

Semester II

S.No	Course Code	Course Name	L	T	P	C
1	MA109T	Linear Algebra and Differential Equations	3	1.5	0	9
2	CS101T	Data Structures and Algorithms	3	0	0	6
3	CS101L	Data Structures and Algorithms Laboratory	0	0	3	3
4	PH102T	Electricity and Magnetism	2	1	0	6
5	BB201T	Biomolecules	2	1	0	6
6	CH203T	States of Matter (1st Half)	3	0	0	3
7	CH201T	Organic Chemistry (2nd Half)	3	0	0	3
8	PH101L	Hands On Science Laboratory - II	0	0	3	3
9	CC	NSO/NSS/NCC/NCA	0	0	0	2
		Total Credits				41

1	Title of the course (L-T-P-C)	Data Structures and Algorithms (3-0-0-6)
2	Pre-requisite courses(s)	Exposure to Computer Programming
3	Course content	Introduction: data structures, abstract data types, analysis of algorithms. Creation and manipulation of data structures: arrays, lists, stacks, queues, trees, heaps, hash tables, balanced trees, tries, graphs. Algorithms for sorting and searching, order statistics, depth-first and breadth-first search, shortest paths and minimum spanning tree.
4	Texts/References	1. Introduction to Algorithms, 3rd edition, by T. Cormen, C. Leiserson, R. Rivest, C. Stein, MIT Press and McGraw-Hill, 2009. 2. Data structures and algorithms in C++, by Michael T. Goodrich, Roberto Tamassia, and David M. Mount, Wiley, 2004.

1	Title of the course (L-T-P-C)	Data Structures and Algorithms Laboratory (0-0-3-3)
2	Pre-requisite courses(s)	Exposure to Computer Programming (CS 102)
3	Course content	Laboratory course for CS 211 is based on creating and manipulating various data structures and implementation of algorithms.
4	Texts/References	<ol style="list-style-type: none"> 1. Introduction to Algorithms, 3rd edition, by T. Cormen, C. Leiserson, R. Rivest, C. Stein, MIT Press and McGraw-Hill, 2009. 2. Data structures and algorithms in C++, by Michael T. Goodrich, Roberto Tamassia, and David M. Mount, Wiley, 2004.

1	Title of the course (L-T-P-C)	Biomolecules (2-1-0-6)
2	Pre-requisite courses(s)	None
3	Course content	<p>Major classes of biological molecules: Comparison of the alphabets and sources of structural diversity of proteins, nucleic acids, carbohydrates and lipids.</p> <p>Proteins: Ramachandran plot, evolution of protein structure, structure-function relationships: myoglobin and adaptations in myoglobin structure in deep diving mammals; allostery in hemoglobin; Bohr effect (for pH and carbon dioxide); adult and foetal hemoglobin. Post-translational modifications: special types of covalent bonds found in proteins. Protein folding: Natively folded and natively disordered proteins; miniproteins and peptide toxins; Anfinsen's observations, Levinthal paradox, cooperativity in protein folding, free energy landscape of protein folding and pathways of protein folding, molten globule state, diseases associated with protein folding.</p> <p>Carbohydrates: Sources of structural diversity; structure- function relationship in glycogen and cellulose, Difficulty associated with sequencing of glycans.</p> <p>Lipids: Structure and properties of storage and membrane lipids. Self-assembly of lipids: packing parameter; Biomembrane organization - sidedness and function; membrane bound proteins - structure, properties and function; transport phenomena.</p> <p>Nucleic acids: Historical perspective leading up to the proposition of DNA double helical structure with emphasis on the innovativeness of experimental design; Secondary structure of RNA; chromatin organization.</p> <p>Enzymes: General principles of catalysis; quantitation of enzyme activity and efficiency; Henri-Michaelis-Menten and Briggs-Haldane relationships; Transition state: definition Pauling's intuition and proposal, catalytic antibodies; Catalytic strategies; Isozymes: Haldane relationship between kinetic constants and equilibrium constant; Zymogens.</p> <p>Bioenergetics: basic principles; equilibria and concept of free energy; coupled interconnecting reactions in metabolism; oxidation of carbon fuels; recurring motifs in metabolism. Relevant metabolic pathways may be included to discuss relevant concepts.</p>
4	Texts/References	<ul style="list-style-type: none"> ● Rodney F Boyer, Concepts in Biochemistry. John Wiley & Sons; 3rd Ed (2 December 2005). ● Thomas Miilar, Biochemistry Explained: A Practical Guide to Learning Biochemistry CRC Press; 1 edition (30 May 2002) , ● Lubert Stryer et al., Biochemistry.W. H. Freeman; 6th Edition edition (14 July 2006) 4. David L Nelson, and Michael M Cox et al., Lehninger principles of biochemistry WH Freeman; 7th ed. 2017 edition (1 January 2017)

1	Title of the course (L-T-P-C)	Electricity and Magnetism (2-1-0-6)
2	Pre-requisite courses(s)	Nil
3	Course content	<ul style="list-style-type: none"> ● Review of vector calculus: Spherical polar and cylindrical coordinates; gradient, divergence and curl; ● Divergence and Stokes' theorems; ● Divergence and curl of electric field, Electric potential, properties of conductors; ● Poisson's and Laplace's equations, uniqueness theorems, boundary value problems, separation of variables, method of images, multipoles; ● Polarization and bound charges, Gauss' law in the presence of dielectrics, Electric displacement D and boundary conditions, linear dielectrics; ● Divergence and curl of magnetic field, Vector potential and its applications; ● Magnetization, bound currents, Ampere's law in magnetic materials, Magnetic field H, boundary conditions, classification of magnetic materials; ● Faraday's law in integral and differential forms, Motional emf, Energy in magnetic fields, Displacement current, Maxwell's equations, ● Electromagnetic (EM) waves in vacuum and media, Energy and momentum of EM waves, Poynting's theorem; <p>Reflection and transmission of EM waves across linear media.</p>
4	Texts/References	<p>(1) Introduction to Electrodynamics (4th ed.), David J. Griffiths, Prentice Hall, 2015.</p> <p>(2) Classical Electromagnetism, J. Franklin, Pearson Education, 2005.</p>

1	Title of the course (L-T-P-C)	States of matter (3-0-0-3)
2	Pre-requisite courses(s)	Fundamental concepts and applications of chemistry (CH101)
3	Course content	<p>The Gaseous State: Gas laws, Equation of state, Concept of temperature, pressure, partial pressure, density, Mole concept.</p> <p>Kinetic Theory of Gases: Maxwells distribution of molecular velocities, Collisions theory. Viscosity of gases. Energy distribution function, Phase rule and equilibria.</p> <p>Real Gases: Deviations from ideal behaviour, Compressibility factors, van der Waals and Virial equation, Reduced equation of state, Law of corresponding states, Critical phenomena, Intermolecular forces.</p> <p>The solid and liquid states and their properties.</p>
4	Texts/References	<ol style="list-style-type: none"> 1. K. L. Kapoor, A Textbook of Physical Chemistry, States of Matter and Ions In Solution (SI Units) - Vol. 1 6th Edition 2. P. Atkins, Julio de Paula, J. Keeler, Atkins' Physical Chemistry: International Eleventh Edition

1	Title of the course (L-T-P-C)	Organic chemistry (3-0-0-3)
2	Pre-requisite courses(s)	Fundamental concepts and applications of chemistry (CH101)
3	Course content	<p>Reactive Intermediates: An overview of the chemistry of carbenes, nitrenes, radicals, carbocations, carbanions and benzyne. Introduction to substitution, elimination, addition, oxidation, reduction, rearrangement types of reactions</p> <p>Epoxydation named reactions: Jacobsen and Sharpless.</p> <p>Olefination named reactions: Wittig, Julia, Wharton, Peterson, Tebbe.</p> <p>Cross-Coupling named reactions: Buchwald-Hartwig, Negishi, Sonogashira, Suzuki, Wurtz, Ullmann, McMurry, Heck, Stille.</p> <p>Pericyclic reactions: Diels-alder cycloaddition, Ene reaction, Cope rearrangement, Claisen rearrangement (Johnson, Ireland and Eschenmoser).</p> <p>Organic chemistry in industry: Pharmaceuticals, dye, and agrochemicals</p>
4	Texts/References	<ol style="list-style-type: none"> 1. Jerry March and Michael Smith, "Advanced Organic Chemistry", 7th Ed., Wiley, 2015. 2. F. A. Carey and R. J. Sundberg, "Advanced Organic Chemistry, Part A and B", 5th Ed., Springer, 2008. 3. J. Clayden, N. Greeves, and S. Warren, "Organic Chemistry", 2nd Ed., Oxford University Press, 2014. 4. W. Carruthers and I. Coldham, "Modern Methods of Organic Synthesis", 4th Ed., Cambridge University Press, 2015. 5. Laszlo Kurti and Barbara Czako, "Strategic applications of named reactions in organic synthesis", 1st Ed., Elsevier, 2005. 6. R. B. Grossman, "Art of writing reasonable organic reaction mechanisms", 2nd Ed., Springer, 2010. 7. P. Bruice, "Organic Chemistry" 7th Ed., Pearson, 2013. 8. Penny Chaloner, "Organic chemistry: A mechanistic approach, CRC Press; 1st edition, 2014