F. Y. B. Sc. Semester I		
CHE-1111	**Foundation of Chemistry I (For Biological Sciences)**	**Credits:** 2 **Hours:** 30
Course Outcomes (COs) On completion of the course, the students will be able to:		**Bloom's Cognitive Level**
CO1	Describe various properties of matter	1
CO2	Explain types of chemical bonds and thermodynamic concepts	2
CO3	Illustrate concepts of ionic and chemical equilibrium. Outline theoretical basis of organic reactions.	3

Unit No.	Title and Contents	No. of lectures
I	**Basic concepts**: Introduction; what is Chemistry and its nature, Properties of Matter and their measurement; elements, metals, non-metals, compounds, mixtures, three physical states of matter, physical and chemical properties, Laws of chemical combinations, Atomic and molecular masses, Mole concept.	5
II	**Solutions:** Types of solutions, Solubility, factors affecting solubility, Colligative properties; vapor pressure lowering, boiling point elevation, depression in freezing point, Osmotic pressure, isotonic, hypertonic and hypotonic solutions.	5
II	**Chemical bonding:** Types of bonds and factors affecting the bond formation, various theories, bond parameters, types of bonds; Covalent, ionic, hydrogen, Van der Waals, hydrophobic, coordinate, Hydrophilic and hydrophobic interactions.	5
III	**Thermodynamics:** Introduction, terms and basic concepts, types of systems, intensive and extensive properties, equilibrium and non-equilibrium states, reversible and irreversible processes, laws of thermodynamics, internal energy, enthalpy, entropy, endo and exothermic reactions, free energy and work, Gibb's Helmholtz equations, ATP and its role in bioenergetics.	5
IV	**Chemical and ionic Equilibrium:** Chemical equilibrium: Reversible and irreversible reactions, Equilibrium constant, Le Chatelier's principle, industrial application. Ionic equilibrium: Electrolytes and their types, Acid and bases, strength of acid and bases, pH of aqueous solutions, Acid–base titrations, indicators in titrations, ionic product, Condition for precipitation, Buffers, buffer action, Henderson equation and related problems.	5
VI	**Organic Chemistry:** Structural representation of organic molecules, classification of organic compounds, nomenclature, isomerism, Theoretical basis of organic reactions.	5

References:

1. The elements of Physical Chemistry, 7th edition (2017), Atkins P, de Paula J. W. H. Oxford University Press.
2. An Introduction to Electrochemistry, edition reprint, 2011, Samuel Glasstone, BiblioBazaar, USA
3. Physical Chemistry for the chemical and biological sciences, 1st edition, (2005), Chang R., University Science Books, USA
4. Essentials of Physical Chemistry, 24th edition, (2000), B S Bahl, G D Tuli, Arun Bahl, S. Chand Limited, India.
5. Concise Inorganic Chemistry, 5th edition (2008), Author: J. D. Lee, John Wiley and Sons, USA.
6. Organic Chemistry, 7th edition, (2011), Morrison Robert Thornton, Pearson Publication, Dorling Kindersley (India Pvt. Ltd.

F. Y. B. Sc. Semester I		
CHE-1121	**Chemistry Practical 1 (For Biological Science)**	**Credits:** 2 **Hours:** 30
Course Outcomes (COs) **On completion of the course, the students will be able to:**		**Bloom's Cognitive Level**
CO1	Outline methods to prepare, standardize and determine the strength of various solutions.	1
CO2	Determine molar gas constant, molar mass and hardness of water sample.	2
CO3	Analyze basic properties of organic compounds.	3

Sr. No.	Contents	Hours
I	To standardize $KMnO_4$ solution and find the strength of given solution.	2
II	To prepare different buffer solutions (Sodium acetate, phosphate and Tris)	2
III	To determine molar gas constant (R) by eudiometric method and express R in different units.	2
IV	To determine total hardness of given water sample.	2
V	Determination of molar mass using colligative property.	2
VI	Organic qualitative analysis (nature, type, physical constant, functional groups)	5

F. Y. B. Sc. Semester I		
CHE-1112	**Foundation of Chemistry II (For Biological Sciences)**	**Credits:** 2 **Hours:** 30
Course Outcomes (COs) On completion of the course, the students will be able to:		**Bloom's Cognitive Level**
CO1	Describe various concepts in Kinetics, Catalysis and Electrochemistry	1
CO2	Explain structure and functions of biomolecules.	2
CO3	Illustrate physical and chemical properties of various organic compounds.	3

Unit No.	Title and Contents	No. of lectures
I	**Chemical Kinetics and Catalysis:** Definition, Reaction rate, Rate laws, Molecularity of reaction, Zero order, Pseudo-order, first order, second order reactions, Half-life of a reaction, Methods to determine order of reaction, Collision theory, effect of temperature on reaction rate, Activation energy and catalysis, Catalysis; types, characteristics of catalyzed reactions, classification of catalysis, enzyme catalysis; classification of enzymes, rate enhancement and activation energy	5
II	**Electrochemistry:** Redox reactions; basic concepts, free energy changes in redox reactions, EMF of a cell and its measurements, Nernst Equation, Computation of cell EMF, Calculation of thermodynamic quantities of cell reactions (ΔG, ΔH and K), standard electrode potential, sign conventions, electrochemical series	5
III	**Introduction to biomolecules**: Carbohydrates: Introduction, biological importance. Definition, Classification (glyceraldehyde, Simple Aldose, Simple Ketoses, D-glucose, Conformation of D-glucose), disaccharides, polysaccharides (starch, glycogen) Proteins:- Amino acids; Structure and properties, Primary, Secondary, Tertiary and Quaternary structure, Lipids: - Introduction, classes, fatty acids; physical and chemical properties, simple lipids Nucleic acids: Nucleosides, nucleotides, Polynucleotide, DNA and RNA	10
IV	**Organic chemistry:** Nomenclature, classification, physical and chemical properties of alcohols, phenols, ethers, aldehydes, ketones, carboxylic acids and amines.	5
V	**Green chemistry:** Definition, role, principles, nanotechnology, features of nanoparticles, synthesis, applications of nanomaterials	5

References:

1. The elements of Physical Chemistry, 7th edition (2017), Atkins P, de Paula J. W. H. Oxford University Press.
2. An Introduction to Electrochemistry, edition reprint, 2011, Samuel Glasstone, BiblioBazaar, USA
3. Physical Chemistry for the chemical and biological sciences, 1st edition, (2005), Chang R., University Science Books, USA
4. Essentials of Physical Chemistry, 24th edition, (2000), B S Bahl, G D Tuli, Arun Bahl, S. Chand Limited, India.
5. Concise Inorganic Chemistry, 5th edition (2008), Author: J. D. Lee, John Wiley and Sons, USA.
6. Organic Chemistry, 7 th edition, (2011), Morrison Robert Thornton, Pearson Publication, Dorling Kindersley (India Pvt. Ltd.)
7. Principles of Biochemistry,7th edition (2017), Lehninger, Freeman W.H. and Company.
8. Biochemistry, Berg J., Tymoczko J., Stryer L., 8th edition (2015), Freeman W. H. and Company.

F. Y. B. Sc. Semester I		
CHE-1122	**Chemistry Practical 2 (For Biological Science)**	**Credits:** 2 **Hours:** 30
Course Outcomes (COs) **On completion of the course, the students will be able to:**		**Bloom's Cognitive Level**
CO1	Outline methods to decide acidic and basic properties of various compounds.	1
CO2	Determine effect of various parameters that influence rate of reaction.	2
CO3	Identify and analyze biomolecules.	3

Sr. No.	Contents	Hours
I	Acid-base titration based on conductivity measurement.	2
II	To study acidic and basic properties of amino acids through its titration curve using pH metry.	2
III	To determine the amount and % of Aspirin from APC tablet.	2
IV	To study effect of varying temperature on the rate of reaction between sodium thiosulphate and hydrochloric acid.	3
V	Characteristic tests for alcohols, phenols, ethers, aldehydes, ketones, carboxylic acids and amines.	3
VI	Qualitative tests for detection of carbohydrates, proteins, nucleic acids and lipids.	3