

BCHY101L	Engineering Chemistry	L	T	P	C
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Pre-requisite	NIL	Syllabus version			
		1.0			
Course Objectives					
<ol style="list-style-type: none">1. To enable students to have fundamental understanding of the basic concepts of different disciplines of chemistry.2. To provide avenues for learning advanced concepts from school to university3. To empower students with emerging concepts in applied chemistry to be useful in addressing societal needs4. To integrate analytical and computational ability with experimental skills to create individuals competent in basic science and its by-product of its application.5. To offer opportunities to create pathways for self-reliant in terms of knowledge and higher learning					
Course Outcomes :					
<ol style="list-style-type: none">1. Understand the fundamental concepts in organic, inorganic, physical, and analytical chemistry.2. Analyze the principles of applied chemistry in solving the societal issues.3. Apply chemical concepts for the advancement of materials.4. Appreciate the fundamental principles of spectroscopy and the related applications.5. Design new materials, energy conversion devices and new protective coating techniques.					
Module:1	Chemical thermodynamics and kinetics	6 hours			
Laws of thermodynamics - entropy change (selected processes) – spontaneity of a chemical reaction and Gibbs free energy - heat transfer; Kinetics - Concept of activation energy and energy barrier - Arrhenius equation- effect of catalysts (homo and heterogeneous) – Enzyme catalysis (Michaelis-Menten Mechanism).					
Module:2	Metal complexes and organometallics	6 hours			
Inorganic complexes - structure, bonding and application; Organometallics – introduction, stability, structure and applications of metal carbonyls, ferrocene and Grignard reagent; Metals in biology (haemoglobin, chlorophyll- structure and property).					
Module:3	Organic intermediates and reaction transformations	6 hours			
Organic intermediates - stability and structure of carbocations, carbanions and radicals; Aromatics (aromaticity) and heterocycles (3, 4, 5, 6 membered and fused systems); Organic transformations for making useful drugs for specific disease targets (two examples) and dyes (addition, elimination, substitution and cross coupling reactions).					
Module:4	Energy devices	6 hours			
Electrochemical and electrolytic cells – electrode materials with examples (semi-conductors), electrode-electrolyte interface- chemistry of Li ion secondary batteries, supercapacitors; Fuel cells: H ₂ -O ₂ and solid oxide fuel cell (SOFC); Solar cells - photovoltaic cell (silicon based), photoelectrochemical cells and dye-sensitized cells.					
Module:5	Functional materials	7 hours			
Oxides of AB, AB ₂ , ABO ₃ type (specific examples); Composites - types and properties; Polymers - thermosetting and thermoplastic polymers – synthesis and application (TEFLON, BAKELITE); Conducting polymers- polyacetylene and effect of doping – chemistry of display devices specific to OLEDs; Nano materials – introduction, bulk vs nano (quantum dots), top-down and bottom-up approaches for synthesis, and properties of nano Au.					
Module:6	Spectroscopic, diffraction and microscopic techniques	5 hours			
Fundamental concepts in spectroscopic and instrumental techniques; Principle and applications of UV-Visible and XRD techniques (numericals); Overview of various techniques such as AAS, IR, NMR, SEM and TEM.					
Module:7	Industrial applications	7 hours			

Water purification methods - zeolites, ion-exchange resins and reverse osmosis; Fuels and combustion -LCV, HCV, Bomb calorimeter (numericals), anti-knocking agents); Protective coatings for corrosion control: cathodic and anodic protection - PVD technique; Chemical sensors for environmental monitoring - gas sensors; Overview of computational methodologies: energy minimization and conformational analysis.			
Module:8	Contemporary topics		2 hours
Guest lectures from Industry and, Research and Development Organizations			
	Total Lecture hours:		45 hours
Textbook			
1.	Theodore E. Brown, H Eugene, LeMay Bruce E. Bursten, Catherine Murphy, Patrick Woodward, Matthew E. Stoltzfus, Chemistry: The Central Science, 2017, 14th edition, Pearson Publishers, 2017. UK		
Reference Books			
1.	Peter Vollhardt, Neil Schore, Organic Chemistry: Structure and Function, 2018, 8th ed WH Freeman, London		
2.	Atkins' Physical Chemistry: International, 2018, Eleventh edition, Oxford University Press; UK		
3.	Colin Banwell, Elaine McCash, Fundamentals for Molecular Spectroscopy, 4th Edition, McGraw Hill, US		
4.	Solid State Chemistry and its Applications, Anthony R. West. 2014, 2nd edition, Wiley, UK.		
5.	Angèle Reinders, Pierre Verlinden, Wilfried van Sark, Alexandre Freundlich, Photovoltaic solar energy: From fundamentals to Applications, 2017, Wiley publishers, UK.		
6.	Lawrence S. Brown and Thomas Holme, Chemistry for engineering students, 2018, 4 th edition – <i>Open access version</i>		
Mode of Evaluation: CAT, Written assignment, Quiz and FAT			
Recommended by Board of Studies		28.06.2021	
Approved by Academic Council		No. 63	Date 23.09.2021