

LOK JAGRUTI UNIVERSITY (LJU)
INSTITUTE OF ENGINEERING AND TECHNOLOGY

Department of Chemical Engineering (708)

Bachelor of Engineering (B.E.) - Semester – I

Course Code:	017081101
Course Name:	Chemistry - I
Category of Course:	Basic Science course (BSC)
Prerequisite Course:	---

Teaching Scheme				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Total Hours
5	0	2	6	50

Syllabus				
Unit No.	Topic/	Prerequisite Topic	Successive Topic	Teaching Hours
01	Introduction to Atomic and Molecular Structure			
	1.1 Structure of an Atom	---	Concept of Radiation (017083403-Unit-6.1)	5 (10%)
	1.2 Types of orbitals	---		
	1.3 Wave Mechanical approach of atom, Heisenberg Uncertainty Principle	Types of orbitals (017081101-Unit-1.2)		
1.4 Schrodinger Wave Equation	Structure of an Atom (017081101-Unit-1.1)			
02	Stereochemistry			
	2.1 Optical activity, Enantiomers, Diastereomers	---	Classification of Dye According to its Constitution and Application (017083304-Unit-6.1)	4 (8%)
	2.2 Polarimeter	Optical activity (017081101-Unit-2.1)		
2.3 Optical activity in Lactic and Tartaric acid	---			
03	Principles and Mechanisms of Organic Reactions-I			
	3.1 Introduction to Reactive intermediates – carbocations, carbanions, carbon radicals, carbenes	---	Manufacturing Process of Ammonia, Urea, and Nitric Acid (017083304-Unit-4.3)	6 (12%)
	3.2 Types of reactions	---		
3.3 Mechanism of substitution, addition, elimination reactions	Types of reaction (017081101-Unit-3.2)			
04	Principles and Mechanisms of Organic Reactions-II			
	4.1 Sand Meyer reaction and its application	Types of reaction (017081101-Unit-3.2)	---	6 (12%)
	4.2 Cannizzaro reaction and its application	---		
4.3 Wolf Kishner reaction and its application	---			
05	The Phase rule			
	5.1 Introduction	---	Criteria for Phase Equilibrium (017083301-Unit-5.2)	5 (10%)
	5.2 Phase, Components, Degree of freedom	Introduction (017081101-Unit-5.1)		
	5.3 Water system	Phase, Components, Degree of freedom (017081101-Unit-5.2)		
5.4 Ag-Pb system	--			
06	Electro Chemistry			
	6.1 Introduction to electrochemistry	---	---	5 (10%)
	6.2 Half reaction, Electrode potential, Nernst's equation	Introduction to electro chemistry (017081101-Unit-6.1)		
	6.3 Electro chemical cell	---		
6.4 Type of electrodes	---			
07	Nuclear chemistry			
	7.1 Introduction to nuclear chemistry	---	---	6 (12%)
	7.2 Radioactivity, type of radiations	Types of Introduction to nuclear chemistry (017081101-Unit-7.1)		
	7.3 Nuclear reactions	---		
	7.4 Nuclear reactor	---		
7.5 Nuclear waste disposal	---			
08	Amino acid & Protein Chemistry			
	8.1 Introduction	---	---	5 (10%)
	8.2 Classification & Isolation of Proteins	Introduction (017081101-Unit-8.1)		
	8.3 Qualitative tests of Proteins	Classification & Isolation of Proteins (017081101-Unit-8.2)		
	8.4 Classification of Amino acids	---		
8.5 Structure of RNA and DNA	---			
09	Introduction to various organic Processes			
	9.1 Introduction	---	Manufacturing Process of Ammonia, Urea, and Nitric Acid (017083304-Unit-4.3)	4 (8%)
	9.2 Nitration, Amination	Types of reaction (017081101-Unit-3.2)		
9.3 Hydrogenation, Halogenations	Types of reaction (017081101-Unit-3.2)			

10	Explosives			4 (8%)
	10.1 Introduction	---	---	
	10.2 classification of explosives	Introduction (017081101-Unit-10.1)		
	10.3 Preparation and uses of explosives	classification of explosives (017081101-Unit-10.2)		

Sr No.	Practical Title	Link to Theory Syllabus
1	To determine the optical activity using Polarimeter .	Unit 2
2	To identify an organic compound through group tests, functional tests and confirmative tests.	Unit 3
3	To synthesize aryl halide by Sand Meyer reaction	Unit 4
4	To synthesize carboxylic acid by Cannizzaro reaction	Unit 4
5	To produce methylene groups containing compounds using Wolf Kishner reaction	Unit 4
6	To determine potential using Electrochemical cell	Unit 6
7	To isolate proteins using different methods.	Unit 8
8	Qualitative analysis of proteins	Unit 8
9	To determine nitrobenzene using Nitration reaction	Unit 9
10	Determination of chloro-butane using Halogenation reaction	Unit 9
11	To identify different explosives.	Unit 10

Major Components/ Equipment	
Sr. No.	Component/Equipment
1	Polarimeter
2	UV Spectrophotometer
3	Centrifuge
4	TLC
5	IR Spectrophotometer
6	Hot air oven
7	Desiccator
8	Electrochemical cells

Proposed Theory + Practical Evaluation Scheme by Academicians (% Weightage Category Wise and it's Marks Distribution)						
L:	5	T:	0	P:	2	
Note: In Theory Group, Total 4 Test (T1+T2+T3+T4) will be conducted for each subject. Each Test will be of 25 Marks. Each Test Syllabus Weightage: Range should be 20% - 30%						
Group (Theory or Practical)	Group (Theory or Practical) Credit	Total Subject Credit	Category	% Weightage	Marks Weightage	
Theory	5	6	MCQ	54%	65	
Theory			Theory Descriptive	21%	25	
Theory			Formulas and Derivation	0%	0	
Theory			Numerical	8%	10	
Expected Theory %	83%			Calculated Theory %	83%	100
Practical	1			Individual Project	0%	0
Practical			Group Project	7%	40	
Practical			Internal Practical Evaluation (IPE)	10%	60	
Practical			Viva	0%	0	
Practical			Seminar	0%	0	
Expected Practical %	17%		Calculated Practical %	17%	100	
Overall %	100%			100%	200	

Course Outcome	
	<i>Upon completion of the course students will be able to</i>
CO1	Understands the fundamental principles of atomic structure, molecular structure, the importance of stereochemistry in organic chemistry, analyze and propose mechanisms for a wide range of organic reactions, including those involving multiple steps, complex intermediates
CO2	Understand the mechanism of the Sandmeyer reaction, Cannizzaro reaction Wolf Kishner reaction and their application in formation of compound, develop a solid understanding of the Phase Rule and its fundamental principles in physical chemistry and thermodynamics
CO3	Understand the basic principles of electrochemistry, be familiar with different types of nuclear reactions
CO4	Understand the structures, properties, and functions of amino acids and proteins, be familiar with different types of organic reactions and chemistry of explosives

Suggested Reference Books	
1	Essential of Physical Chemistry by Bahl and Tuli., S Chand & Co. Ltd, New Delhi.
2	D.A. Skoog, D.M. West, F.J. Holler, S.R. Crouch, Fundamentals of Analytical Chemistry
3	Engineering Chemistry by Jain and Jain, Dhanpat Rai Publishing Co.
4	R.T. Morrison and R.N. Boyd, Organic Chemistry, Prentice Hall of India Pvt. Ltd., 5th edition, 1990
5	A Text Book Of Organic Chemistry by P. L. Soni, Sultan Chand & Sons, New Delhi.

List of Open Source Software/Learning Website	
1	https://nptel.ac.in
2	https://www.edx.org/course/subject/chemistry

Practical Project/Hands on Project		
Sr. No.	List of Practical Projects/Hands on Project	Linked with Unit
1	Describe in detail importance of orbitals and their structures. How they decide structure of molecule?	Unit 1
2	Provide different ways to segregate and identify optical isomers from sample given.	Unit 2
3	Give various examples of chemical industries in which different organic reactions are widely utilized.	Unit 3
4	Describe the ways in which General reactions of organic chemistry are used for efficient results.	Unit 4,5
5	Explain various aspects and applications of Water system.	Unit 5
6	Provide application of Nernst equation in qualitative analysis.	Unit 6
7	Show how Electrodes are backbone for electroanalytical techniques.	Unit 6
8	State in detail Radioactivity and incident occurred in recent past.	Unit 7
9	Explain in detail how Classification of proteins plays important role in genetic studies.	Unit 8
10	In recent scenario Halogenation reactions are most widely used in industry, give justification.	Unit 9
11	Prove link between the study of various organic reaction and explosives.	Unit 10