Drug Action: Energy concept and its importance in drug action. First, Second and Third laws of thermodynamics and the principles derived from these laws which are of significance to drug action. Inter-and intra-molecular interactions. Covalent, ion-ion, Hydrogen bonding, C-H hydrogen bonding, dihydrogen bonding, Vander Waals interactions and the associate energies.	25
4.	Molecular Docking: Introduction to drug discovery, Computers in discovery process Drug properties, Drug properties, Introduction to molecular docking, Rigid docking, Flexible docking, manual docking, Advantage and disadvantage of docking software.	25

Teaching-Learning Methodology	• Regular class room teaching will be done with following tools: a. Conventional black board and chalk. b. ICT tools such as projectors, smart boards, etc will also be used for better explanation of scientific components. • Appropriate reference materials will also provided to the students as and when required from departmental library resources.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Understand the principle of biological data collection scientific data statistically
2.	They will know the importance of mean, standard error and standard deviation
3.	They will be able to recognize the definition of statistics as a subject and its relation with other sciences.
4.	Understand tools of bioinformatics and computational biology
5.	Explore various bioinformatics tools used to study drug action and drug discovery.

Suggested References:	
Sr. No.	References
1.	The Organic Chemistry of Drug Design and Drug Action: R. B. Silverman
2.	Molecular Mechanism of Drug Action: C .J. Coulson
3.	A primer of Drug Action: R. M. Julien
4.	Principles of Drug Action: W.B. Pratt, P. Taylor

On-line resources to be used if available as reference material
On-line Resources: https://nptel.ac.in/courses/102/101/102101056/ https://nptel.ac.in/courses/102/106/102106065/ https://serc.carleton.edu/microbelife/k12/bioinformatics/resources.html https://www.openintro.org/book/biostat/