Faculty of Engineering & Technology
Diploma Engineering (DE)
(W. E. F.: 2023-24)

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Name of Faculty	:	Faculty of Engineering & Technology
Name of Program	:	Diploma Engineering
Course Code	:	1DCH01
Course Title	:	Applied Chemistry
Type of Course	:	Basic Science (BS)
Year of Introduction	:	2023-24

Prerequisite	:	Understanding of basic science
Course Objective	:	To provide students with a fundamental understanding of the scope and importance of chemistry, atomic structure and periodicity, chemical bonding, reaction rates and kinetics, as well as spectroscopic and analytical techniques used in the chemical industry quality control.
Course Outcomes	:	At the end of this course, students will be able to:
	CO1	Understand the scope and importance of chemistry. Understand the discovery of electrons, protons, and neutrons, their atomic structure, the concepts of shells, subshells, and orbitals, and their electronic configurations.
	CO2	Understand the significance of classification and the periodic table.
	CO3	Understand the valence electrons and the types of chemical bonds, Lewis structures, VSEPR theory, hybridization, molecular orbital theory, and its applications.
	CO4	Understand the rate of a reaction and the factors affecting it. Understand the order and molecularity of a reaction, rate law, and specific rate constant.
	CO5	Understand spectroscopic techniques such as UV, IR, and NMR, and their applications. Understand the use of analytical techniques in chemical industry quality control.

Teaching and Examination Scheme

Teaching Scheme (Contact Hours)			Credits	Examination Marks				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	SEE	CIA	SEE	CIA	
3	0	2	4	70	30	30	20	150

Legends: ***L****-Lecture;* ***T****–Tutorial/Teacher Guided Theory Practice;* ***P*** *– Practical,* ***C*** *– Credit,* ***SEE*** *– Semester End Examination,* ***CIA*** *- Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.))*

Course Content

Unit No.	Topics	Teaching Hours	Weightage	Mapping with COs
1	**Basic concepts of Chemistry** General importance and scope of Chemistry, Nature of matter, Laws of chemical combination. Discovery of Electron, Proton and Neutrons, atomic number, isotopes, and Isobars, Thomson's model and its limitations. Rutherford`s model and its limitations, Bohr`s model and its limitations, concepts of shells and subshells, dual nature of matter and light, DE Broglie`s relationship, Heisenberg uncertainty principal, concepts of orbitals, quantum numbers, shapes of s, p and d orbitals, Aufbau principal, Pauli`s exclusion principle and Hund`s rule, electronic configuration of atoms	8	20%	CO1 CO2
2	**Classification of Elements and Periodicity in properties** Significance of classification, brief history of the development of periodic table, modern periodic law and the present form of periodic table, periodic trends in properties of elements -atomic radii, ionic radii, inert gas radii, Ionization enthalpy, electron gain enthalpy, electronegativity, valency. Nomenclature of elements with atomic number greater than 100.	8	20%	CO2 CO3
3	**Chemical bonding and coordination Compound** Valence electrons, ionic bond, covalent bond, bond parameters, Lewis's structure, polar character of covalent bond, covalent character of ionic bond, valence bond theory, resonance, geometry of covalent molecules, VSEPR theory, concept of hybridization, involving s, p and d orbitals and shapes of some simple molecules, molecular orbital theory	8	20%	CO3
4	**Chemical kinetics** Rate of a reaction (Average and instantaneous), factors affecting rate of reaction: concentration, temperature, catalyst; order and molecularity of a reaction, rate law and specific rate constant, integrated rate equations and half-life (only for zero and first order reactions), concept of collision theory (elementary idea, no mathematical treatment), activation energy, Arrhenius equation	8	20%	CO4
5	**Analytical techniques** Spectroscopic Techniques and Applications: Elementary idea and simple applications of UV, IR and NMR, Numerical problems. Application in Chemical industry quality control example	8	20%	CO5

Suggested Distribution of Theory Marks Using Bloom's Taxonomy						
Level	Remembrance	Understanding	Application	Analyse	Evaluate	Create
Weightage	**25**	**25**	**20**	**15**	**10**	**5**

NOTE: This specification table shall be treated as a general guideline for the students and the teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Suggested List of Experiments/Tutorials

Sr. No.	Name of Experiment/Tutorial	Teaching Hours
1	Prepare a standard solution of oxalic acid or potassium permanganate.	2
2	Determination of the rate of a reaction using different experimental methods.	2
3	Determine pH-Values of given samples of Solution by using Universal Indicator and pH-meter.	2
4	Determination of the molecular geometry of different molecules using VSEPR theory.	2
5	Analysis of the periodic trends of the ionization energy of different elements.	2
6	Determination of the concentration of a substance in a sample using titration methods.	2
7	Determine the strength of the given sodium hydroxide solution by titrating against standard oxalic acid solution using phenolphthalein indicator.	2
8	Determination of the concentration of a colored species using UV-Vis spectrophotometry	2

Major Equipment/ Instruments and Software Required

Sr. No.	Name of Major Equipment/ Instruments and Software
1	Weighing balance, Magnetic stirrer
2	pH meter
3	UV-Vis spectrophotometer

Suggested Learning Websites

Sr. No.	Name of Website
1	https://www.khanacademy.org/science/chemistry
2	https://www.chemguide.co.uk/
3	https://ocw.mit.edu/courses/chemistry/
4	https://chem.libretexts.org/
5	https://www.rsc.org/

Reference Books

Sr. No.	Name of Reference Books
1	11th and 12th NCERT Chemistry books
2	Concise Inorganic Chemistry by J.D. Lee
3	Inorganic Chemistry by Shriver and Atkin
4	Engineering chemistry: Fundamentals and applications by Sikha Agarwal
5	Chemistry for Engineers by Amarika Singh and S Vairm
6	Chemistry for Engineers by B K Ambasta
7	Chemistry for Engineers (WIND) " by Rajesh Agnihotri