

### Third Year (VI Semester)

Year	Semester	Course Code	Course Name	Theory/ Practical	Credit	Total Credit	Min. Counselling Hrs
<b>CERTIFICATE IN CHEMISTRY</b>							
III	VI	CHE(N)-302	Advance Chemistry-II	Theory	3	4	9
		CHE(N)-302L	Laboratory Course/Work	Practical	1		3

### SEMESTER- VI

#### (THEORY)

<b>Programme: Degree in Bachelor of Science</b>	<b>Year: III</b>	<b>Semester-VI</b>
<b>Course Code:</b> CHE(N) 302		
<b>Course Name:</b> Advance Chemistry- II		
<b>Credit:</b> 3		
<b>Max. Marks:</b> 70+30 =100		

#### Course Objective and Outcomes:

Upon successful completion of this course, the learners will be able to describe the magnetic properties of coordination compounds. They will also learn about organometallic compounds, some industrially important inorganic materials and their applications in various industries. Learners will gain an understanding of how to determine the structure of organic molecules using UV, IR and NMR spectroscopic techniques. They learn about the basic concepts of chromatography and heteroatomic compounds and natural product.

### Syllabus Details

#### Block-I: Inorganic Chemistry

##### Unit 1: Magnetic properties of transition metal complex

Types of magnetic behavior, Methods of determining magnetic susceptibility-Guyed and Quinckes method, spin only formula, orbital contribution to magnetic moments, application of magnetic moment data of 3d-metal complexes.

##### Unit 2: Organometallic chemistry

Mononuclear carbonyls and the nature of bonding in metal carbonyls. Definition, nomenclature, classification, general methods of preparation of organometallic compounds and a brief account of metal-ethylenic complexes. Alkyl and Aryl derivatives of alkali and alkaline earth metals.

### **Unit 3: Some industrial importance of Inorganic materials (Silicon and phosphazenes)**

Silicones and Phosphazenes as examples of inorganic polymers, nature of bonding in triphosphazenes.

### **Unit 4: Hard and Soft Acid and Base (HSAB)**

Classification of acids and bases as hard and soft. Pearson's HSAB concept, acid-base strength and hardness and softness. Symbiosis, theoretical basis of hardness and softness, electronegativity and hardness and softness.

## **Block -II: Organic Chemistry**

### **Unit 5: Heterocyclic compound –I**

Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and pyridine, methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution reaction in pyridine derivatives. Comparison of basicity of pyridine, piperidine and pyrrole.

### **Unit 6: Heterocyclic compound –II**

Introduction to condensed five and six numbered heterocycles. Preparation and reactions of quinoline and isoquinoline with special reference to Fisher indol synthesis, Skraup synthesis and Bischer Napieralski synthesis. Mechanism of electrophilic substitution reaction of quinoline and isoquinoline.

### **Unit 7: Natural Product**

Classification, extraction and general methods of structure determination of terpenoids: limonene, citral and alkaloids: nicotine, cocaine

## **Block III- Analytical Techniques and Spectroscopy**

### **Unit 8: UV-Visible spectroscopy**

Ultraviolet (UV) absorption spectroscopy absorption laws (Beer-Lambert law), molar absorptivity, presentation and analysis of UV spectra, types of electronic transitions, effect of conjugation,

concept of chromophore and auxochrome. Bathochromic, hypsochromic, hyperchromic and hypochromic shifts. UV spectra of conjugated enes and enones.

### **Unit 9: IR-Spectroscopy**

Infra-Red (IR) absorption spectroscopy- molecular vibrations, Hooke's Law, selection rules, intensity and position of IR bands, measurement of IR spectrum, finger print region, characteristic absorptions of various functional groups and interpretation of IR spectra of simple organic compounds.

### **Unit 10: NMR- Spectroscopy**

Proton magnetic resonance ( $^1\text{H}$  NMR) spectroscopy, nuclear shielding and deshielding, chemical shift and molecular structure, spin-spin splitting and coupling constants, areas of signals, interpretation of PMR spectra of simple organic molecules such as ethyl bromide, ethanol, acetaldehyde, 1,1,2-tribromoethane, ethyl acetate, toluene and acetophenone. Problems pertaining to the structure elucidation of simple organic compounds using UV, IR and PMR spectroscopic techniques.

### **Unit 11: Raman Spectroscopy**

Concept of polarizability, selection rules, pure rotational and pure vibrational Raman spectra of diatomic molecules, selection rules. Unit 12: Basic concepts of chromatography, Introduction, Types, paper and column chromatography.

### **Unit 12: Basic concepts of chromatography**

Introduction, Types, paper and column chromatography.

## SEMESTER- VI

### (Practical)

<b>Programme: Degree in Bachelor of Science</b>	<b>Year: III</b>	<b>Semester-VI</b>
<b>Course Code: CHE(N) 302L</b>		
<b>Course Name: Laboratory Course/Work-VI</b>		
<b>Credit: 1</b>		
<b>Max. Marks: 50</b>		

#### Course Objective and Outcomes:

Upon completion of this course, the learners will have the knowledge and skills to estimate different metal ions through gravimetric exercise. Also, they can easily analyze and separate the binary organic mixture. Spectroscopic and chromatographic exercise will train them to interpret the spectral data and chromatograms of organic compounds and will make them job ready for suitable industries.

#### Syllabus Details

#### Block-4: Laboratory Course

#### Unit 13: Laboratory hazards and safety precautions

#### Unit 14: Inorganic exercise:

Gravimetric analysis Gravimetric analysis of any one or two metal ions; Ba<sup>2+</sup>, Fe<sup>3+</sup>, Ni<sup>2+</sup>, Cu<sup>2+</sup>, Zn<sup>2+</sup> etc.

#### Unit 15: Organic exercise:

Binary mixture of organic compounds and Natural product extraction Binary mixture of organic compounds: Analysis of binary mixture of organic compounds separable by NaHCO<sub>3</sub>

#### Unit 16: Natural product extraction:

Extraction and identification of caffien, caisen etc.

#### Unit 17: Analysis of organic compounds by spectroscopic techniques

Functional Group determination by UV and IR Spectroscopy; analysis of organic compounds including alcohols, phenols, carboxylic acids, carbonyl compounds, nitrogen-containing compounds.

#### Unit 18: Paper chromatography

Demonstrative Chromatography- paper chromatography (Analytical separation of organic compounds- Amino acids/ dyes)

**Distribution of marks shall be as given below:**

1.	Inorganic exercise	:	12
2.	Organic exercise	:	12
3.	Spectroscopic and chromatographic exercise	:	11
4.	Viva Home assignment/internal assessment	:	05
5.	lab record and attendance	:	10