GENERAL CHEMISTRY – III

Semester	Subject Code	Category	Lecture hours		Theory hours		Practical hours		Credits
			Per week	Per sem.	Per week	Per sem.	Per week	Per sem.	
IV	21CCH4A	Core-IV	4	60	4	60	-	-	4

COURSE OBJECTIVES:

The students will be able to

- Gain knowledge about the basic concepts regarding Nitrogen, Oxygen, Halogen families and Noble gases.
- Understand about Carbonyl compounds, Carboxylic Acids, Thermodynamics of solutions and Colligative properties.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	Learn about the p-block elements, nitrogen and oxygen families.	K4
CO2	Get a clear knowledge about halogen family, noble gases and their applications.	K4
CO3	Know about the important reactions of carbonyl compounds and carboxylic acids.	K3
CO4	Understand about the concepts and importance of solutions	K3
CO5	Gain knowledge about partially miscible liquids, colligative properties and their applications.	K4

*CO – Course Outcomes

Knowledge Level: K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze.

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	M	M	S	S
CO2	S	S	M	M	S	S
CO3	S	S	S	S	S	S
CO4	S	S	M	M	S	S
CO5	S	S	S	M	S	S

(S – Strong; M – Medium; L – Low)

UNIT – I: p-Block Elements – Nitrogen and Oxygen family **12 Hours**

1.1 General characteristics of elements of V A Group with reference to electronic configuration, atomic and ionic radii, ionization energy, electron affinity, electronegativity, oxidation states, inert pair effect, catenation, halides, oxides, hydrides, oxy acids – Preparation, properties and uses of Hydrazine, Hydroxylamine and Hydrazoic acid – Allotropes of Phosphorus and their structures – Chemistry of PH_3, PCl_3, PCl_5, $POCl_3$– oxides and oxyacids of Nitrogen and phosphorous.

1.2 General characteristics of elements of VI A group with reference to electronic configuration, atomic and ionic radii, ionization energy, electron affinity, electronegativity, oxidation states, inert pair effect, catenation, anomalous behavior of oxygen – Structure and uses of ozone – Sulphur: Allotropes of sulphur – Rhombic and Monoclinic sulphur – Structure of sulphur and action of heat, properties, structure and uses of SO_2, SO_3, H_2SO_4, hyposulphurous acid and pyrosulphuric acid – Peracids of sulphur – Preparation, properties, structure and uses.

UNIT – II: Halogens and Noble gases 12 Hours

2.1 General characteristics of halogens with reference of electronegativity, electron affinity, oxidation states, and oxidising power – Anomalous behavior of fluorine – Hydrides, oxides and oxyacids of halogens – Interhalogen compounds – Classification, structures and uses of interhalogen compounds – ICl, BrF_3, ClF_5 and IF_7.

2.2 Inert gases – Position of noble gases in the periodic table – General characteristics – structure and shape of xenon compounds – XeF_2, XeF_4, XeF_6, $XeOF_2$, $XeOF_4$, XeO_3 – Clathrates of Xenon – Uses of noble gases.

UNIT – III: Carbonyl Compounds and Carboxylic Acids 12 Hours

3.1 Common methods of synthesis: Synthesis of aldehydes from acid chlorides, Stephen's reduction – Gattermann-Kosch and Rosenmund's reaction – Synthesis of ketones from nitriles, Friedel-Crafts and Hoesch reactions – Reactions of nucleophilic additions to carbonyl group – Addition of HCN, alcohols, sodium bisulphite, Grignard reagents – Aldol, Perkin, Benzoin and Knoevenegal condensation reactions – Wittig reaction, Mannich reaction, Reformatsky reaction and Cannizzaro reaction.

3.2 Preparation of carboxylic acids from alcohols, cyanides and Grignard reagents – Acidity of carboxylic acids – Effect of substituents on acid strength – Reactions of carboxylic acids – Hell-Volhard-Zelinsky reaction – Esterification, acylation, dehydration and

reduction – Dicarboxylic acids – General method of Preparation from acetoacetic ester – Action of heat on dicarboxylic acid – Oxalic acid, malonic acid, succinic acid, glutaric acid, adipic acid and phthalic acid.

UNIT – IV: Thermodynamics of Solutions **12 Hours**

4.1 Solutions of gases in liquids – Henry's law – Limitations – Solution of liquids in liquids – Raoult's law – Determination of molecular mass from lowering of vapour pressure – Vapour pressure of ideal solutions – Activity of a component in an ideal solution – Thermodynamics of ideal solutions – Free energy change, Volume change, Enthalpy change and Entropy change of mixing of ideal solutions.

4.2 Vapour pressure of real and non-ideal solutions – Vapour pressure-composition and Boiling point-composition curves of completely miscible binary solutions – Fractional distillation of binary liquid solutions – Azeotropic mixtures.

UNIT – V: Solutions and Colligative Properties **12 Hours**

5.1 Solubility of partially miscible liquids – CST – Phenol-water system, triethlyamine-water system and nicotine-water system – Effect of impurities on CST – Nernst Distribution law – Thermodynamic derivation and applications.

5.2 Colligative properties of dilute solutions – Thermodynamic derivation of elevation in boiling point and depression in freezing point – Van't Hoff factor – Abnormal molar mass – Association and dissociation – Osmosis and osmotic pressure – Definition – Relation between osmotic pressure and Lowering of vapour pressure of an ideal solution.

TEXT BOOKS:

S. No.	Authors	Title	Publishers	Year of publication
1.	P. L. Soni and H. M. Chawla	Text Book of Organic Chemistry	Sultan Chand and Sons	1986
2.	K. S. Tewari, N. K. Vishnoi, and S. N. Mehrotra	A Text Book of Organic Chemistry	Vikas Publishing House, 3rd edition	2011
3.	B. R. Puri, L. R. Sharma and Madan S. Pathania	Principles of Physical Chemistry	Vishal Publishing Co.	2013

REFERENCE BOOKS:

S.	Authors	Title	Publishers	Year of

No.				publication
1.	B. R. Puri, L. R. Sharma and K. C. Kalia	Principles of Inorganic Chemistry	Milestone Publications	2013
2.	W. U. Malik, G. D. Tuli and R. D. Madan	Selected Topics in Inorganic Chemistry	S. Chand Publications	2008
3.	Arun Bahl and B. S. Bahl	Advanced Organic Chemistry	S. Chand and Company Ltd.	2010
4.	M. K. Jain and S. C. Sharma	Modern Organic Chemistry	Vishal Publishing Co.	2017
5.	R. T. Morrison and R. N. Boyd	Organic Chemistry	Prentice- Hall of India	2008
6.	P. L. Soni	Text Book of Physical Chemistry	Sultan Chand and Sons	1992
7.	R. D. Madan	Modern Inorganic Chemistry	S. Chand Publications	2014
8.	J.E. Huheey	Inorganic Chemistry – Principles, Structure and Reactivity	Harper Collins, New York.	1993
9.	Arun Bahl, B. S. Bahl and G. D. Tuli	Essentials of Physical Chemistry	S. Chand and company Pvt. Ltd.	2012

TEACHING METHODOLOGY:

- Power Point Presentations
- Assignments
- Animated videos
- Chalk and Board