

**DEPARTMENT OF CHEMISTRY**

**SYLLABUS 2019-2022**

**(OUTCOME BASED EDUCATION)**

**BOARD OF STUDIES 2019**

**I - VI SEMESTERS**



**NALLAMUTHU GOUNDER MAHALINGAM COLLEGE**

**(AUTONOMOUS)**

Re-Accredited with 'A' Grade by NAAC

An ISO 9001: 2015 Certified Institution

**POLLACHI – 642 001**

## **NGM College**

### **Vision**

Our dream is to make the college an institution of excellence at the national level by imparting quality education of global standards to make students academically superior, socially committed, ethically strong, spiritually evolved and culturally rich citizens to contribute to the holistic development of the self and society.

### **Mission**

Training students to become role models in academic arena by strengthening infrastructure, upgrading curriculum, developing faculty, augmenting extension services and imparting quality education through an enlightened management and committed faculty who ensure knowledge transfer, instill research aptitude and infuse ethical and cultural values to transform students into disciplined citizens in order to improve quality of life.

## **DEPARTMENT OF CHEMISTRY**

### **VISION**

The Department of Chemistry aspires to be among the top in the nation by preparing the students in such a way that they are self reliant, highly informed and a better choice in the demanding and ever changing world.

### **MISSION**

The teaching of Chemistry aims to: gear the students to be liberative, transformative and empowering the Learner and the Learned (Teacher)

### Scheme of examination

| FIRST SEMESTER |             |  |            |            |            |     |             |         |
|----------------|-------------|--|------------|------------|------------|-----|-------------|---------|
| Part           | Course Code | Course title                                     | Hrs / Week | Hours Exam | Max. Marks |     | Total Marks | Credits |
|                |             |  |            |            | Int.       | S.E |             |         |
| I              | 19UTL101    | Tamil / Hindi paper – I                          | 6          | 3          | 25         | 75  | 100         | 03      |
| II             | 19UEN101    | Applied English –I                               | 5          | 3          | 25         | 75  | 100         | 03      |
| III            | 19UCY101    | Core Paper – I Inorganic and Organic chemistry   | 7          | 3          | 25         | 75  | 100         | 04      |
|                | 19UCY203    | Core Practical- I Inorganic Qualitative Analysis | 2          | --         | --         | -   | --          | --      |
|                | 19UCY1A1    | Allied Mathematics Paper- I                      | 8          | 3          | 25         | 75  | 100         | 04      |
| IV             | 19UHRI01    | Human Rights                                     | 1          | 2          | --         | 50  | 50          | 02      |
|                | 19HEC101    | HE – (Personal values & SKY Yoga practice -I)    | 1          | 2          | 25         | 25  | 50          | 01      |
| V              |             | Extension Activities<br>See Annexure -I          |            |            |            |     |             |         |
|                |             |  |            |            |            |     | 500         | 17      |

| SECOND SEMESTER |             |  |            |           |           |     |             |         |
|-----------------|-------------|--|------------|-----------|-----------|-----|-------------|---------|
| PART            | Course Code | Course   | Hrs / Week | Hrs/ Exam | Max.Marks |     | Total Marks | Credits |
|                 |             |  |            |           | Int.      | S.E |             |         |
| I               | 19UTL202    | Tamil paper-II/Hindi Paper-II                    | 6          | 3         | 25        | 75  | 100         | 03      |
| II              | 19UEN202    | Applied English - II                             | 5          | 3         | 25        | 75  | 100         | 03      |
| III             | 19UCY202    | Core Paper-II Organic and Physical chemistry     | 6          | 3         | 25        | 75  | 100         | 04      |
|                 | 19UCY203    | Core Practical- I Inorganic Qualitative Analysis | 2          | 3         | 40        | 60  | 100         | 03      |
|                 | 19UCY2A2    | Allied Mathematics Paper-II                      | 8          | 3         | 25        | 75  | 100         | 04      |
| IV              | 19EVS201    | Environmental studies                            | 2          | 2         | --        | 50  | 50          | 02      |
|                 | 19HEC202    | HE – (Family values & SKY Yoga practice -II)     | 1          | 2         | 25        | 25  | 50          | 01      |
| V               |             | Extension Activities<br>See Annexure -I          |            |           |           |     |             |         |
|                 |             |  |            |           |           |     | 600         | 20      |

| THIRD SEMESTER |                       |  |            |            |           |     |       |         |
|----------------|-----------------------|--|------------|------------|-----------|-----|-------|---------|
| Part           | Course Code           | Course   | Hrs / Week | Hours Exam | Max.Marks |     | Total | Credits |
|                |                       |  |            |            | Int       | S.E |       |         |
| I              | 19UTL303              | Tamil paper/ Hindi Paper – III   | 5          | 3          | 25        | 75  | 100   | 03      |
| II             | 19UEN303              | English Paper – III  | 6          | 3          | 25        | 75  | 100   | 03      |
| III            | 19UCY304              | CorePaper-III Inorganic and Physical Chemistry                                   | 6          | 3          | 25        | 75  | 100   | 04      |
|                | 19UCY406              | Core Practical II Volumetric and Organic Qualitative Analysis                    | 3          | --         | --        | --  | --    | --      |
|                | 19UCY3A1              | Allied Physics Paper –I  | 5          | 3          | 25        | 75  | 100   | 04      |
|                | 19UCY4A3              | Allied Physics Practical for Mathematics and Chemistry                           | 3          | --         | --        | --  | --    | --      |
| IV             | 19HEC303              | HE – (Professional values & SKY Yoga practice –III)                              | 1          | 2          | 25        | 25  | 50    | 01      |
|                | 19UCY3N1/<br>19UCY3N2 | Non Major Elective I Food Science and Technology/ Chemistry of Consumer Products | 1          | 2          | --        | 50  | 50    | 02      |
| V              |                       | Extension Activities<br>See Annexure -I  |            |            |           |     |       |         |
|                |                       |  | 500        |            |           |     |       | 17      |

| FOURTH SEMESTER |                       |  |            |            |           |     |       |         |
|-----------------|-----------------------|--|------------|------------|-----------|-----|-------|---------|
| Part            | Course Code           | Course   | Hrs / Week | Hours Exam | Max.Marks |     | Total | Credits |
|                 |                       |  |            |            | Int.      | S.E |       |         |
| I               | 19UTL404              | Tamil Paper/ Hindi Paper IV  | 5          | 3          | 25        | 75  | 100   | 03      |
| II              | 19UEN404              | English for Excellence Paper –II   | 6          | 3          | 25        | 75  | 100   | 03      |
| III             | 19UCY405              | Core Paper – IV Inorganic, Organic and physical chemistry                          | 6          | 3          | 25        | 75  | 100   | 04      |
|                 | 19UCY406              | Core Practical II Volumetric and Organic Qualitative Analysis                      | 3          | 6          | 40        | 60  | 100   | 05      |
|                 | 19UCY4A2              | Allied Physics Paper – II  | 5          | 3          | 25        | 75  | 100   | 04      |
|                 | 19UCY4A3              | Allied Physics Practical for Mathematics and Chemistry                             | 3          | 3          | 40        | 60  | 100   | 04      |
| IV              | 19HEC404              | HE – ( Social Values & SKY Yoga practice -IV)                                      | 1          | 2          | 25        | 25  | 50    | 01      |
|                 | 19UCY4N3/<br>19UCY4N4 | Non Major Elective II Water and Water Treatment Processes/<br>Diagnostic Chemistry | 1          | 2          | --        | 50  | 50    | 02      |
| V               |                       | Extension Activities<br>See Annexure -I  |            |            |           | 50  | 50    | 01      |
|                 |                       |  | 750        |            |           |     |       | 27      |

**FIFTH SEMESTER**

| Part       | Course Code           | Course   | Hrs / Week | Hrs/ Exam | Max.Marks |     | Total | Credits |
|------------|-----------------------|--|------------|-----------|-----------|-----|-------|---------|
|            |                       |  |            |           | Int       | S.E |       |         |
| <b>III</b> | 19UCY507              | Core Paper – V<br>Nuclear and Co-ordination Chemistry  | 4          | 3         | 25        | 75  | 100   | 04      |
|            | 19UCY508              | Core Paper – VI<br>Organic Chemistry- I  | 4          | 3         | 25        | 75  | 100   | 04      |
|            | 19UCY509              | Core Paper – VII<br>Electro Chemistry  | 4          | 3         | 25        | 75  | 100   | 04      |
|            | 19UCY510              | Core Paper- VIII<br>Dye Chemistry  | 4          | 3         | 25        | 75  | 100   | 04      |
|            | 19UCY5E1              | Core Elective I- Analytical Chemistry  | 4          | 3         | 25        | 75  | 100   | 04      |
|            | 19UCY5E2              | Core Elective Practical-<br>Application Oriented Practical                                     | 2          | 3         | 40        | 60  | 100   | 02      |
|            | 19UCY615              | Core Practical III Gravimetric Analysis and Physical Chemistry                                 | 6          | --        | --        | --  | --    | --      |
| <b>IV</b>  | 19UCY5S1/<br>19UCY5S2 | Skill Based Elective –I<br>Network and Information security/<br>Cyber Security-Ethical Hacking | 1          | 2         | --        | 50  | 50    | 02      |
|            | 19GKL501              | General Knowledge& General Awareness   | SS         | 2         | --        | 50  | 50    | 02      |
|            | 19HEC505              | HE – ( National Values & SKY Yoga practice -V)   | 1          | 2         | 25        | 25  | 50    | 01      |
|            |                       |  |            |           |           |     | 750   | 27      |

**SIXTH SEMESTER**

| PART       | Course Code           | Course   | Hrs / Week | Hrs/ Exam | Max.Marks |     | Total | Credits |
|------------|-----------------------|--|------------|-----------|-----------|-----|-------|---------|
|            |                       |  |            |           | Int.      | S.E |       |         |
| <b>III</b> | 19UCY611              | Core Paper – IX<br>Physical Methods and Chemical Structure   | 4          | 3         | 25        | 75  | 100   | 05      |
|            | 19UCY612              | Core Paper – X<br>Organic Chemistry-II   | 4          | 3         | 25        | 75  | 100   | 04      |
|            | 19UCY613              | Core Paper – XI<br>Chemical Kinetics and Photo Chemistry   | 4          | 3         | 25        | 75  | 100   | 05      |
|            | 19UCY6E3              | Core Elective III- Polymer Chemistry   | 4          | 3         | 25        | 75  | 100   | 05      |
|            | 19UCY614              | Project work   | 6          | -         | 20        | 80  | 100   | 05      |
|            | 19UCY615r             | Core Practical III Gravimetric Analysis and Physical Chemistry   | 6          | 6         | 80        | 120 | 200   | 05      |
| <b>IV</b>  | 19UCY6S3/<br>19UCY6S4 | Skill Based Elective –II<br>Green chemistry /<br>Skill Based Elective -II<br>Theory behind practical chemistry | 1          | 2         | --        | 50  | 50    | 02      |
|            | 19HEC606              | HE – ( Global values & SKY Yoga practice -VI)  | 1          | 2         | 25        | 25  | 50    | 01      |
|            |                       |  |            |           |           |     | 800   | 32      |
|            |                       | GRAND TOTAL  |            |           |           |     | 3900  | 140     |

**Annexure – I: List of Part – V Subjects**

| <b>S.No</b> | <b>Subject Code</b> | <b>Subjects</b>                   |
|-------------|---------------------|-----------------------------------|
| 1.          | 19UNC401            | NCC                               |
| 2.          | 19UNS402            | NSS                               |
| 3.          | 19USG403            | Sports and Games                  |
| 4.          | 19URO404            | Rotract Clib                      |
| 5.          | 19URR405            | Red Ribbon Club                   |
| 6.          | 19UYR406            | Youth Red Cross                   |
| 7.          | 19UCA407            | Consumer Awareness                |
| 8.          | 19UED408            | Entrepreneurship Development Cell |
| 9.          | 19UCR409            | Centre for Rural Development      |
| 10.         | 19USS410            | Student Guild of Service          |
| 11.         | 19UGS411            | Green Society                     |
| 12.         | 19UEO412            | Equal Opportunity Cell            |
| 13.         | 19UFA413            | Fine Arts Club                    |

**List of Part III Subjects (Core Elective Papers)**

| <b>S.No</b> | <b>Subject Code</b> | <b>Subjects</b>                |
|-------------|---------------------|--------------------------------|
| 1.          | 19UCY5E1            | Analytical chemistry           |
| 2.          | 19UCY5E2            | Application Oriented Practical |
| 3.          | 19UCY6E3            | Polymer Chemistry              |

## Bloom's Taxonomy Based Assessment Pattern

**K1**-Remember; **K2**- Understanding; **K3**- Apply; **K4**-Analyze; **K5**- Evaluate

### 1. Theory: 75 Marks Part- I, II, III

#### (i) TEST- I & II and ESE:

| Knowledge Level | Section  | Marks   | Description           | Total |
|-----------------|--|---------|-----------------------|-------|
| K1, K2          | A(Answer all)  | 10x1=10 | MCQ/Define            | 75    |
| K3              | B (Either or pattern)  | 5x5=25  | Short Answers         |       |
| K4& K5          | C(Answer 4 out of 6 and Question No. 16 is compulsory, 17-21 Answer any Three) | 4x10=40 | Descriptive/ Detailed |       |

### 2. Theory: 50 Marks Part - IV

| Knowledge Level | Section               | Marks     | Description           | Total |
|-----------------|-----------------------|-----------|-----------------------|-------|
| K1, K2          | A(Answer all)         | 10x1=10   | MCQ/Define            | 50    |
| K3<br>K4& K5    | B (Answer 5 out of 8) | 5 x 8 =40 | Descriptive/ Detailed |       |

### 3. Practical Examinations Part – III (D1 Core, D3 Core Elective Practical & Allied Practicals)

| Knowledge Level | Section                  | Marks | Total |
|-----------------|--------------------------|-------|-------|
| K3              | Practicals & Record work | 60    | 100   |
| K4              |                          | 40    |       |
| K5              |                          |       |       |

### 4. Practical Examinations Part – III (D2 & D3 Core Practicals)

| Knowledge Level | Section                  | Marks | Total |
|-----------------|--------------------------|-------|-------|
| K3              | Practicals & Record work | 120   | 200   |
| K4              |                          | 80    |       |
| K5              |                          |       |       |

### 5. Project Part – III (D3 Core Paper)

| Knowledge Level | Section                | Marks | Total |
|-----------------|------------------------|-------|-------|
| K3              | Project & Dissertation | 60    | 100   |
| K4              |                        | 40    |       |
| K5              |                        |       |       |

### 6.Theory - part IV (D3 SBE)

| Knowledge Level | Section       | Marks   | Description | Total |
|-----------------|---------------|---------|-------------|-------|
| K2,<br>K3& K4   | Answer any 50 | 50x1=50 | MCQ         | 50    |

### Components of Continuous Assessment

| Components         |    | Calculation          | CIA Total |
|--------------------|----|----------------------|-----------|
| Test 1             | 75 | $\frac{75+75+25}{3}$ | 25        |
| Test 2             | 75 |                      |           |
| Assignment/Seminar | 25 |                      |           |

### Components of Continuous Assessment (D3 & D2 Core Practicals)

| Components |    | Calculation | CIA Total |
|------------|----|-------------|-----------|
| Model      | 40 | 40+20+20    | 80        |
| Skilled    | 20 |             |           |
| Record     | 20 |             |           |

### Components of Continuous Assessment (D1 Core, D3 Core Elective practical & Allied Practicals)

| Components |    | Calculation | CIA Total |
|------------|----|-------------|-----------|
| Model      | 20 | 20+10+10    | 40        |
| Skilled    | 10 |             |           |
| Record     | 10 |             |           |



## **Programme Outcomes**

The students have to

- PO1** Demonstrate the in-depth knowledge and understanding the scientific principles in chemical science
- PO2** Think intellectually, display professional and practical skills in their career and communicate effectively to the team or society

## **Programme Specific Outcomes**

On successful completion of the programme, the students

- PSO1** have adequate knowledge in the core areas of chemical sciences
- PSO2** understand the underlying principles in every experiment and able to design, carry out, record and analyze the results of chemical experiments carried out in the laboratory
- PSO3** develop critical thinking, problem solving ability and effective oral and written communications
- PSO4** gain exposure and ideas in frontier areas of chemical research
- PSO5** achieve employability in chemical related industries and academic institutions

**HOD- Chemistry**

**Dr.M. Durairaju**  
**(CDC-Co-ordinator)**

**Dr. R. Muthukumaran**  
**(Controller of Examinations)**

|                        |          |  |                 |           |
|------------------------|----------|--|-----------------|-----------|
| <b>Programme code:</b> | B.Sc.    | <b>Programme Title :</b>               | CHEMISTRY       |           |
| <b>Course Code:</b>    | 19UCY101 | <b>Title</b>                           | <b>Batch :</b>  | 2019-2022 |
| <b>Hrs/Week:</b>       | 7        | <b>Core Paper – I</b>                  | <b>Semester</b> | I         |
|                        |          | <b>Inorganic and Organic Chemistry</b> | <b>Credits:</b> | 4         |

### Course Objective

To enable the students to

- understand basic theoretical concepts on chemical bonding and hybridization
- acquire knowledge on the mechanistic pathway of aliphatic nucleophilic substitutions and aromatic electrophilic substitutions in organic reactions
- gain knowledge on aromaticity

### Course Outcome

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

| <b>Knowledge Level</b> | <b>CO Number</b> | <b>CO Statement</b>  |
|------------------------|------------------|--|
| K4                     | CO1              | interpret the types of chemical bonding present in molecules   |
| K2                     | CO2              | deduce the geometry of the molecules   |
| K2,K3                  | CO3              | understand and apply the concepts in determining the mechanisms of aliphatic nucleophilic substitution reactions |
| K3, K4                 | CO4              | apply and interpret the factors affecting in determining the orientation and reactivity of substituted benzene   |

## Syllabus

| Unit      | Content   | Hrs       |
|-----------|---|-----------|
| <b>I</b>  | <p>Long form of Periodic Table: Main features, advantages and defects.</p> <p>Periodic properties of elements.</p> <p>Chemical bonding: Variable electrovalency - Pseudo inert gas configuration-Inert pair effect.</p> <p>Ionic Bonding-Conditions for the formation of an ionic compound, Characteristics of Ionic compounds, Crystal lattice energy and its determination by Born-Haber Cycle.</p> <p>Covalent Bonding: Lewis – Langmuir concept and Octet rule, Characteristics of covalent compounds- Partial ionic character in covalent bond.</p> <p>Fajan’s rules and their applications in explaining melting points and solubility properties.</p> <p>Co-ordinate covalent bonding: Characteristics.</p> <p><b><i>Hydrogen bonding-concept, types and applications - melting and boiling points of hydrides of nitrogen, Oxygen and Fluoride and Lesser density of ice.</i></b></p> | <b>19</b> |
| <b>II</b> | <p>Concept of Hybridization: <math>sp</math>, <math>sp^2</math> and <math>sp^3</math> with reference to <math>C_2H_2</math>, <math>C_2H_4</math> and <math>CH_4</math>. Applications of VSEPR Theory to <math>BeCl_2</math>, <math>BCl_3</math>, <math>H_2O</math>, <math>NH_3</math>, <math>CH_4</math>, <math>PCl_5</math> and <math>SF_6</math> molecules.</p> <p>Molecular Orbital Theory: Symmetry of molecular orbitals. Application to simple Homonuclear and Heteronuclear molecules - <math>H_2</math>, <math>He_2</math>, <math>O_2</math>, <math>F_2</math>, <math>N_2</math>, <math>CO</math> and <math>NO</math>. Bond order and magnetic properties.</p> <p>Ozone: Preparation, properties, structure and uses.</p> <p>Ozone depletion: Causes and effects.</p> <p>Sulphur: Peracids of sulphur and Sodium thiosulphate - Preparation, properties, structure and uses.</p>      | <b>18</b> |

|            |   |           |
|------------|---|-----------|
| <b>III</b> | <p><b>ORGANIC CHEMISTRY:</b></p> <p>Polar Effects: Inductive, mesomeric, electromeric and hyperconjugative effects. Steric inhibition of resonance</p> <p>Homolytic and Heterolytic fission: Free radicals, carbocation, carbanion and their stability. Electrophiles and nucleophiles with examples.</p> <p>Alkenes: Preparations involving dehydrohalogenation, dehydration, dehalogenation, reduction of alkynes and Wittig reaction.</p> <p>Mechanism of <math>\beta</math>-Elimination: E1 and E2 . Saytzeff and Hofmann rules.</p> <p>Reactions of Alkenes: Addition of hydrogen halide, Markovnikov rule, peroxide effect, hypohalous acid, sulphuric acid, water, hydroboration.</p> <p>Oxidation by alkaline <math>\text{KMnO}_4</math>, <math>\text{HIO}_4</math> and Ozonolysis.</p> | <b>18</b> |
| <b>IV</b>  | <p>Dienes: Classification and stability. 1,2 and 1,4 addition of Butadiene. Diels-Alder reaction.</p> <p>Alkynes: Preparation of alkynes by dehydrohalogenation, dehalogenation and electrolysis.</p> <p>Reactions: Hydroboration, addition of hydrogen halides, water, formation of acetylides and Ozonolysis.</p> <p>Grignard reagent - Preparation and synthetic utility of Ethyl magnesium iodide.</p> <p>Aliphatic Nucleophilic Substitution:</p> <p><math>\text{S N}^1</math> and <math>\text{S N}^2</math> mechanisms. Effect of structure of substrate, nucleophile and solvent.</p>  | <b>18</b> |
| <b>V</b>   | <p>Benzene: Resonance, Resonance energy and structure.</p> <p>Aromaticity: Huckel's rule. Non-benzenoid aromatic compounds.</p> <p>Cyclopropenyl cation, cyclopentadienyl anion and Tropylium cation.</p> <p>Aromatic Electrophilic Substitution: Arenium ion mechanism, mechanism of nitration, sulphonation, halogenation, Friedel-Crafts alkylation and acylation in benzene.</p>  | <b>18</b> |

|  |   |           |
|--|---|-----------|
|  | Orientation and reactivity of Monosubstituted benzene: ortho, para and meta directing. Role of inductive and mesomeric effects in electrophilic aromatic substitution in phenol and nitrobenzene. |           |
|  | <b>Total contact hours/Semester</b>   | <b>91</b> |

**\*Italics denotes self study topics**

### Teaching Methods

Lecture by chalk & talk, power point presentations, group discussions, seminar, quiz, assignment, experience Discussion, brain storming, Activity, Models.

### Text Books

| S.No. | Author(s)               | Title of the Book                | Publisher                         | Year of Publication |
|-------|-------------------------|----------------------------------|-----------------------------------|---------------------|
| 1.    | Soni. P.L               | Text book of Inorganic Chemistry | Sultan Chand & Sons, New Delhi    | 2012                |
| 2.    | Bahl.B.S. and Arun Bahl | Advanced Organic Chemistry       | S.Chand & Company Ltd., New Delhi | 2007                |
| 3.    | Soni. P.L.              | Text book of Organic Chemistry   | Sultan Chand & Sons, New Delhi    | 2012                |
| 4.    | Madan. R.D.             | Advanced Inorganic Chemistry     | S.Chand & Company Ltd., New Delhi | 2011                |

### Reference Books

| S.No. | Author(s)                                 | Title of the Book                      | Publisher                      | Year of Publication |
|-------|---|--|--------------------------------|---------------------|
| 1.    | Finar I.L.                                | Organic Chemistry                      | Longmans                       | 2006                |
| 2.    | Morrison. R.T. and Boyd. R.N.             | Organic Chemistry                      | Allyn and Bacon Ltd., New York | 1976                |
| 3.    | Wahid U.Malik, G.D, Tuli, and Madan. R.D. | Selected Topics in Inorganic Chemistry | S.Chand & Company, New Delhi   | 2006                |

### Mapping with Programme Outcomes

| CO \ PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|----------|------|------|------|------|------|
| CO1      | S    | S    | H    | H    | S    |
| CO2      | H    | S    | H    | S    | H    |
| CO3      | S    | S    | S    | H    | S    |
| CO4      | S    | H    | S    | H    | H    |

trong; H-High; M-Medium; L-Low

| Compiled by<br>Name with Signature | Verified by<br>HOD Name with<br>Signature | CDC             | COE               |
|------------------------------------|---|-----------------|-------------------|
| Dr.Indumathy Ramasamy              | Dr.A. Ayyasamy                            | Dr.M. Durairaju | Dr.R.Muthukumaran |

|                        |          |                                       |                 |           |
|------------------------|----------|---------------------------------------|-----------------|-----------|
| <b>Programme code:</b> | B.Sc.    | <b>Programme Title :</b>              | CHEMISTRY       |           |
| <b>Course Code:</b>    | 19UCY202 | <b>Title</b>                          | <b>Batch :</b>  | 2019-2022 |
|                        |          | <b>Core Paper – II</b>                | <b>Semester</b> | II        |
| <b>Hrs/Week:</b>       | 6        | <b>Organic and Physical Chemistry</b> | <b>Credits:</b> | 4         |

### Course Objective

To make the students to

- acquire knowledge on the mechanisms of naming reactions in carbonyl compounds
- gain knowledge in the synthetic utility of active methylene compounds
- understand basics concepts on quantum mechanics and important laws of thermodynamics

### Course Outcome

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

| <b>Knowledge Level</b> | <b>CO Number</b> | <b>CO Statement</b>  |
|------------------------|------------------|--|
| K1                     | CO1              | recollect the mechanisms of various naming reactions   |
| K2,K3                  | CO2              | understand and apply usage of active methylene compounds in synthesizing different substituted carboxylic acids and ketones    |
| K3                     | CO3              | apply quantum mechanical treatment to sub-atomic particles of atom   |
| K4                     | CO4              | interpret the significance of laws of thermodynamics and its applications in deriving various other laws of physical chemistry |

## Syllabus

| Unit | Content   | Hrs |
|------|---|-----|
| I    | <p><b>Alcohols:</b> General methods of Preparation and its chemical properties. Distinction among primary, secondary and tertiary alcohols.</p> <p><i>Manufacture of ethanol from molasses. Absolute alcohol, methylated spirit and power alcohol.</i></p> <p><b>Ethers:</b> General methods of preparation and its chemical properties. Preparation and properties of diethyl ether.</p> <p><b>Dicarboxylic acids:</b> Preparation and properties of oxalic, malonic, succinic and phthalic acids.</p> <p><b>Acetoacetic ester:</b> Preparation and its applications in the synthesis of acetone, adipic acid, crotonic acid and 4-methyl uracil. Keto-enol tautomerism.</p> <p><b>Malonic ester:</b> Preparation and its applications in the synthesis of crotonic acid, barbutric acid, succinic acid and dimethyl acetic acid.</p> <p><b>Acid derivatives:</b> Acetyl chloride and acetic anhydride-Preparation, properties and uses.</p> | 16  |
| II   | <p><b>Carbonyl compounds:</b> Preparation by Rosenmund reduction, Stephen reaction and dry distillation of calcium salts of fatty acids.</p> <p>Mechanism of Nucleophilic addition reaction in aldehydes and ketones: Addition of Grignard reagent, HCN, NaHSO<sub>3</sub> and NH<sub>3</sub>. Addition with NH<sub>2</sub>-NH<sub>2</sub>, C<sub>6</sub>H<sub>5</sub>NHNH<sub>2</sub>, NH<sub>2</sub>OH, H<sub>2</sub>NCONHNH<sub>2</sub> and ROH.</p> <p>Mechanism of Aldol, Perkin, Benzoin condensation, Cannizzaro and Reformatsky reactions.</p> <p>Reduction: Wolff-Kishner, Clemmensen, MPV reductions.</p> <p>Reduction with reagents: Lithium Aluminium Hydride and</p>   | 16  |



|            |   |           |
|------------|---|-----------|
|            | <p>Sodium Borohydride.</p> <p>Oxidation of aldehydes and ketones using Tollen's reagent, Fehling's solution, <math>\text{SeO}_2</math>, <math>\text{CrO}_3</math>, PCC, PDC and Oppenauer oxidation.</p>  |           |
| <b>III</b> | <p>Quantum Theory: Failure of classical theory in explaining the black body radiation. Planck's radiation theory, Quantisation of energy. Einstein's theory of Photoelectric effect.</p> <p>Wave mechanics: Characteristics of wave motion. de-Broglie's equation. Davison and Germer experiment. Heisenberg's uncertainty principle.</p> <p>Schrodinger wave equation and significance of <math>\Psi</math> and <math>\Psi^2</math><br/>(Derivation not required)</p>  | <b>16</b> |
| <b>IV</b>  | <p>Thermodynamics: Importance, Limitations and Thermodynamic terms. Types of Thermodynamic equilibrium and processes.</p> <p>First law of Thermodynamics: Law of conservation of energy, internal energy. Enthalpy and Heat capacity: Relation between <math>C_p</math> and <math>C_v</math>.</p> <p>Work done in an isothermal reversible expansion of an ideal gas. Reversible adiabatic expansion of an ideal gas: Relation between temperature and volume and temperature and pressure.</p> <p>Joule- Thomson Experiment: Joule-Thomson Effect, Joule – Thomson coefficient for an ideal gas, Inversion Temperature.</p> <p>Zeroth law of thermodynamics. Absolute zero of temperature.</p> | <b>15</b> |
| <b>V</b>   | <p>Second law of thermodynamics: Limitations of First law. Need for Second law of thermodynamics. Various statements of Second law of thermodynamics.</p> <p>Thermo chemistry: Definition – Standard Enthalpy of formation and Enthalpy of neutralization. Bond energy and its applications<br/>Measurement of enthalpy of reactions by Bomb Calorimeter.</p> <p>Entropy: Definition, Entropy changes in reversible and irreversible spontaneous processes. Entropy change</p>  | <b>15</b> |

|  |  |           |
|--|--|-----------|
|  | <p>accompanying change of phase, isothermal expansion of an ideal gas with change in pressure, volume and temperature. Entropy of mixing of ideal gases. Carnot's cycle, Physical significance of entropy.</p> <p>Helmholtz and Gibbs free energy functions: Variation of free energy with temperature or pressure, Gibbs Helmholtz equation.</p> <p>Third law of Thermodynamics (statement only).</p> |           |
|  | <b>Total hours/Semester</b>  | <b>78</b> |

**\*Italics denotes self study topics**

### Teaching Methods

Lecture by chalk & talk, power point presentations, group discussions, seminar, quiz, assignment, Experience Discussion, brain storming, Activity, Models.

### Text Books

| S.No. | Author(s)                                  | Title of the Book                 | Publisher                         | Year of Publication |
|-------|--|-----------------------------------|-----------------------------------|---------------------|
| 1.    | Bahl.B.S. and Arun Bahl                    | Advanced Organic Chemistry        | S.Chand & Company Ltd., New Delhi | 2007                |
| 2.    | Soni. P.L                                  | Text book of Inorganic Chemistry  | Sultan Chand & Sons, New Delhi    | 2012                |
| 3.    | Puri B.R.,Sharma L.R and Madan S. Pathania | Principles of Physical Chemistry  | Vishal Publishing House           | 2013                |
| 4.    | Negi. A.S., and Anand S.C.                 | A text book of physical chemistry | New Age International PVT Ltd     | 2009                |

### Reference Books

| S.No. | Author(s)                     | Title of the Book               | Publisher                      | Year of Publication |
|-------|-------------------------------|---------------------------------|--------------------------------|---------------------|
| 1.    | Finar I.L.                    | Organic Chemistry, Vol.I and II | Pearson Education, Singapore   | 2003                |
| 2.    | Soni. P.L. and Dharmarha O.P. | Text book of Physical Chemistry | Sultan Chand & Sons, New Delhi | 2005                |

### Mapping with Programme Outcomes

| CO \ PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|----------|------|------|------|------|------|
| CO1      | S    | S    | S    | H    | S    |
| CO2      | H    | H    | H    | S    | H    |
| CO3      | S    | S    | H    | M    | S    |
| CO4      | S    | H    | S    | H    | H    |

trong; H-High; M-Medium; L-Low

| Compiled by<br>Name with Signature | Verified by<br>HOD Name with<br>Signature | CDC             | COE               |
|------------------------------------|---|-----------------|-------------------|
| Dr.Indumathy Ramasamy              | Dr.A. Ayyasamy                            | Dr.M. Durairaju | Dr.R.Muthukumaran |

|                        |          |  |                 |           |
|------------------------|----------|--|-----------------|-----------|
| <b>Programme code:</b> | B.Sc.    | <b>Programme Title :</b>                                       | CHEMISTRY       |           |
| <b>Course Code:</b>    | 19UCY203 | <b>Title</b>   | <b>Batch :</b>  | 2019-2022 |
|                        |          | <b>Core Practical-I<br/>Inorganic Qualitative<br/>Analysis</b> | <b>Semester</b> | II        |
| <b>Hrs/Week:</b>       | 2        |  | <b>Credits:</b> | 3         |

### Course Objective

To enable the students to

- gain knowledge in the identification of given two acidic and basic radicals
- develop analytical skill in inorganic qualitative analysis

### Course Outcomes

| <b>Knowledge Level</b> | <b>CO Number</b> | <b>CO Statement</b>   |
|------------------------|------------------|---|
| K3                     | CO1              | To remember the procedure for the analysis of given acid and basic radicals   |
| K4                     | CO2              | To understand the chemical reactions responsible for the precipitation or other reactions leading to identification of the given radicals |
| K4                     | CO3              | To apply the theoretical knowledge/concept studied to their practical sessions  |

## Syllabus

| Unit | Content  | Hrs |
|------|--|-----|
|      | <b>1. Inorganic mixture analysis</b><br>a) Analysis of a mixture containing two cations and two anions of which one will be an interfering ion.<br>b) Reactions of the following ions:<br>Lead, Copper, Nickel, Bismuth, Cadmium, Iron, Manganese, Zinc, Calcium, Strontium, Barium, Magnesium and Ammonium.<br>Carbonate, Nitrate, Fluoride, Sulphate, Chloride, Oxalate, Phosphate and Borate. |     |
|      | <b>Total hours/Semester</b>  | 26  |

## Teaching Methods

Lab activity, Quiz, Assignment, Discussions, Demonstration

## Text Books for Study

| S.No. | Author(s)   | Title of the Book                          | Publisher                             | Year of Publication |
|-------|---|--|---------------------------------------|---------------------|
| 1.    | Venkateswaran, V.,<br>Veeraswamy. R and<br>Kulandaivelu. A.R. | Basic Principles of<br>Practical Chemistry | S.Chand<br>Publications,<br>New Delhi | 2004                |

## Reference Books

| S.No. | Author(s)     | Title of the Book   | Publisher                               | Year of Publication |
|-------|---------------|---------------------|---|---------------------|
| 1.    | Thomas, A.O., | Practical Chemistry | Scientific Book<br>Center,<br>Cannanore | 2003                |

### Mapping with Programme Outcomes

| CO \ PSO   | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|------------|------|------|------|------|------|
| <b>CO1</b> | S    | S    | H    | S    | S    |
| <b>CO2</b> | H    | S    | H    | S    | H    |
| <b>CO3</b> | S    | S    | S    | H    | S    |

S-Strong; H-High; M-Medium; L-Low

|  |  |                 |                   |
|--|--|-----------------|-------------------|
| <b>Compiled by</b><br><b>Name with Signature</b> | <b>Verified by</b><br><b>HOD Name with</b><br><b>Signature</b> | <b>CDC</b>      | <b>COE</b>        |
| Dr.T.Gowrani                                     | Dr.A. Ayyasamy   | Dr.M. Durairaju | Dr.R.Muthukumaran |

|                        |          |   |                 |           |
|------------------------|----------|---|-----------------|-----------|
| <b>Programme code:</b> | B.Sc.    | <b>Programme Title :</b>                | CHEMISTRY       |           |
| <b>Course Code:</b>    | 19UCY304 | <b>Title</b>                            | <b>Batch :</b>  | 2019-2022 |
|                        |          | <b>Core Paper- III</b>                  | <b>Semester</b> | III       |
| <b>Hrs/Week:</b>       | 6        | <b>Inorganic and Physical Chemistry</b> | <b>Credits:</b> | 04        |

### Course Objective

To learn the industrial aspects of inorganic materials and thermodynamics of solution

### Course Outcome

| <b>Knowledge Level</b> | <b>CO Number</b> | <b>CO Statement</b>  |
|------------------------|------------------|--|
| K1                     | CO1              | To remember the basic metallurgical operations for extraction    |
| K2                     | CO2              | To understand the concept of thermodynamics of solution          |
| K3                     | CO3              | To apply the concept of law of mass action to various equilibria |
| K4                     | CO4              | To acquire knowledge in colligative properties                   |

## Syllabus

| Unit | Content  | Hours |
|------|--|-------|
| I    | Basic Metallurgical operations: Concentration, calcination, roasting, reduction and refining. Extraction process of Mn, Zn (carbon-reduction and electrolytic method), Fe (Blast furnace) and Ni (Mond's process).<br>Alloys: Preparation and properties. Composition and uses of some important alloys of Al, Ni, Sn and Pb.  | 15    |
| II   | Cement: Types of cement, composition, manufacture and setting of cement.<br>Glass: Manufacture, types and coloured glass.<br>Inorganic Polymers: Silicones-Preparation, properties and applications.<br><b><i>Fuels: Classification of fuels, calorific value and characteristics of good fuel.</i></b><br>Gaseous Fuels: Advantages, Composition and uses of natural gas, water gas, producer gas, oil gas, LPG, CNG and Gobar gas.<br>Liquid fuels –Petroleum-composition and classification.<br>Refining of crude petroleum and uses of various fractions.<br>Petroleum industries in India. Anti-Knocking agents, Octane and Cetane numbers. Synthetic Petrol – Catalytic Cracking of petroleum. | 16    |
| III  | Chemical potential, Gibbs – Duhem equation, variation of chemical potential with temperature and pressure. Chemical potential of ideal gases. Clapeyron-Clausius equation-application to various equilibria.<br>Chemical equilibrium: Law of mass action - relationship between $K_p$ and $K_c$ . van't Hoff's reaction isotherm and isochore. De Donder's concept of chemical equilibria. Formation of HI, dissociation of $PCl_5$ and $N_2O_4$ .<br>Le Chatelier's principle: Application to synthesis of ammonia.   | 15    |
| IV   | Thermodynamics of solutions:<br>Types of solutions: Solution of liquids in liquids. Ideal solution. Raoult's law, Henry's law (Statement only). Non-ideal solution-deviation from Raoult's law.<br>Duhem – Margules equation. Fractional distillation and azeotropes.  | 16    |



|          |   |           |
|----------|---|-----------|
|          | Phase equilibria between condensed phases: Partially miscible liquid system-phenol-water, triethylamine –water and nicotine –water system.<br>Completely immiscible liquids: steam distillation. Nernst distribution law-thermodynamic derivation, application to association of benzoic acid and study of $I_2 + I^- \rightleftharpoons I_3^-$ .   |           |
| <b>V</b> | Colligative properties of solutions:<br>Lowering of vapour pressure: Determination of lowering of vapour pressure by static method and dynamic method.<br>Elevation of Boiling point: Definition, Calculation of molecular weight, Determination of elevation of boiling point by Cottrell's method.<br>Depression of freezing point: Definition, Calculation of molecular weight, Determination of freezing point depression by Beckmann's method.<br>Osmotic pressure: Laws of Osmotic pressure, van't Hoff's equation for osmotic pressure of dilute solution. Berkely and Hartley method of determination of osmotic pressure. Abnormal molecular weight and van't Hoff factor. | <b>16</b> |
|          | <b>Total contact Hrs/Semester</b>   | <b>78</b> |

**\*Italics denotes self study topics**

### Teaching Methods

Lecture by Chalk and Talk, Power point Presentations, Group discussions, Seminar, Quiz, Assignment.

### Text Books

| <b>S.No.</b> | <b>Author(s)</b>                | <b>Title of the Book</b>                                    | <b>Publisher</b>                      | <b>Year of Publication</b> |
|--------------|---------------------------------|---|---------------------------------------|----------------------------|
| <b>1</b>     | Puri and Sharma and Kalia. K.C. | Principles of Inorganic Chemistry, 31 <sup>st</sup> Edition | Milestone Publishers and Distributors | 2013                       |
| <b>2</b>     | Soni. P.L.                      | Text book of Inorganic Chemistry, 20 <sup>th</sup> edition  | Sultan Chand & Sons                   | 2002                       |
| <b>3</b>     | Puri, Sharma and Pathania.      | Principles of Physical Chemistry, 46 <sup>th</sup> Edition  | Vishal Publishing Co., Jalandar       | 2013                       |

|          |   |   |   |                   |
|----------|---|---|---|-------------------|
| <b>4</b> | Satya Prakash,<br>Tuli, Basu and<br>Madan | Advanced Inorganic<br>Chemistry, Volume –<br>II, 4 <sup>th</sup> Edition. | S Chand &<br>Company Pvt Ltd,<br>New Delhi. | 2015<br>(Reprint) |
|----------|---|---|---|-------------------|

### References

| <b>S.No.</b> | <b>Author(s)</b>                | <b>Title of the Book</b>                        | <b>Publisher</b>                            | <b>Year of Publication</b> |
|--------------|---------------------------------|---|---|----------------------------|
| 1            | Jain.P.C and<br>Monaka Jain     | Engineering Chemistry, 15th<br>Edition          | Dhanpat Rai Publishing<br>Company (P) Ltd., | 2005                       |
| 2            | Soni.P.L. and<br>Dharmarha. O.P | Text book of Physical<br>Chemistry, 7th Edition | Sultan Chand & Sons,,<br>New Delhi.         | 2005                       |

### Mapping with Programme Outcomes

| <div> <div>PSO</div> <div>CO</div> </div> | <b>PSO1</b> | <b>PSO2</b> | <b>PSO3</b> | <b>PSO4</b> | <b>PSO5</b> |
|---|-------------|-------------|-------------|-------------|-------------|
| <b>CO1</b>                                | H           | S           | S           | H           | S           |
| <b>CO2</b>                                | H           | S           | H           | S           | H           |
| <b>CO3</b>                                | S           | S           | S           | H           | S           |
| <b>CO4</b>                                | S           | H           | H           | S           | H           |

S-Strong; H-High; M-Medium; L-Low

| <b>Compiled by</b><br><b>Name with Signature</b> | <b>Verified by</b><br><b>HOD Name with Signature</b> | <b>CDC</b>     | <b>COE</b>        |
|--|--|----------------|-------------------|
| Dr.M.Selladurai                                  | Dr.A.Ayyasamy  | Dr.M.Durairaju | Dr.R.Muthukumaran |

|                        |          |                                    |                 |           |
|------------------------|----------|------------------------------------|-----------------|-----------|
| <b>Programme code:</b> | B.Sc.    | <b>Programme Title :</b>           | CHEMISTRY       |           |
| <b>Course Code:</b>    | 19UCY3N1 | <b>Title</b>                       | <b>Batch :</b>  | 2019-2022 |
|                        |          | <b>Non Major Elective- I</b>       | <b>Semester</b> | III       |
| <b>Hrs/Week:</b>       | 1        | <b>Food Science And Technology</b> | <b>Credits:</b> | 02        |

### Course Objective

To create an awareness regarding food and nutrition.

### Course Outcome

| <b>Knowledge Level</b> | <b>CO Number</b> | <b>CO Statement</b>                                     |
|------------------------|------------------|---|
| K1                     | CO1              | To remember the sources of food and its function        |
| K2                     | CO2              | To get the idea about food preservation methods         |
| K3                     | CO3              | To deploy the food adulterants and their effects        |
| K4                     | CO4              | To interpret the functions of food corporation of India |

## Syllabus

| Unit       | Content  | Hours     |
|------------|--|-----------|
| <b>I</b>   | <b>Food and Nutrition :</b><br>Functions of food, food sources, energy value of foods, elementary idea about digestion and metabolism of Carbohydrates, Fats and Proteins.   | <b>3</b>  |
| <b>II</b>  | <b>Food preservation :</b><br>Importance of food preservation, causes of food spoilage, principles of food preservation. Methods of food preservation-<br>Bacterostatic Methods: Dehydration, pickling and salting<br>Bacterocidal Methods: Canning and cooking. | <b>3</b>  |
| <b>III</b> | Milk Processing – Pasteurisation and milk products<br>Food Additives : Antioxidants , Food Colours, Food enzymes, Spices and flavouring agents. Merits and demerits of additives and preservatives.  | <b>3</b>  |
| <b>IV</b>  | Food adulteration: Common adulterants and their effects. Intentional and incidental adulterants. Metallic contamination, contamination by pests and pesticide residues. Simple physical and chemical tests for detection of food adulterants.                    | <b>2</b>  |
| <b>V</b>   | Packaging hazards. Food poisoning and food borne diseases.<br>Food Laws: FSSAI<br>Food Standard: ISI standards and the Agmark standards.<br><i>Functions of Food Corporation of India.</i>   | <b>2</b>  |
|            | <b>Total contact Hrs/Semester</b>  | <b>13</b> |

**\*Italics denotes self study topics**

## Teaching Methods

Lecture by Chalk & Talk, Power point Presentations, Group discussions, Seminar, Quiz, Assignment.

### Text Books

| S.No. | Author(s)                           | Title of the Book  | Publisher                     | Year of Publication |
|-------|-------------------------------------|--|-------------------------------|---------------------|
| 1     | Swaminathan M                       | Essentials of Food and Nutrition, Volume I and II, 2 <sup>nd</sup> Edition | Ganesh Publishers, Madras     | 2002                |
| 2     | Sumati R. Mudambi and Rajagopal M.V | Fundamentals of Foods and Nutrition, 3 <sup>rd</sup> Edition               | Wiley Eastern Ltd., New Delhi | 1990                |

### References

| S.No | Author(s)       | Title of the Book              | Publisher                                   | Year of Publication |
|------|-----------------|--------------------------------|---|---------------------|
| 1    | Jayashree Ghosh | Applied Chemistry, 1st Edition | S.Chand and company Ltd., New Delhi         | 2006                |
| 2    | Srilakshmi B    | Food Science, Third Edition    | New Age International Publishers, New Delhi | 2006                |

### Mapping with Programme Outcomes

| CO \ PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|----------|------|------|------|------|------|
| CO1      | H    | S    | S    | H    | S    |
| CO2      | S    | H    | H    | S    | H    |
| CO3      | H    | S    | S    | S    | H    |
| CO4      | S    | S    | S    | S    | H    |

S-Strong; H-High; M-Medium; L-Low

| Compiled by<br>Name with Signature | Verified by<br>HOD Name with<br>Signature | CDC            | COE               |
|------------------------------------|---|----------------|-------------------|
| C.Umamaheswari                     | Dr.A.Ayyasamy                             | Dr.M.Durairaju | Dr.R.Muthukumaran |

|                        |          |   |                 |           |
|------------------------|----------|---|-----------------|-----------|
| <b>Programme code:</b> | B.Sc.    | <b>Programme Title :</b>  | CHEMISTRY       |           |
| <b>Course Code:</b>    | 19UCY3N2 | <b>Title</b>  | <b>Batch :</b>  | 2019-2022 |
|                        |          | <b>Non Major Elective- I<br/>Chemistry of Consumer Products</b> | <b>Semester</b> | III       |
| <b>Hrs/Week:</b>       | 1        |   | <b>Credits:</b> | 02        |

### Course Objective

To acquire the basic knowledge in consumer product chemistry

### Course Outcome

| <b>Knowledge Level</b> | <b>CO Number</b> | <b>CO Statement</b>  |
|------------------------|------------------|--|
| K1                     | CO1              | To recollect the ingredients present in consumer products          |
| K2                     | CO2              | To get the idea about action of soaps and detergents               |
| K3                     | CO3              | To update the knowledge relevant to modern trends in the industry. |
| K4                     | CO4              | To analyze the hazards of cosmetics                                |

## Syllabus

| Unit | Content  | Hours     |
|------|--|-----------|
| I    | <b>SOAPS :</b> Saponification of oils and fats. Manufacture of soaps. Formulation of toilet soaps. Different ingredients used and their functions. Mechanism of cleansing action of soap, Medicated soaps, Herbal soaps. Soft soaps, Shaving soaps and Creams.   | 3         |
| II   | <b>DETERGENTS:</b> Different ingredients in the formulation of detergent powders and soaps. Liquid detergents. AOS (alpha olefin sulphonates. cationic detergents: examples. Manufacture and applications. Non-ionic detergents: examples.<br>Mechanism of action of detergents. Comparison of soaps and detergents.   | 3         |
| III  | <b>COSMETICS:</b> Introduction and classification<br>Face creams: cold cream, vanishing cream, cleansing and bleaching cream-ingredients, formulation and uses.<br><i>Face powder: Requirements and ingredients.</i><br>Hand cream: Formulations, Ingredients and uses.<br>Nail preparations: Nail bleach, nail lacquers, nail lacquers and nail removers – requirements ingredients and formulations. | 3         |
| IV   | <b>MAKE UP PREPARATIONS :</b><br>Lipstick, Rouge, Mascara – characteristics and ingredients<br>Dentifrices: Tooth paste and tooth powder -Essential and special ingredients and their functions.   | 2         |
| V    | Hair preparations: Hair oils and hair tonics. Ingredients and their functions. Hair cream: Formulations.<br>Shampoos: constituents and functions.<br>Hair Dyes: Primary requirements of a dye. Vegetable colorings, metal salts and dye used in hair dyes.<br>Hair removers: Temporary and permanent removal of hair.<br>Quality control of cosmetics in India. Health hazards of cosmetics.           | 2         |
|      | <b>Total contact Hrs/Semester</b>  | <b>13</b> |



**\*Italics denotes self study topics**

### **Teaching Methods**

Lecture by chalk & Talk, Power point Presentations, Group discussions, Seminar, Quiz, Assignment.

### **Text Book**

| <b>S.No</b> | <b>Author(s)</b> | <b>Title of the Book</b>                                | <b>Publisher</b> | <b>Year of Publication</b> |
|-------------|------------------|---|------------------|----------------------------|
| <b>1</b>    | Thangamma Jacob  | Text book of Applied Chemistry, 1 <sup>st</sup> Edition | Macmillan        | 1987                       |

### **Reference**

| <b>S.No</b> | <b>Author(s)</b> | <b>Title of the Book</b>        | <b>Publisher</b>           | <b>Year of Publication</b> |
|-------------|------------------|---------------------------------|----------------------------|----------------------------|
| 1           | Gobala Rao, .S   | Outlines of chemical technology | Affiliated East West press | 1998                       |

### Mapping with Programme Outcomes

| <div> <div>PSO</div> <div>CO</div> </div> | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|------|------|------|------|------|
| <b>CO1</b>                                | S    | S    | M    | H    | S    |
| <b>CO2</b>                                | S    | S    | H    | S    | H    |
| <b>CO3</b>                                | H    | S    | S    | H    | H    |
| <b>CO4</b>                                | H    | S    | H    | S    | H    |

S-Strong; H-High; M-Medium; L-Low

| <div> <div>Compiled by</div> <div>Name with Signature</div> </div> | <div> <div>Verified by</div> <div>HOD Name with Signature</div> </div> | CDC            | COE               |
|--|--|----------------|-------------------|
| C.Umamaheswari   | Dr.A.Ayyasamy  | Dr.M.Durairaju | Dr.R.Muthukumaran |

|                        |          |  |                 |           |
|------------------------|----------|--|-----------------|-----------|
| <b>Programme code:</b> | B.Sc.    | <b>Programme Title :</b>                         | CHEMISTRY       |           |
| <b>Course Code:</b>    | 19UCY405 | <b>Title</b>                                     | <b>Batch :</b>  | 2019-2022 |
|                        |          | <b>Core Paper – IV</b>                           | <b>Semester</b> | IV        |
| <b>Hrs/Week:</b>       | 6        | <b>Inorganic, Organic and Physical Chemistry</b> | <b>Credits:</b> | 04        |

### Course Objective

To study the periodic properties of elements, reactions of organic compounds and phase rule

### Course Outcome

| <b>Knowledge Level</b> | <b>CO Number</b> | <b>CO Statement</b>   |
|------------------------|------------------|---|
| K1                     | CO1              | To recollect the properties of transition and inner transition elements |
| K2                     | CO2              | To understand the mechanisms of naming reactions                        |
| K3                     | CO3              | To execute the concept of isomerism in various compounds                |
| K4                     | CO4              | To figure out the phase diagram of various systems                      |

## Syllabus

| Unit       | Contents  | Hours     |
|------------|---|-----------|
| <b>I</b>   | <p>Transition Elements: Characteristics of transition elements. Trends in periodic properties- electronic configuration, Atomic and ionic radii, oxidation states, ionization potentials, colour, magnetic properties, catalytic properties and ability to form complexes.</p> <p>Extraction and uses of Ti, V, Mo, W and Co. Platinum Metals: Metallurgy of platinum. <i>Platinum black, Platinised asbestos, colloidal platinum - preparation and uses.</i></p> <p>Group Discussions: (i) Cr, Mo and W (iii) Fe, Co and Ni . Alloy steels. Heat treatment of steel. Iron and steel industry in India. Preparation and uses of the following compounds. <math>\text{TiO}_2</math>, <math>\text{TiCl}_4</math>, <math>\text{CrO}_2\text{Cl}_2</math>, <math>\text{ZrOCl}_2</math>, <math>\text{V}_2\text{O}_5</math>, <math>\text{FeSO}_4</math>, <math>(\text{NH})_4\text{MoO}_4</math>, <math>\text{PtCl}_4</math>.</p> | <b>16</b> |
| <b>II</b>  | <p>Inner Transition Elements:</p> <p>Lanthanides and Actinides: Occurrence, electronic structure, oxidation states, colour, absorption spectra and magnetic properties. Lanthanide contraction and its consequences. Separation of Lanthanide elements by ion exchange method. Comparison of Lanthanides with Actinides.</p> <p>Extraction of Uranium from Pitch blende.</p>  | <b>15</b> |
| <b>III</b> | <p>Preparation of phenol from aryl halide and Grignard reagent.</p> <p>Reactions of Phenol: Nitration, sulphonation, halogenation, Kolbe's Schmidt reaction, Friedel Crafts reaction, Reimer Tiemann reaction, Duff's reaction, Lederer –Manasse reaction and Gattermann aldehyde synthesis.</p> <p>Nitro Compounds: Aliphatic nitro compounds: Nitromethane and Nitroethane- preparation and properties. Nitro-Acinitro tautomerism.</p> <p>Aromatic nitro compounds : Reduction of Nitrobenzene in neutral, acidic and alkaline media and electrolytic reduction. Preparation of ortho, meta and para dinitrobenzenes and T.N.T.</p>  | <b>16</b> |

|           |   |           |
|-----------|---|-----------|
| <b>IV</b> | <p><b>Amines:</b></p> <p>Aliphatic amines: separation of mixture of amines, Basicity of amines.</p> <p>Aromatic amines: Preparation and properties of Aniline, Diazotisation and Coupling with mechanism</p> <p>Conformational analysis of Ethane, n- Butane and Cyclohexane.</p> <p>Distinction between Conformation and Configuration.</p> <p>Stereoisomerism: Types, R-S configuration, optical isomerism in lactic acid and tartaric acid, racemisation, methods of resolution and asymmetric synthesis.</p> <p>Geometrical isomerism: cis and trans isomerism in maleic and fumaric acid and E-Z notation.</p> | <b>15</b> |
| <b>V</b>  | <p>Phase rule and phase equilibria:</p> <p>Concept of phase, components and degrees of freedom with examples.</p> <p>Thermodynamic derivation of Gibbs-Phase Rule.</p> <p>One component system: Phase diagram and discussion of water and sulphur system.</p> <p>Two component system : Construction of phase diagram by thermal analysis. Simple eutectic- Pb-Ag System.</p> <p>Formation of compounds with congruent melting point: Zn-Mg system.</p> <p>Formation of compounds with incongruent melting point: Na-K system.</p> <p>Salt- Water system: Potassium Iodide-Water system.</p>                        | <b>16</b> |
|           | <b>Total contact Hrs/Semester</b>   | <b>78</b> |

**\*Italics denotes self study topics**

### **Teaching Methods**

Lecture by chalk & Talk, Power point Presentations, Group discussions, Seminar, Quiz, Assignment.

### Text Books

| S.No | Author(s)                                   | Title of the Book  | Publisher                         | Year of Publication |
|------|---|--|-----------------------------------|---------------------|
| 1    | Soni. P.L.,                                 | Text book of Inorganic Chemistry, 20 <sup>th</sup> edition       | Sultan Chand & Sons               | 2002                |
| 2    | Bahl, B.S and Arun Bahl                     | A textbook of Organic Chemistry, 18 <sup>th</sup> Edition        | Sultan Chand & Sons               | 2007                |
| 3    | Soni P.L                                    | Text book of Organic Chemistry, 29 <sup>th</sup> Revised Edition | Sultan Chand & Sons, New Delhi    | 2012                |
| 4    | Puri B.R., Sharma L.R and Madan S. Pathania | Principles of Physical Chemistry, 46 <sup>th</sup> Edition       | Vishal Publishing House, Jalandar | 2013                |

### References

| S.No | Author(s)               | Title of the Book                          | Publisher                    | Year of Publication |
|------|-------------------------|--|------------------------------|---------------------|
| 1    | Finar, I.L              | Organic Chemistry, Vol. I                  | Pearson Education, Singapore | 2003                |
| 2    | Morrison, R.T. and Boyd | Organic Chemistry, 6 <sup>th</sup> Edition | Pearson Education, Singapore | 2003                |

### Mapping with Programme Outcomes

| CO \ PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|----------|------|------|------|------|------|
| CO1      | H    | S    | S    | H    | S    |
| CO2      | H    | S    | H    | S    | H    |
| CO3      | S    | H    | S    | H    | S    |
| CO4      | H    | H    | H    | S    | H    |

S-Strong; H-High; M-Medium; L-Low

| Compiled by<br>Name with<br>Signature | Verified by<br>HOD Name with<br>Signature | CDC            | COE               |
|---------------------------------------|---|----------------|-------------------|
| Dr.M.Selladurai                       | Dr.A.Ayyasamy                             | Dr.M.Durairaju | Dr.R.Muthukumaran |

|                        |          |  |                 |           |
|------------------------|----------|--|-----------------|-----------|
| <b>Programme code:</b> | B.Sc     | <b>Programme Title :</b>                           | CHEMISTRY       |           |
| <b>Course Code:</b>    | 19UCY406 | <b>Title</b>                                       | <b>Batch :</b>  | 2019-2022 |
|                        |          | <b>Core Practical II</b>                           | <b>Semester</b> | IV        |
| <b>Hrs/Week:</b>       | 3        | <b>Volumetric and Organic Qualitative Analysis</b> | <b>Credits:</b> | 5         |

### Course Objective

To develop the analytical skills in volumetric and organic qualitative analysis.

### Course Outcome

| <b>Knowledge Level</b> | <b>CO Number</b> | <b>CO Statement</b>   |
|------------------------|------------------|---|
| K1                     | CO1              | To understand the apparatus used in volumetric analysis and correct titrimetric procedure |
| K2                     | CO2              | To develop preparative skills in the organic preparations                                 |
| K3                     | CO3              | To get the idea about organic qualitative analysis  |
| K4                     | CO4              | To analyse the elements and functional groups of organic compounds.                       |



## Syllabus

| Unit | Content  | Hrs |
|------|--|-----|
|      | <p><b>I) Volumetric Analysis</b></p> <p><b>a) Permanganometry:</b></p> <ol style="list-style-type: none"> <li>1. Estimation of Ferrous ion.</li> <li>2. Estimation of Oxalic acid.</li> <li>3. Estimation of Sodium nitrite.</li> </ol> <p><b>b) Dichrometry:</b></p> <ol style="list-style-type: none"> <li>1) Estimation of Ferrous ion using internal indicator.</li> <li>2) Estimation of Ferric ion using external indicator</li> </ol> <p><b>c) Iodometry:</b></p> <ol style="list-style-type: none"> <li>1) Estimation of Copper.(Demonstration only)</li> <li>2) Estimation of Potassium dichromate.</li> </ol> <p><b>d) EDTA-Titrations:</b></p> <ol style="list-style-type: none"> <li>1) Estimation of Calcium.</li> <li>2) Estimation of Zinc.</li> <li>3) Estimation of Magnesium.</li> <li>4) Estimation of hardness of water-temporary and permanent</li> </ol> |     |

|  |   |           |
|--|---|-----------|
|  | <p><b>Organic Qualitative Analysis</b></p> <p>a) Systematic qualitative analysis of organic compounds containing one functional group: Aldehydes, Ketones, Primary amines, Nitrocompounds, Amides, Anilides, Carbohydrates, Carboxylic acids and Phenols.</p> <p>b) Organic Preparations:</p> <ol style="list-style-type: none"> <li>1) Acetylation of aniline to acetanilide.</li> <li>2) Hydrolysis of benzamide to benzoic acid.</li> <li>3) Hydrolysis of ester ( ethylbenzoate to benzoicacid).</li> <li>4) Nitration of acetanilide to p-nitroacetanilide.</li> </ol> |           |
|  | <b>Total hours/Semester</b>   | <b>39</b> |

### Teaching Methods

Group discussions, Assignment and Experience Discussion.

### Text Book

| S.No | Author(s)  | Title of the Book                           | Publisher                             | Year of Publication |
|------|--|---|---------------------------------------|---------------------|
| 1    | Venkateswaran,V.,<br>R.Veerawamy and<br>A.R.Kulandaivelu | Basic Principles of<br>Practical Chemistry. | S.Chand<br>Publications, New<br>Delhi | 2004                |

**Reference**

| <b>S.No</b> | <b>Author(s)</b> | <b>Title of the Book</b> | <b>Publisher</b>       | <b>Year of Publication</b> |
|-------------|------------------|--------------------------|------------------------|----------------------------|
| 1           | Thomas, A.O.     | Practical Chemistry      | Scientific Book Centre | 2003                       |

**Mapping with Programme Outcomes**

| <div>PSO</div> <div>CO</div> | <b>PSO1</b> | <b>PSO2</b> | <b>PSO3</b> | <b>PSO4</b> | <b>PSO5</b> |
|------------------------------|-------------|-------------|-------------|-------------|-------------|
| <b>CO1</b>                   | H           | S           | S           | H           | S           |
| <b>CO2</b>                   | S           | S           | H           | S           | H           |
| <b>CO3</b>                   | S           | S           | S           | M           | S           |
| <b>CO4</b>                   | S           | H           | S           | S           | H           |

S-Strong; H-High; M-Medium; L-Low

| <b>Compiled by</b>         | <b>Verified by</b>             |                |                   |
|----------------------------|--------------------------------|----------------|-------------------|
| <b>Name with Signature</b> | <b>HOD Name with Signature</b> | <b>CDC</b>     | <b>COE</b>        |
| Dr.M.Amutha                | Dr.A.Ayyasamy                  | Dr.M.Durairaju | Dr.R.Muthukumaran |

|                        |          |  |                 |           |
|------------------------|----------|--|-----------------|-----------|
| <b>Programme code:</b> | B.Sc     | <b>Programme Title :</b>                   | CHEMISTRY       |           |
| <b>Course Code:</b>    | 19UCY4N3 | <b>Title</b>                               | <b>Batch :</b>  | 2019-2022 |
|                        |          | <b>Non Major Elective -II</b>              | <b>Semester</b> | IV        |
| <b>Hrs/Week:</b>       | 1        | <b>Water and Water Treatment Processes</b> | <b>Credits:</b> | 02        |

### Course Objective

To develop the knowledge in industrial waste water treatment

### Course Outcome

| <b>Knowledge Level</b> | <b>CO Number</b> | <b>CO Statement</b>  |
|------------------------|------------------|--|
| K1                     | CO1              | To recollect the source and nature of water                      |
| K2                     | CO2              | To understand the concept of soft water and hard water           |
| K3                     | CO3              | To apply the various softening methods of hard water             |
| K4                     | CO4              | To analyze the nature, effect and treatment of industrial wastes |

## Syllabus

| Unit | Content  | Hours     |
|------|--|-----------|
| I    | Hardness of water – Hard water and Soft water. Types of hardness, Units of hardness, Equivalents of Calcium carbonate.<br>Estimation of hardness of water by EDTA method. Total hardness, temporary hardness and permanent hardness.                     | 3         |
| II   | <i>Disadvantages of hard water in domestic and industrial use.</i> Scales and Sludge formation, prevention of scales. Internal conditioning and external conditioning. Caustic embrittlement – boiler corrosion – priming and foaming.                   | 3         |
| III  | Softening of hard water: Lime soda process, Cold and Hot process.<br>Zeolite process : Natural and synthetic zeolites.<br>Ion exchange process : Cation exchange and anion exchange resins.<br>Regeneration of cation and anion exchangers.              | 2         |
| IV   | Purification of water for municipal purposes: Filtration, Sedimentation and Coagulation, Sterilization, Physical and Chemical methods.<br>Sea water as a source of drinking water: Desalting, electrodialysis and reverse osmosis.                       | 3         |
| V    | Industrial wastewater treatment: Removal of Iron and Silica . Water for boiler use.<br>Industrial wastes and treatment processes: Types of industrial wastes, The nature, effect and treatment of paper, pulp and food processing industrial wastewater. | 2         |
|      | <b>Total contact Hrs/Semester</b>  | <b>13</b> |

**\*Italics denotes self study topics**

## Teaching Methods

Lecture by Chalk & Talk, Power point Presentations, Group discussions, Seminar, Quiz, Assignment.

### Text Books

| S.No | Author(s)                  | Title of the Book                                | Publisher                               | Year of Publication |
|------|----------------------------|--|---|---------------------|
| 1    | Jain. P.C. and Monika Jain | Engineering Chemistry, 15 <sup>th</sup> Edition  | Dhanpat Rai Publishing Company (P) Ltd. | 2005                |
| 2    | Sharma, B.K                | Environmental chemistry, 2 <sup>nd</sup> Edition | Goel Publishing Company(P) Ltd.         | 2000                |

### Reference

| S.No | Author(s)      | Title of the Book                          | Publisher            | Year of Publication |
|------|----------------|--|----------------------|---------------------|
| 1    | Ravishanker. N | Applied chemistry, 3 <sup>rd</sup> Edition | National Pathippaham | 2002                |

### Mapping with Programme Outcomes

| CO \ PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|----------|------|------|------|------|------|
| CO1      | H    | S    | S    | H    | S    |
| CO2      | H    | H    | H    | S    | H    |
| CO3      | S    | S    | S    | H    | H    |
| CO4      | H    | S    | H    | S    | H    |

S-Strong; H-High; M-Medium; L-Low

| Compiled by<br>Name with Signature | Verified by<br>HOD Name with Signature | CDC            | COE               |
|------------------------------------|--|----------------|-------------------|
| C.Umamaheswari                     | Dr.A.Ayyasamy                          | Dr.M.Durairaju | Dr.R.Muthukumaran |

|                        |          |                                |                 |           |
|------------------------|----------|--------------------------------|-----------------|-----------|
| <b>Programme code:</b> | B.Sc.    | <b>Programme Title :</b>       | CHEMISTRY       |           |
| <b>Course Code:</b>    | 19UCY4N4 | <b>Title</b>                   | <b>Batch :</b>  | 2019-2022 |
|                        |          | <b>Non Major Elective - II</b> | <b>Semester</b> | IV        |
| <b>Hrs/Week:</b>       | 1        | <b>Diagnostic Chemistry</b>    | <b>Credits:</b> | 02        |

### Course Objective

To develop their knowledge in diagnosis process

### Course Outcome

| <b>Knowledge Level</b> | <b>CO Number</b> | <b>CO Statement</b>  |
|------------------------|------------------|--|
| K1                     | CO1              | To remember the basic concepts of metabolism of carbohydrates                      |
| K2                     | CO2              | To get the idea about hemoglobin, renal, and liver function                        |
| K3                     | CO3              | To familiarize with mechanism of regulations of blood sugar and the clinical tests |
| K4                     | CO4              | To analyze and execute the clinical laboratory techniques                          |



## Syllabus

| Unit       | Content   | Hours     |
|------------|---|-----------|
| <b>I</b>   | Enzymes: classification and properties of enzymes. Co-enzymes and examples Digestion and absorption of carbohydrates, fats and proteins.  | <b>3</b>  |
| <b>II</b>  | Metabolism of carbohydrates. Glycolysis, Glycogenesis.<br>Regulation of blood sugar : Mechanism of maintaining blood sugar level.<br>Glycosuria, Glucose tolerance test, Normal GTT curves. GTT curves in Diabetes mellitus Diabetes Mellitus –symptoms and control measures.             | <b>3</b>  |
| <b>III</b> | Blood lipids, Ketogenesis, ketolysis and ketosis Urine: composition of urine . <i>General characteristics, Normal and abnormal constituents of urine.</i>   | <b>2</b>  |
| <b>IV</b>  | Formation of urine: Glomerular filtration and tubular reabsorption. Renal function tests: Inulin clearance test, urea concentration test and dye test.<br>Haemoglobin: Functions and properties of Haemoglobin. Conversion of Haemoglobin to Bilepigments. Jaundice –Types and diagnosis. | <b>3</b>  |
| <b>V</b>   | Liver : Functions of liver. Liver function tests: Tests based on excretory functions, metabolic function and the capacity for detoxication.   | <b>2</b>  |
|            | <b>Total contact Hrs/Semester</b>   | <b>13</b> |

\*Italics denotes self study topics

## Teaching Methods

Lecture by Chalk & Talk, Power point Presentations, Group discussions, Seminar, Quiz, Assignment.

## Text Book

| S.No     | Author(s)        | Title of the Book   | Publisher                     | Year of Publication |
|----------|------------------|---|-------------------------------|---------------------|
| <b>1</b> | Ambika Shanmugam | Fundamentals of Biochemistry for Medical Students, Seventh, Indian Edition, | Lippincott Williams & Wilkins | 2012                |

## Reference

| S.No | Author(s) | Title of the Book  | Publisher                      | Year of Publication |
|------|-----------|--|--------------------------------|---------------------|
| 1    | Soni. P.L | Text book of Organic Chemistry, 29 <sup>th</sup> revised edition | Sultan Chand & Sons, New Delhi | 2012                |

## Mapping with Programme Outcomes

| PSO<br>CO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|-----------|------|------|------|------|------|
| CO1       | S    | S    | S    | H    | S    |
| CO2       | S    | S    | H    | S    | H    |
| CO3       | H    | S    | S    | H    | S    |
| CO4       | H    | H    | H    | S    | H    |

S-Strong; H-High; M-Medium; L-Low

| Compiled by<br>Name with Signature | Verified by<br>HOD Name with Signature | CDC            | COE               |
|------------------------------------|--|----------------|-------------------|
| C.Umamaheswari                     | Dr.A.Ayyasamy                          | Dr.M.Durairaju | Dr.R.Muthukumaran |

|                        |          |  |                 |           |
|------------------------|----------|--|-----------------|-----------|
| <b>Programme code:</b> | B.Sc     | <b>Programme Title :</b>                                 | CHEMISTRY       |           |
| <b>Course Code:</b>    | 19UCY507 | <b>Title</b>   | <b>Batch :</b>  | 2019-2022 |
|                        |          | <b>Core Paper- V</b>                                     | <b>Semester</b> | V         |
| <b>Hrs/Week:</b>       | 4        | <b>Nuclear chemistry and<br/>Co-ordination chemistry</b> | <b>Credits:</b> | 4         |

### Course Objective

To develop the skill to aesthetically appreciate Nuclear and Co-ordination chemistry

### Course Outcome

| <b>Knowledge Level</b> | <b>CO Number</b> | <b>CO Statement</b>   |
|------------------------|------------------|---|
| K1                     | CO1              | To understand the theory of radioactivity   |
| K2                     | CO2              | To have knowledge on uses of radio-active elements in various fields                        |
| K3                     | CO3              | To understand various theories of bonding in coordination compounds and their importance    |
| K4                     | CO4              | To know the chemistry of carbonyls, basic knowledge on metallic bonding and semiconductors. |

## Syllabus

| Unit       | Content  | Hrs       |
|------------|--|-----------|
| <b>I</b>   | <p>Need of Nuclear Energy in India.</p> <p>Radio activity. Mass defect, packing fraction. Nuclear binding energy, n/p ratio and stability of the nucleus. Differences between nuclear and chemical reactions. Half- life period.</p> <p>Applications of artificial radioactivity : Age of the earth and <math>C^{14}</math> dating, medical field applications</p> <p>Isotopes: Detection of isotope by Aston Mass Spectrograph.</p> <p>Separation of isotopes by Electromagnetic, Thermal diffusion and Electrolytic techniques.</p> <p>Nuclear fission and fusion. Types of nuclear wastes and different methods of disposal of High and low radioactive wastes.</p> | <b>10</b> |
| <b>II</b>  | <p>Co-ordination chemistry: Double salt and coordination compounds.</p> <p>Definitions of the terms: Ligands and Co-ordination number. Classification of ligands. Nomenclature of Co-ordination compounds. Theories of Co-ordination compounds: Werner's Theory: Designation of Cobalt (III)-ammine complexes. Sidgwick's Theory: Electronic interpretation of Co-ordination bond - Effective atomic number rule.</p> <p>VB theory: Postulates and its applications in the determination of geometry and magnetic property of the complexes.</p>   | <b>11</b> |
| <b>III</b> | <p>Crystal field theory: Postulates. C.F.T- splitting of d-orbital in tetrahedral and Octahedral complexes. C.F.T.stabilization energy. Spectrochemical series.</p> <p>Chelates: Definition, classification, stability factors ,sequestration and sequestering agents. Detection and structure determination of Complexes: Solubility method, change in colour, pH measurements and conductance measurements.</p>  | <b>11</b> |
|            | <p>isomerism in Co-ordination compounds:</p> <p>Structural isomerism: Ionisation, Hydrate and Linkage isomerism.</p> <p>Stereo isomerism: Geometrical isomerism in 4 and 6 - Co-ordination complexes. Optical isomerism in 4 -and 6- Co-ordination compounds.</p> <p>Applications of complexes in quantitative analysis: Estimation of <math>Ni^{2+}</math> using DMG and <math>Mg^{2+}</math> using Oxine.</p>  | <b>10</b> |

|           |  |           |
|-----------|--|-----------|
| <b>IV</b> | Ligands substitution in octahedral complexes: Inert and Labile complexes<br>Nucleophilic ligands substitution reactions, $S_N^1$ and $S_N^2$ mechanisms.<br>Substitution reactions without breaking Metal-Ligand bond.<br>Trans effect in square planar complexes: Definition, trans effect series and uses of trans effect.   |           |
| <b>V</b>  | Carbonyls Compounds: Mono and Binuclear carbonyls of $Ni(CO)_4$ , $Fe(CO)_5$ , $Fe_2(CO)_9$ , $Co_2(CO)_8$ , and $Cr(CO)_6$ - synthesis, properties, structure and EAN.<br>Metallic bond: Electron Sea model, Valence bond theory and Band theory.<br><i>Semiconductors: Intrinsic and Extrinsic Semi Conductors - n-type and p-type - Properties and uses.</i><br>Structures of alloys: Interstitial, substitutional and intermetallic alloys | <b>10</b> |
|           | <b>Total contact Hrs/Semester</b>  | <b>52</b> |

**\*Italics denotes self study topics**

### Teaching Methods

Lecture by chalk & Talk, Power point Presentations, Group discussions, Seminar, Quiz, Assignment.

### Text Books

| S.No | Author(s)                       | Title of the Book   | Publisher                             | Year of Publication |
|------|---------------------------------|---|---------------------------------------|---------------------|
| 1    | Puri and Sharma and Kalia. K.C. | Principles of Inorganic Chemistry, 31 <sup>st</sup> Edition | Milestone Publishers and Distributors | 2013                |
| 2    | Soni. P.L.                      | Text book of Inorganic Chemistry, 20 <sup>th</sup> Edition  | Sultan Chand & Sons                   | 2012                |
| 3    | Madan, Malik and Tuli.          | Selected Topics in Inorganic Chemistry                      | Sultan Chand & Sons                   | 2006                |

## References

| S.No | Author(s)                     | Title of the Book                                      | Publisher                       | Year of Publication |
|------|-------------------------------|--|---------------------------------|---------------------|
| 1    | Lee. J.D                      | Concise Inorganic Chemistry,5 <sup>th</sup> Edition    | Black Well Science Ltd, London. | 2006                |
| 2    | Jain. P.C. and Monika Jain    | Engineering Chemistry,15 <sup>th</sup> Edition         | Dhanpat Rai Publishing Company  | 2005                |
| 3    | Gopalan. R. and Ramalingam V. | Concise Coordination Chemistry,3 <sup>rd</sup> Edition | Vikas Publishing house          | 2006                |

## Mapping with Programme Outcomes

| CO \ PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|----------|------|------|------|------|------|
| CO1      | H    | S    | S    | H    | S    |
| CO2      | H    | S    | H    | S    | H    |
| CO3      | S    | S    | S    | S    | H    |
| CO4      | S    | H    | H    | S    | H    |

trong; H-High; M-Medium; L-Low

| Compiled by<br>Name with Signature | Verified by<br>HOD Name with Signature | CDC            | COE               |
|------------------------------------|--|----------------|-------------------|
| Dr.M.Amutha                        | Dr.A.Ayyasamy                          | Dr.M.Durairaju | Dr.R.Muthukumaran |

|                        |          |                            |                 |           |
|------------------------|----------|----------------------------|-----------------|-----------|
| <b>Programme code:</b> | B.Sc.    | <b>Programme Title :</b>   | CHEMISTRY       |           |
| <b>Course Code:</b>    | 19UCY508 | <b>Title</b>               | <b>Batch :</b>  | 2019-2022 |
|                        |          | <b>Core Paper – VI</b>     | <b>Semester</b> | V         |
| <b>Hrs/Week:</b>       | 4        | <b>Organic Chemistry-I</b> | <b>Credits:</b> | 4         |

### Course Objective

To make the students to

- understand the mechanisms in molecular rearrangements
- acquire knowledge on heterocyclic compounds
- gain knowledge in carbohydrate chemistry
- acquire knowledge on structural elucidation of natural products

### Course Outcome

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

| <b>Knowledge Level</b> | <b>CO Number</b> | <b>CO Statement</b>   |
|------------------------|------------------|---|
| K1, K4                 | CO1              | recollect and interpret the mechanisms of molecular rearrangements                          |
| K2                     | CO2              | understand the significance of heterocyclic compounds                                       |
| K2                     | CO3              | understand the importance of carbohydrate chemistry   |
| K3,K4                  | CO4              | apply and interpret various chemical methods in deducing the structures of natural products |

## Syllabus

| Unit | Content  | Hrs       |
|------|--|-----------|
| I    | Molecular Rearrangements: Pinacol - Pinacolone. Beckmann, Hoffmann, Curtius, Schmidt, Benzidine, Benzilic acid, Fries, Baeyer Villiger, Cope and Claisen rearrangements.   | 10        |
| II   | Heterocyclic Compounds: Chemistry of Furan, Pyrrole, Thiophene, Pyridine, Quinoline, Isoquinoline and Indole.<br>Pyrazole - Preparation and properties   | 10        |
| III  | Carbohydrates: Classification, configuration of Monosaccharides, chemistry and structural elucidation of Glucose and Fructose, interconversion in sugar series [Glucose to Fructose and vice versa, Glucose to Arabinose and vice versa], Mutarotation and epimerization. <i>Sucrose, Maltose, Lactose, and Saccharin – Preparation, Properties and uses [Structural elucidation is not needed].</i> | 11        |
| IV   | Alkaloids: Definition, occurrence and extraction of alkaloids from plants. General methods of determining structure. Determination of structure of Coniine, Piperine, Papaverine and Nicotine  | 11        |
| V    | Terpenoids: Classification, isoprene rule, special isoprene rule and Gemdialkyl rule, Extraction from plants, structural elucidation of Citral, Camphor, $\alpha$ - terpineol and Menthol.   | 10        |
|      | <b>Total hours/Semester</b>  | <b>52</b> |

**\*Italics denotes self study topics**

### Teaching Methods

Lecture by chalk & talk, power point presentations, group discussions, seminar, quiz, assignment, experience Discussion, brain storming, Activity, Models.



### Text Books

| S.No. | Author(s)               | Title of the Book              | Publisher                         | Year of Publication |
|-------|-------------------------|--------------------------------|-----------------------------------|---------------------|
| 1.    | Finar. I.L.             | Organic Chemistry              | ELBS Edition                      | 2006                |
| 2.    | Bahl.B.S. and Arun Bahl | Advanced Organic Chemistry     | S.Chand & Company Ltd., New Delhi | 2010                |
| 3.    | Soni. P.L.              | Text book of Organic Chemistry | Sultan Chand & Sons, New Delhi    | 2012                |

### Reference Books

| S.No. | Author(s)                  | Title of the Book                                      | Publisher                   | Year of Publication |
|-------|----------------------------|--|-----------------------------|---------------------|
| 1.    | Gurtu. J.N. and Kapoor. R. | Organic Reactions and Reagents                         | S.Chand & Company, Newdelhi | 1998                |
| 2.    | Gurdeep. R. Chatwal        | Organic Chemistry of Natural Products, Volume I and II | Goel Publishing House       | 2004                |

### Mapping with Programme Outcomes

| CO \ PSO   | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|------------|------|------|------|------|------|
| <b>CO1</b> | S    | S    | S    | H    | S    |
| <b>CO2</b> | S    | S    | S    | S    | H    |
| <b>CO3</b> | S    | S    | H    | H    | S    |
| <b>CO4</b> | S    | H    | S    | H    | H    |

trong; H-High; M-Medium; L-Low

|  |  |                 |                   |
|--|--|-----------------|-------------------|
| <b>Compiled by<br/>Name with Signature</b> | <b>Verified by<br/>HOD Name with<br/>Signature</b> | <b>CDC</b>      | <b>COE</b>        |
| Dr.Indumathy Ramasamy                      | Dr.A. Ayyasamy                                     | Dr.M. Durairaju | Dr.R.Muthukumaran |

|                        |          |                          |                 |           |
|------------------------|----------|--------------------------|-----------------|-----------|
| <b>Programme code:</b> | B.Sc.    | <b>Programme Title :</b> | CHEMISTRY       |           |
| <b>Course Code:</b>    | 19UCY509 | <b>Title</b>             | <b>Batch :</b>  | 2019-2022 |
|                        |          | <b>Core Paper – VII</b>  | <b>Semester</b> | V         |
| <b>Hrs/Week:</b>       | 4        | <b>Electro Chemistry</b> | <b>Credits:</b> | 4         |

### Course Objective

- (i) To understand the concepts between electrochemistry and thermodynamics.
- (ii) To apply electro chemical principles to fuel cells, batteries and mechanism of corrosion.

### Course Outcome

| <b>Knowledge Level</b> | <b>CO Number</b> | <b>CO Statement</b>  |
|------------------------|------------------|--|
| K1                     | CO1              | Able to write balanced half –cell reactions, determine overall cell reactions and calculate the standard reduction potential             |
| K2                     | CO2              | To understand the principles and applications of conductance measurements  |
| K3                     | CO3              | To describe and understand the operation of electrochemical systems for the production of electric energy, i.e. batteries and fuel cells |
| K4                     | CO4              | To describe general corrosion in terms of electrochemistry and methods for minimizing corrosion  |

## Syllabus

| Unit       | Content  | Hrs       |
|------------|--|-----------|
| <b>I</b>   | <p>Electrolytic Conduction and Electrolysis:</p> <p>Faradays Laws of electrolysis. Measurement of conductivity in electrolytic solution. Variation of specific and equivalent conductances with dilution.</p> <p>Transport Number: Definition, Determination by the Hittorf's method and the Moving Boundary Method.</p> <p>Arrhenius theory of electrolytic dissociation and the Ostwalt's dilution law. Kohlrausch's law of independent migration of ions and its applications. Debye -Huckel theory of strong electrolytes. Debye Huckel Onsager equation for the equivalent conductivity of strong electrolytes (Derivation not required), Wein and Debye Falkenhagen effects.</p>   | <b>10</b> |
| <b>II</b>  | <p>Applications of conductance measurements:</p> <p>Determination of degree of dissociation of weak electrolytes, determination of ionic product of water, determination of solubility of sparingly soluble salts and conductometric titrations.</p> <p>Electrochemical cells: Nernst Equation, EMF of a cell and it's measurement. Thermodynamic quantities of cell reactions: <math>\Delta H</math>, <math>\Delta S</math> and <math>\Delta G</math> from EMF data.</p> <p>Reversible electrodes and their types: Metal - Metal ion, Metal - insoluble salt, Gas - ion and redox electrodes. Single electrode potentials, standard electrode potentials, electrochemical series, computation of standard EMF and writing cell reactions.</p> | <b>11</b> |
| <b>III</b> | <p>Electrodes for the measurement of pH:</p> <p>Hydrogen gas electrode, Quinhydrone electrode and glass electrode</p> <p>Buffer solution: Buffer action, Henderson's equation and the evaluation of the dissociation constant.</p> <p>Acid-Base Indicators: Theories of Acid-Base Indicators. Acid-Base Titrations and choice of Indicators.</p> <p>Hydrolysis of Salts: Degree of hydrolysis, Relationship between <math>K_h</math>, <math>K_w</math> and</p>   | <b>10</b> |

|           |   |           |
|-----------|---|-----------|
|           | the dissociation constant for salts such as sodium acetate, ammonium chloride and ammonium acetate.   |           |
| <b>IV</b> | <p>Electrochemical cells:</p> <p>Concentration cells with and without transference. Liquid junction potential - Formation and elimination.</p> <p>Applications of EMF measurements: Calculation of valency of ions in doubtful cases (<math>\text{Hg}^+/\text{Hg}^{2+}</math>), equilibrium constant of a electrochemical reaction, determination of transport number, determination of solubility of sparingly soluble salts.</p>  | <b>11</b> |
| <b>V</b>  | <p>Batteries: Dry Cell, Lead-Acid storage cell and Nickel- Cadmium, Nickel-Zinc accumulator. Fuel Cell: Hydrogen - Oxygen fuel cell.</p> <p>Hydrogen over voltage: Measurement and its application to metal deposition.</p> <p>Electrochemical corrosion: Mechanism, Galvanic and differential aeration corrosion.</p> <p><i>Prevention of corrosion: Proper designing, using pure metal, using metal alloys, cathodic protection, modifying the environment and uses of inhibitor (Brief account only).</i></p> <p>Metallic coatings: Anodic and cathodic coatings. Method of application of metallic coatings: Hot dipping and electro plating (Nickel and chromium plating).</p> | <b>10</b> |
|           | <b>Total hours/semester</b>   | <b>52</b> |

**\*Italics denotes self study topics**

### **Teaching Methods**

Lecture by Chalk & Talk, Power point Presentations, Group discussions, Seminar, Quiz, Assignment.

### Text Books

| S.No | Author(s)                       | Title of the Book  | Publisher                                  | Year of Publication |
|------|---------------------------------|--|--|---------------------|
| 1    | Puri and Sharma and. Pathania   | Principles of Physical Chemistry                         | Milestone Edition, Vishal Publishing House | 2007                |
| 2    | Soni. P.L., and Dharmarha. O.P. | Text book of Physical Chemistry, 7 <sup>th</sup> Edition | Sultan Chand & Sons,                       | 2005                |
| 3    | Jain. P.C. and Monica Jain.,    | Engineering Chemistry, 17th Edition                      | Dhanpat Rai Publishing Company(P) Ltd      | 2005                |

### References

| S.No | Author(s)                             | Title of the Book                              | Publisher                      | Year of Publication |
|------|---------------------------------------|--|--------------------------------|---------------------|
| 1    | Samuel H.Marion. and Carl F.Prutton., | Principle of Physical Chemistry, 4th Edition   | Amerind ublishing Co. Pvt.Ltd  | 1972                |
| 2    | Negi. A.S. and Anand. S.C             | A Text book of Physical Chemistry, 4th Edition | New Age International (P) Ltd. | 1995                |
| 3    | Atkins. P.W.,                         | Physical Chemistry                             | ELBS/ Oxford University Press  | 1987                |

### Mapping with Programme Outcomes

| CO \ PSO   | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|------------|------|------|------|------|------|
| <b>CO1</b> | H    | S    | S    | H    | S    |
| <b>CO2</b> | H    | S    | H    | S    | H    |
| <b>CO3</b> | S    | S    | S    | H    | S    |
| <b>CO4</b> | S    | H    | H    | S    | H    |

S-Strong; H-High; M-Medium; L-Low

| <b>Compiled by<br/>Name with Signature</b> | <b>Verified by<br/>HOD Name with<br/>Signature</b> | <b>CDC</b>     | <b>COE</b>        |
|--|--|----------------|-------------------|
| Dr.T.Gowrani                               | Dr.A.Ayyasamy                                      | Dr.M.Durairaju | Dr.R.Muthukumaran |

|                        |          |                          |                 |           |
|------------------------|----------|--------------------------|-----------------|-----------|
| <b>Programme code:</b> | B.Sc.    | <b>Programme Title:</b>  | CHEMISTRY       |           |
| <b>Course Code:</b>    | 19UCY510 | <b>Title</b>             | <b>Batch:</b>   | 2019-2022 |
|                        |          | <b>Core Paper – VIII</b> | <b>Semester</b> | V         |
| <b>Hrs/Week:</b>       | 4        | <b>Dye Chemistry</b>     | <b>Credits:</b> | 4         |

### Course Objective

To encourage the students to opt their career as dye chemists in dyeing and textile industry

### Course Outcome

| <b>Knowledge Level</b> | <b>CO Number</b> | <b>CO Statement</b>   |
|------------------------|------------------|---|
| <b>K1</b>              | <b>CO1</b>       | To learn the basic concepts and theories of colour and its constitution |
| <b>K2</b>              | <b>CO2</b>       | To understand the preparation and properties of various types of dyes   |
| <b>K3</b>              | <b>CO3</b>       | To know the classification and application of different dyes            |
| <b>K4</b>              | <b>CO4</b>       | To acquire knowledge in process and applications of dyes                |



## Syllabus

| Unit       | Content  | Hrs       |
|------------|--|-----------|
| <b>I</b>   | <p>Electromagnetic spectrum: Various regions. Relationship of colour observed to wavelength of light absorbed. Complementary colours. Terms used in dye chemistry - Chromophores, Auxochrome, Bathochromic shift, Hypsochromic shift, Hypochromic shift and Hyperchromic shift.</p> <p>Requisites of a true dye: Classification of dyes according to their chemical constitution and mode of applications.</p> <p>Theories of colour and constitution: Otto Witt's theory, Quinonoid theory and Molecular orbital theory of various transitions.</p>                     | <b>10</b> |
| <b>II</b>  | <p>Nitro dyes: Picric acid, Martius yellow, Naphthol Yellow S – synthesis and applications.</p> <p>Nitroso dyes: Fast Green O, Naphthol Green Y - synthesis and applications</p> <p>Azo dyes: Diazotisation, Mechanism of diazotization, Effects of substituent on diazotization. Diazo coupling and coupling with phenols and Amines.</p> <p>Classification of azo dyes as monoazo and bisazo dyes.</p> <p>Synthesis and applications of important azo dyes: Methyl orange, Orange I, Orange II, Metanil yellow, Eriochrome Black – T, Bismark brown and Congo red.</p> | <b>10</b> |
| <b>III</b> | <p>Diphenyl methane dyes: Auramine O and Auramine G - synthesis and uses.</p> <p>Triphenyl methane dyes: Malachite green, Rosaniline, and Crystal violet - Synthesis and uses.</p> <p>Phthalein and Xanthene dyes: Phenolphthalein, and Rhodamine B - Synthesis and uses.</p> <p>Indigoid dyes: Indigotin – Synthesis and application to fibre. Indigosol O – Synthesis.</p>   | <b>11</b> |
| <b>IV</b>  | <p>Anthroquinone dyes: Anthraquinone acid dyes – Alizarin cyanine green and Solway ultra blue B, Mordant dyes – Alizarin and Alizarin Blue, Vat dyes- CI Vat Blue 43 and Carbazole and Disperse dyes - Disperse Red 15.</p> <p>Organic Pigments: Characteristics of pigments, uses of pigments. Types of</p>   | <b>10</b> |

|          |   |           |
|----------|---|-----------|
|          | Pigments - Lakes, Toners. Ionic and non-ionic Pigments.<br>Phthalocyanines.<br>Fluorescent brightening agents. Classification and properties. Fluorescent brighteners for a. cellulosic fibers b. acrylic fibers.   |           |
| <b>V</b> | Types of textile fibres: Natural, Semisynthetic and Synthetic fibres – Cotton, Wool, Silk, Cellulose acetate, Viscose rayon, polyamides, polyacrylonitrile and polyester.<br>Binding of dye with fibre- Ionic forces, Hydrogen bonds, Vander Waals forces, Covalent bonds.<br>Selection of dyes for different fibres, Fastness properties of dyes.<br>Process of dyeing: A simple treatment, various methods of dyeing - Direct dyeing, Mordant dyeing, Vat dyeing, Disperse dyeing. Formation of dye on the fibre.<br><i>Pollution problems in dyeing industry.</i><br>Non-textile uses of dyes: Uses of dyes in leather, paper, foods and drugs, colour photography and indicators. | <b>11</b> |
|          | <b>Total contact Hrs/Semester</b>   | <b>52</b> |

**\*Italics denotes self study topics**

## Teaching Methods

Lecture by chalk & Talk, Power point Presentations, Group discussions, Seminar, Quiz, Assignment.

## Text Books

| S.No | Author(s)                   | Title of the Book           | Publisher                    | Year of Publication |
|------|-----------------------------|-----------------------------|------------------------------|---------------------|
| 1    | Tyagi. O.D. and Yadav. M.A. | Text Book of Synthetic Dyes | Anmol publications Pvt. Ltd. | 2001                |
| 2    | Bahl and Arun Bhal B.S.     | Advanced Organic Chemistry  | S.Chand & Company Ltd.       | 2007                |

## References

| S.No. | Author(s)                                | Title of the Book                            | Publisher                           | Year of Publication |
|-------|--|--|-------------------------------------|---------------------|
| 1     | Rao. R.S., Vidya Chawathe and Shah. S.J. | An Introduction to Synthetic Drugs and Dyes  | Himalaya publishing House           | 1997                |
| 2     | Lubs. H.A.                               | The Chemistry of Synthetic Dyes and Pigments | Robert E.Krieger Publishing Company | 1997                |
| 3     | Arora. M.G.                              | A Text Book of Synthetic Dyes                | Anmol publication                   | 1996                |

## Mapping with Programme Outcomes

| CO \ PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|----------|------|------|------|------|------|
| CO1      | H    | S    | S    | H    | S    |
| CO2      | H    | S    | H    | S    | H    |
| CO3      | H    | S    | S    | S    | S    |
| CO4      | S    | S    | H    | S    | H    |

S-Strong; H-High; M-Medium; L-Low

| Compiled by<br>Name with Signature | Verified by<br>HOD Name with<br>Signature | CDC            | COE               |
|------------------------------------|---|----------------|-------------------|
| Dr.M.Selladurai                    | Dr.A.Ayyasamy                             | Dr.M.Durairaju | Dr.R.Muthukumaran |

|                        |          |                                |                 |           |
|------------------------|----------|--------------------------------|-----------------|-----------|
| <b>Programme code:</b> | B.Sc.    | <b>Programme Title :</b>       | CHEMISTRY       |           |
| <b>Course Code:</b>    | 19UCY511 | <b>Title</b>                   | <b>Batch :</b>  | 2019-2022 |
|                        |          | <b>Core Elective Paper – I</b> | <b>Semester</b> | V         |
| <b>Hrs/Week:</b>       | 4        | <b>Analytical chemistry</b>    | <b>Credits:</b> | 4         |

### Course Objective

To develop the skill to aesthetically appreciate Analytical chemistry

### Course Outcome

| <b>Knowledge Level</b> | <b>CO Number</b> | <b>CO Statement</b>   |
|------------------------|------------------|---|
| K1                     | CO1              | To learn instrumentation and basic principles and applications of modern analytical tools such as thermogravimetry and polarography |
| K2                     | CO2              | To have knowledge on uses of nephelometry and flame photometry  |
| K3                     | CO3              | To understand the polarography, electrogravimetry and chromatography  |
| K4                     | CO4              | To acquire knowledge and applications of various analytical tools   |

## Syllabus

| Unit       | Content   | Hrs       |
|------------|---|-----------|
| <b>I</b>   | <p><i>Data Analysis: Definition and terms – absolute and relative error. Precision and accuracy. Classification of errors. Sources and minimisation of errors. Significant figures.</i></p> <p>Gravimetric Analysis: Precipitation methods. Conditions of precipitation, co-precipitation and post precipitation. Precipitation from homogeneous solution. Washing of the precipitate. Organic precipitants – DMG, Cupron, Cupferron, oxine and salicylaldoxime.</p>                    | <b>10</b> |
| <b>II</b>  | <p>Thermogravimetric Analysis (TGA): Principle, factors affecting thermogravimetric curves. Applications: Evaluation of gravimetric precipitation, curie point determination and study of organic compounds.</p> <p>Electrogravimetry- principle only.</p> <p>Differential thermal analysis (DTA): Principle, factors affecting the DTA curve. Applications: heat of reaction, specific heat and quality control.</p> <p>Thermometric titrations (TTA): Principle and applications.</p> | <b>10</b> |
| <b>III</b> | <p>Polarimetry: Theory and instrumentation. Comparison of acid strength using polarimeter.</p> <p>Nephelometry and Turbidimetry: Theory, principles and applications in Inorganic analysis, turbidimetric titrations and phase titrations.</p> <p>Flame photometry: Theory, principle and applications in Qualitative and Quantitative analyses.</p>  | <b>10</b> |
| <b>IV</b>  | <p>Polarography: Principle, dropping mercury electrode – advantages and disadvantages. Experimental assembly, current – voltage curves. Significance of Ilkovic equation (derivation not required).</p> <p>Half wave potential. Applications in qualitative and quantitative analyses.</p> <p>Amperometric Titrations: Principle, apparatus and technique. Dead stop end point method. Advantages and disadvantages of amperometric titrations.</p>                                     | <b>11</b> |
| <b>V</b>   | <p>Chromatographic techniques:</p> <p>Paper Chromatography: Principle, RF value and experimental details.</p> <p>Applications in qualitative and quantitative analyses.</p>   | <b>11</b> |

|  |  |           |
|--|--|-----------|
|  | <p>Thin Layer Chromatography: Principle, brief account of experimental details and its advantages. Applications in the separation of amino acids.</p> <p>Column Chromatography: Principle, experimental details, factors affecting the column efficiency and applications.</p> <p>Ion Exchange Chromatography: Principle, types of resins, action of resins and applications in softening of hard water.</p> |           |
|  | <b>Total contact Hrs/Semester</b>  | <b>52</b> |

**\*Italics denotes self study topics**

### Teaching Methods

Lecture by Chalk & Talk, Power point Presentations, Group discussions, Seminar, Quiz, Assignment.

### Text Books

| S.No | Author(s)         | Title of the Book  | Publisher                 | Year of Publication |
|------|-------------------|--|---------------------------|---------------------|
| 1    | Chatwal and Anand | Instrumental Methods of Chemical Analysis, 5 <sup>th</sup> Edition | Himalaya publishing House | 2005                |
| 2    | Arthur. I. Vogel  | Inorganic Quantitative Analysis, 3rd Edition                       | Longmans                  | 1964                |
| 3    | Khopkar           | Basic concepts of Analytical Chemistry, 3rd Edition                | Wiley Eastern Ltd         | 1992                |

**Reference**

| <b>S.No</b> | <b>Author(s)</b> | <b>Title of the Book</b>                      | <b>Publisher</b>    | <b>Year of Publication</b> |
|-------------|------------------|---|---------------------|----------------------------|
| 1           | Usharani. S.     | Analytical Chemistry, 1 <sup>st</sup> Edition | Macmillan India Ltd | 2000                       |

**Mapping with Programme Outcomes**

| CO \ PSO   | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|------------|------|------|------|------|------|
| <b>CO1</b> | S    | S    | S    | H    | S    |
| <b>CO2</b> | H    | S    | H    | S    | S    |
| <b>CO3</b> | H    | S    | S    | S    | H    |
| <b>CO4</b> | S    | H    | H    | S    | H    |

trong; H-High; M-Medium

| <b>Compiled by<br/>Name with Signature</b> | <b>Verified by<br/>HOD Name with<br/>Signature</b> | <b>CDC</b>     | <b>COE</b>        |
|--|--|----------------|-------------------|
| Dr.A.Ayyasamy                              | Dr.A.Ayyasamy                                      | Dr.M.Durairaju | Dr.R.Muthukumaran |

|                        |          |   |                 |           |
|------------------------|----------|---|-----------------|-----------|
| <b>Programme code:</b> | B.Sc.    | <b>Programme Title :</b>  | CHEMISTRY       |           |
| <b>Course Code:</b>    | 19UCY512 | <b>Title</b>  | <b>Batch :</b>  | 2019-2022 |
|                        |          | <b>Core Elective Practical :<br/>Application Oriented<br/>Practical</b> | <b>Semester</b> | V         |
| <b>Hrs/Week:</b>       | 2        |   | <b>Credits:</b> | 02        |

### Course Objective

- To develop the theoretical knowledge acquired in analytical chemistry
- To enable the students to acquire the quantitative skills in the preparation of inorganic complexes and dyes

### Course Outcome

| <b>Knowledge Level</b> | <b>CO Number</b> | <b>CO Statement</b>  |
|------------------------|------------------|--|
| K1                     | CO1              | To understand the basic concept of analytical chemistry  |
| K2                     | CO2              | To apply the theoretical knowledge in the preparation of inorganic metal complexes and dyes    |
| K3                     | CO3              | To enable the students to acquire analytical skills (qualitative and quantitative skills)      |
| K4                     | CO4              | To develop hands on training in instruments like Melting point apparatus and spectrophotometer |



## Syllabus

| Unit | Content  | Hrs       |
|------|--|-----------|
| I    | <ol style="list-style-type: none"><li>1. Determination of melting point of organic substances (Acetanilide, meta- dinitrobenzene, benzoic acid, benzanilide, urea nitrate)</li><li>2. Determination of Boiling point of organic substances (Benzene, Carbon tetra chloride, isopropyl alcohol, methyl ethyl ketone. ethyl acetate.)</li><li>3. Preparation of Tetramminecopper(II) complex</li><li>4. Preparation of Hexamminecobalt(II) Chloride</li><li>5. Preparation of Potassium trioxalatochromate(III)</li><li>6. Preparation of Methyl orange</li><li>7. Preparation of para- nitrobenzene-azo-<math>\beta</math>-naphthol</li><li>8. Colorimetric estimation of Ferric ion with ammonium thiocyanate</li><li>9. Colorimetric estimation of Nickel as Nickeldimethylglyoximate</li><li>10. Determination of saponification value of an oil</li></ol> |           |
|      | <b>Total contact Hrs/Semester</b>  | <b>26</b> |

## Teaching Methods

Lecture by chalk & Talk, Power point Presentations, Group discussions, Seminar, Quiz, Assignment.

## Text Book

| S.No | Author(s)   | Title of the Book  | Publisher              | Year of Publication |
|------|---|--|------------------------|---------------------|
| 1    | Venkateswaran. V,<br>Veeraswamy. R and<br>Kulandaivelu. A.R | Basic principles of<br>Practical chemistry, 1 <sup>st</sup><br>Edition | Sultan Chand &<br>Sons | 1997                |

## Reference

| S.No | Author(s)   | Title of the Book  | Publisher              | Year of Publication |
|------|-------------|--|------------------------|---------------------|
| 1    | Thomas. A.O | Practical Chemistry for B.Sc., Main Students,. 3 <sup>rd</sup> Edition | Scientific Book Centre | 1985                |

## Mapping with Programme Outcomes

| CO \ PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|----------|------|------|------|------|------|
| CO1      | H    | S    | S    | H    | S    |
| CO2      | H    | H    | H    | S    | H    |
| CO3      | S    | S    | S    | M    | H    |
| CO4      | S    | H    | H    | H    | H    |

trong; H-High; M-Medium; L-Low

| Compiled by<br>Name with Signature | Verified by<br>HOD Name with Signature | CDC            | COE               |
|------------------------------------|--|----------------|-------------------|
| Dr.M.Amutha                        | Dr.A.Ayyasamy                          | Dr.M.Durairaju | Dr.R.Muthukumaran |

|                        |           |   |                 |           |
|------------------------|-----------|---|-----------------|-----------|
| <b>Programme code:</b> |           | <b>Programme Title :</b>                |                 |           |
| <b>Course Code:</b>    | 19 UCY5S1 | <b>Title</b>                            | <b>Batch :</b>  | 2019-2022 |
|                        |           | <b>Network and Information Security</b> | <b>Semester</b> | V         |
| <b>Hrs/Week:</b>       | 1         |   | <b>Credits:</b> | 2         |

### Course Objective

- To impart knowledge of Network security, Wi-Fi security, hackers, secure networking and password managers.

### Course Outcomes (CO)

|    |     |   |
|----|-----|---|
| K1 | CO1 | To remember the basic concepts of network                 |
| K2 | CO2 | To understand the network hacking techniques              |
| K3 | CO3 | To deploy information and network security                |
| K4 | CO4 | To interpret the common threats today in computer network |

## Syllabus

| Unit              | Content   | Hrs |
|-------------------|---|-----|
| Unit I            | Basics of Network – Network Media – Various Operating Systems – Basics of Firewalls on all Platforms including Windows, MacOS and Linux.  | 3   |
| Unit II           | Security Vulnerabilities across an entire network – Network Hacking techniques and Vulnerability scanning.  | 3   |
| Unit III          | Configure and architect a small network for physical and wireless security – Firewalls configuration on Windows platform and Linux platform. Network privacy issues   | 2   |
| Unit IV           | Network monitoring to discover and identify potential hackers and malware using tools like WIRESHARK and SYSLOG. Online tracking by hackers   | 2   |
| Unit V            | Best methods of authentication including passwords, multifactor authentication including soft tokens and hard tokens. Best password managers to use – how passwords are cracked – how to mitigate the password attacks. | 3   |
| Total Contact Hrs |   | 13  |

Google classroom

## Reference:

Course Materials will be made online through NGM Open source learning platforms

### Mapping

| CO \ PSO   | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|------------|------|------|------|------|------|
| <b>CO1</b> | M    | M    | M    | H    | S    |
| <b>CO2</b> | H    | M    | H    | H    | H    |
| <b>CO3</b> | M    | H    | M    | M    | M    |
| <b>CO4</b> | M    | H    | H    | H    | H    |

trong; H-High; M-Medium; L-Low

| Course Designed by<br>Name and Signature | Verified by HOD<br>Name and Signature | Checked by<br>CDC | Approved by<br>COE |
|--|---------------------------------------|-------------------|--------------------|
| Ms.R.Sudha                               | Dr.A.Ayyasamy                         | Dr.M.Durairaju    | Dr.R.Muthukumaran  |

|                        |           |   |                 |           |
|------------------------|-----------|---|-----------------|-----------|
| <b>Programme code:</b> |           | <b>Programme Title :</b>                |                 |           |
| <b>Course Code:</b>    | 19 UCY5S2 | <b>Title</b>                            | <b>Batch :</b>  | 2019-2022 |
|                        |           | <b>Cyber security – Ethical Hacking</b> | <b>Semester</b> | V         |
| <b>Hrs/Week:</b>       | 1         |   | <b>Credits:</b> | 2         |

### Course Objective

- To understand the basics of cyber security and how ethical hacking is done on Cyber space and how to secure and protect them like security experts

### Course Outcomes (CO)

|    |     |   |
|----|-----|---|
| K1 | CO1 | To remember the basic concepts of cyber security  |
| K2 | CO2 | To understand the knowledge about ethical hacking |
| K3 | CO3 | To deploy the use of hacking tools                |
| K4 | CO4 | To analyze the details about internet connection  |

## Syllabus

| Unit                     | Content  | Hrs       |
|--------------------------|--|-----------|
| <b>Unit I</b>            | To Understand how websites work, how to discover and exploit web application vulnerabilities and to gain full control over websites. Secure systems from all the known attacks. Secret tracking and hacking infrastructure.  | <b>3</b>  |
| <b>Unit II</b>           | Ethical hacking in Cyber space - its fields and the different types of hackers. Hack & secure both Wi-Fi & wired networks  | <b>3</b>  |
| <b>Unit III</b>          | Discover vulnerabilities & exploitation of hacking in cyber network servers. How secure systems are hacked using client-side and social engineering attacks. Use of hacking tools such as Metasploit, Aircrack-ng, SQLmap.....etc.   | <b>2</b>  |
| <b>Unit IV</b>           | Network basics & how devices interact inside a network - Network Penetration. Control connections of clients in network by password cracking. Fake Wi-Fi network creation with internet connection and spy on clients. To Gather detailed information about clients and networks like their OS, opened ports ...etc. | <b>2</b>  |
| <b>Unit V</b>            | Explore the threat landscape - Darknets, dark markets, zero day vulnerabilities, exploit kits, malware, phishing and much more. Master defenses against phishing, SMShing, vishing, identity theft, scam, cons and other social engineering threats.   | <b>3</b>  |
| <b>Total Contact Hrs</b> |  | <b>13</b> |

Google classroom

### Reference:

Course Materials will be made online through NGM Open source learning platforms

### Mapping

| CO \ PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|----------|------|------|------|------|------|
| CO1      | M    | S    | M    | H    | S    |
| CO2      | H    | M    | H    | M    | H    |
| CO3      | M    | H    | M    | M    | M    |
| CO4      | M    | M    | H    | H    | H    |

trong; H-High; M-Medium; L-Low

| Course Designed by<br>Name and Signature | Verified by HOD<br>Name and Signature | Checked by<br>CDC | Approved by<br>COE |
|--|---------------------------------------|-------------------|--------------------|
| Ms.R.Sudha                               | Dr.A.Ayyasamy                         | Dr.M.Durairaju    | Dr.R.Muthukumaran  |



|                        |          |  |                 |           |
|------------------------|----------|--|-----------------|-----------|
| <b>Programme code:</b> | B.Sc.    | <b>Programme Title :</b>                       | CHEMISTRY       |           |
| <b>Course Code:</b>    | 19UCY611 | <b>Title</b>                                   | <b>Batch :</b>  | 2019-2022 |
|                        |          | <b>Core Paper – IX</b>                         | <b>Semester</b> | VI        |
| <b>Hrs/Week:</b>       | 4        | <b>Physical Methods and Chemical Structure</b> | <b>Credits:</b> | 5         |

### Course Objective

To make the students to

- acquire knowledge on basic concepts in spectroscopy
- gain basic knowledge in various spectroscopic techniques like rotational, vibrational, Raman, UV-visible, NMR and EPR
- understand the electrical and magnetic properties of molecules

### Course Outcome

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

| <b>Knowledge Level</b> | <b>CO Number</b> | <b>CO Statement</b>   |
|------------------------|------------------|---|
| K1, K2                 | CO1              | recollect and understand the basic theoretical concepts in various types of spectroscopy          |
| K4                     | CO2              | interpret the structure of the unknown molecules from the given spectra                           |
| K4                     | CO3              | evaluate various parameters like bond length, vibrational frequency from spectroscopic techniques |
| K3                     | CO4              | apply electrical and magnetic properties in solving the structures of the molecules               |

## Syllabus

| Unit       | Content  | Hrs       |
|------------|--|-----------|
| <b>I</b>   | <p><b>Molecular Spectroscopy:</b></p> <p>Basic concepts of molecular spectroscopy, types of changes induced by the interaction of electromagnetic radiation with matter, regions of Electromagnetic spectrum.</p> <p><b>Microwave Spectroscopy:</b> Theory, Rigid and non-rigid rotor models, patterns of spectral lines, Determination of bond length and accurate mass of atom.</p> <p><b>IR spectroscopy:</b> Theory, Molecular vibrations, vibrational degrees of freedom, Harmonic and anharmonic oscillator models. Force constant, Vibrational frequency, factors affecting carbonyl stretching frequency (inductive and mesomeric effects) and hydrogen bonding. Overtones, combination bands, Fermi resonance and fingerprint region.</p> | <b>10</b> |
| <b>II</b>  | <p><b>Raman spectroscopy:</b></p> <p>Origin of Raman lines - stokes and anti-stokes lines. Characteristics of Raman lines, Mechanism of Raman effect, Differences between Raman and Infrared spectra.</p> <p><b>UV and Visible Spectroscopy:</b></p> <p>Theory, types of electronic transitions, chromophore, auxochrome, intensity shifts, absorption bands and intensity.</p> <p>Franck – Condon principle, pre-dissociation spectra, Birge-Spoooner method of evaluation of dissociation energy from electronic spectra. Woodward Fischer rule for calculation for absorption maxima in dienes.</p>   | <b>11</b> |
| <b>III</b> | <p><b>NMR Spectroscopy:</b> Theory and principles, chemical shift, factors affecting chemical Shift, Anisotropy and inductive effect, reference (TMS) and solvents used. Splitting of signals, spin-spin coupling, coupling constant (elementary ideas). Application of NMR in the study of simple molecules (Ethanol, Ethyl bromide, Benzene, Toluene, Xylene and Mesitylene).</p> <p><b>ESR:</b> Theory, 'g' factor, derivative curves. Hyperfine splitting, line width. Applications of <math>\bullet\text{CH}_3</math> and <math>\text{Mn}^{2+}</math> ion.</p>  | <b>10</b> |

|           |   |           |
|-----------|---|-----------|
| <b>IV</b> | <b>Solid State Chemistry:</b><br>Unit Cell, crystal systems, Bravais Lattice, Law of rational indices, Miller indices.<br>Geometrical requirement in close packed structures. Packing in ionic crystals. Simple cubic (SC), body centered cubic (BCC) and hexagonal close packed (HCP) structures, crystal structures of NaCl, ZnS, diamond and graphite.<br>Defects in crystals: Point defects, Schottky defects, Frenkel defects, metal excess defects and metal deficiency defects.<br>The radius-ratio rule. X-ray examination of crystals by Debye-Scherrer method.  | <b>11</b> |
| <b>V</b>  | <b>Electrical properties of Molecules:</b><br><i>Polar and non-polar molecules, Dipolemoment, Meaning of the terms – total molar polarisation, orientation polarisation and distortion polarisation. Effect of temperature on Molar polarization. Determination of dipolemoment of polar gas, Application of dipolemoment in the study of simple molecules.</i><br><b>Magnetic properties of molecules:</b><br>Meaning of the terms – magnetic susceptibility, magnetic permeability and magnetic moment. Diamagnetism, Paramagnetism and Ferromagnetism. Curie-Weiss Law. Determination of magnetic susceptibility of paramagnetic substance using Guoy balance. Application of magnetic properties in identifying the geometry of simple and complex molecules. | <b>10</b> |
|           | <b>Total hours/Semester</b>   | <b>52</b> |

**\*Italics denotes self study topics**

### **Teaching Methods**

Lecture by chalk & talk, power point presentations, group discussions, seminar, quiz, assignment, experience Discussion, brain storming, in-house lab Activity, Models.

### Text Books

| S.No. | Author(s)                      | Title of the Book                          | Publisher                                   | Year of Publication |
|-------|--------------------------------|--|---|---------------------|
| 1.    | Puri, Sharma and Pathania      | Principles of Physical Chemistry           | Millennium Edition, Vishal Publishing House | 2007                |
| 2.    | Sharma. Y.R.                   | Elementary Organic Absorption Spectroscopy | Sultan Chand & Sons                         | 2007                |
| 3.    | Gurdeep Chatwal & Sham K.Anand | Instrumental Methods of Analysis           | Himalaya Publishing House                   | 2005                |

### Reference Books

| S.No. | Author(s)    | Title of the Book                     | Publisher                 | Year of Publication |
|-------|--------------|---------------------------------------|---------------------------|---------------------|
| 1.    | Soni. P.L.   | Text book of Organic Chemistry        | Sultan Chand & Sons       | 2002                |
| 2.    | William kemp | Organic Spectroscopy                  | ELBS edition              | 1985                |
| 3.    | Manas Chanda | Atomic Structure and Chemical bonding | Tata Mc Graw Hill Company | 1988                |

### Mapping with Programme Outcomes

| CO \ PSO   | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|------------|------|------|------|------|------|
| <b>CO1</b> | S    | S    | S    | S    | S    |
| <b>CO2</b> | H    | S    | H    | S    | H    |
| <b>CO3</b> | S    | S    | S    | S    | S    |
| <b>CO4</b> | S    | H    | S    | S    | H    |

S-Strong; H-High; M-Medium; L-Low

| Compiled by<br>Name with Signature | Verified by<br>HOD Name with<br>Signature | CDC             | COE               |
|------------------------------------|---|-----------------|-------------------|
| Dr.Indumathy Ramasamy              | Dr.A. Ayyasamy                            | Dr.M. Durairaju | Dr.R.Muthukumaran |

|                        |          |                             |                 |           |
|------------------------|----------|-----------------------------|-----------------|-----------|
| <b>Programme code:</b> | B.Sc.    | <b>Programme Title :</b>    | CHEMISTRY       |           |
| <b>Course Code:</b>    | 19UCY612 | <b>Title</b>                | <b>Batch :</b>  | 2019-2022 |
|                        |          | <b>Core Paper – X</b>       | <b>Semester</b> | VI        |
| <b>Hrs/Week:</b>       | 4        | <b>Organic chemistry-II</b> | <b>Credits:</b> | 4         |

### Course Objective

To develop the skill to aesthetically appreciate Organic chemistry

### Course Outcome

| <b>Knowledge Level</b> | <b>CO Number</b> | <b>CO Statement</b>  |
|------------------------|------------------|--|
| K1                     | CO1              | To develop the knowledge in solving the problems in organic chemistry                                    |
| K2                     | CO2              | To understand the structure and properties of proteins,DNA,vitamins and lipids                           |
| K3                     | CO3              | To create awareness regarding chemotherapy   |
| K4                     | CO4              | To help the students to opt their career as biotechnologists, pharamacologists or medical representative |

## Syllabus

| Unit       | Content   | Hrs       |
|------------|---|-----------|
| <b>I</b>   | <p>i) Solving problems of structures of organic compounds based on reactions of the following: Aldehydes, Ketones, Amines, Nitro-compounds, Phenols and Acids.</p> <p>ii) Polynuclear hydrocarbons: Condensed systems – Naphthalene, Anthracene and phenanthrene-Preparation, properties and uses. Structural elucidation of Naphthalene and Anthracene.</p>  | <b>11</b> |
| <b>II</b>  | <p>Amino acids: Classification, Glycine and Alanine: Properties and synthesis by the following methods: Amination of <math>\alpha</math> - halo acids, Gabriel's phthalimide synthesis and Strecker synthesis. Synthesis of polypeptides by carbobenzoxy method.(Bergmann method)</p> <p>ii) Proteins: Classification, primary and secondary structures of proteins, denaturation and biological functions of proteins.</p>                 | <b>10</b> |
| <b>III</b> | <p>Nucleic Acids: Carbohydrates present in nucleic acids. Nitrogen bases present in nucleic acids. Nucleosides and Nucleotides with examples. Functions of nucleotides. Nucleotide as energy carriers. Structure, replication and functions of DNA.</p> <p>ii) Lipids: Classification according to Bloor. Sources, extraction. Properties and analysis of oils and fats.</p>  | <b>11</b> |
| <b>IV</b>  | <p>Vitamins: Definition and classification as fat and water soluble vitamins, occurrence, deficiency diseases. Synthesis of the following: Vitamin A1(retinol), Vitamin B1, Pyridoxine and Ascorbic acid</p>  | <b>10</b> |
| <b>V</b>   | <p>Chemotherapy: Introduction, Definition and classification of drugs.</p> <p>i) Sulphadugs: Structure and uses of sulphanilamide, sulphapyridine, sulphadiazine, sulphaacetamide, sulphathiazole and sulpha guanidine. Mode of action.</p> <p><i>ii) Antimalarials: Classification, structure and uses of chloroquine and pamaquine.</i></p> <p><i>iii) Antiseptics: Definition, structure and uses of chloramine-T and Iodoform .</i></p> | <b>10</b> |

|  |  |           |
|--|--|-----------|
|  | iv) Anaesthetics: characteristics, structure and uses of Procaine and Pentothal sodium.<br>v) Antibiotics: Introduction, structure and uses of Penicillin and Tetracycline.<br><b>(Note: Structural elucidation of drugs not required)</b> |           |
|  | <b>Total contact Hrs/Semester</b>  | <b>52</b> |

**\*Italics denotes self study topics**

### Teaching Methods

Lecture by Chalk&Talk, Power point Presentations, Group discussions, Seminar, Quiz, Assignment.

### Text Book

| S.No | Author(s)               | Title of the Book   | Publisher                      | Year of Publication |
|------|-------------------------|---|--------------------------------|---------------------|
| 1    | Soni.P.L. and Chawla    | Text Book of Organic Chemistry                            | Sultan Chand & Sons, New Delhi | 1992                |
| 2    | Gurdeep R. Chatwal      | Organic Chemistry of Natural Products, Volume II. Edition | Himalaya Publishing House      | 2006                |
| 3    | Bahl. B.S and Arun Bhal | Advanced Organic Chemistry, 1 <sup>st</sup> Edition       | Advanced Organic Chemistry     | 2007                |



## Reference

| S.No | Author(s) | Title of the Book               | Publisher | Year of Publication |
|------|-----------|---------------------------------|-----------|---------------------|
| 1    | Finar I.L | Organic Chemistry.,<br>Volume I | Longmans  | 2006                |

## Mapping with Programme Outcomes

| CO \ PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|----------|------|------|------|------|------|
| CO1      | S    | S    | S    | H    | S    |
| CO2      | H    | S    | H    | S    | S    |
| CO3      | H    | S    | S    | S    | H    |
| CO4      | S    | H    | H    | M    | H    |

S-Strong; H-High; M-Medium; L-Low

| Compiled by<br>Name with Signature | Verified by<br>HOD Name with<br>Signature | CDC            | COE               |
|------------------------------------|---|----------------|-------------------|
| Dr.A.Ayyasamy                      | Dr.A.Ayyasamy                             | Dr.M.Durairaju | Dr.R.Muthukumaran |

|                        |          |   |                 |           |
|------------------------|----------|---|-----------------|-----------|
| <b>Programme code:</b> | B.Sc.    | <b>Programme Title :</b>                    | CHEMISTRY       |           |
| <b>Course Code:</b>    | 19UCY613 | <b>Title</b>                                | <b>Batch :</b>  | 2019-2022 |
|                        |          | <b>Core Paper – XI</b>                      | <b>Semester</b> | VI        |
| <b>Hrs/Week:</b>       | 4        | <b>Chemical kinetics and Photochemistry</b> | <b>Credits:</b> | 5         |

### Course Objective

To develop the skill to aesthetically appreciate Chemical Kinetics and Photochemistry

### Course Outcome

| <b>Knowledge Level</b> | <b>CO Number</b> | <b>CO Statement</b>  |
|------------------------|------------------|--|
| K1                     | CO1              | To understand the concept of rate of reaction                            |
| K2                     | CO2              | To derive rate equations of various orders                               |
| K3                     | CO3              | To understand the effect and consequence of radiation on molecular level |
| K4                     | CO4              | To get basic knowledge in adsorption theories                            |

## Syllabus

| Unit       | Content   | Hrs       |
|------------|---|-----------|
| <b>I</b>   | The concept of Reaction Rate, Rate law and Rate equation. Factors influencing rates of chemical reactions. Order and Molecularity of a reaction. Setting and solving simple differential equations for first order, Second order and Zero order reactions. Pseudounimolecular reactions. Half-life time of a reaction – Expressions for $t_{1/2}$ - for first, second and $n^{\text{th}}$ order reactions. Experimental techniques for measuring reaction kinetics – Volumetry and Polarimetry.   | <b>11</b> |
| <b>II</b>  | Methods of determining order of a reaction – Differential rate expressions, Integral rate expressions and Half-life method. Equilibrium approximation and Steady state approximation. Effect of Temperature on reaction rates – Temperature co-efficient, The Arrhenius equation – Derivation, activation energy and its determination.<br>Theories of reaction rates: Lindemann theory of Unimolecular reactions, Collision theory and Absolute reaction rate theory. Comparison of ARRT with Collision theory.                              | <b>11</b> |
| <b>III</b> | Catalysis: General characteristics of Catalytic reactions. Types of catalysis – Theories of Homogeneous and Heterogeneous catalysis- Kinetics of acid – base catalysed reactions.<br>Enzyme catalysis: Kinetics of enzyme-catalysed reactions – Michaelis- Menten equation. Effect of Temperature and pH on enzyme catalysis.<br>Adsorption: Chemisorption and physisorption, Adsorption of gases by solids. Factors affecting adsorption – Types of adsorption isotherms – Freundlich adsorption isotherm and Langmuir adsorption isotherms. | <b>10</b> |
|            | <b>Photochemistry:</b> Consequence of light absorption – The Jablonski diagram, Laws of Photochemistry - Lambert and Lambert-Beer's laws, Grothus–Draper law, The Stark–Einstein law of photochemical equivalence, Quantum efficiency and its determination. The photochemical rate law: Kinetics of $\text{H}_2$ - $\text{Cl}_2$ reaction, Kinetics of $\text{H}_2$ – $\text{Br}_2$ reaction, Comparison of thermal and  |           |

|           |   |           |
|-----------|---|-----------|
| <b>IV</b> | photochemical reactions. Photosensitization and Quenching, Chemiluminescence. Lasers and their uses (Elementary idea only).   | <b>10</b> |
| <b>V</b>  | <b><i>Colloids: Classification, preparation and application of colloids</i></b><br>Properties of colloids:<br><b><i>Optical and kinetic properties: Tyndall effect and Brownian movement</i></b><br>Electrical properties: Charge on colloidal particle, Electrical double layer and Zetapotential.<br>Electrokinetic properties: Electroosmosis and Electrophoresis.<br>Emulsions: Preparation, Properties and Applications.<br>Gels: Properties and Applications. | <b>10</b> |
|           | <b>Total contact Hrs/Semester</b>   | <b>52</b> |

**\*Italics denotes self study topics**

### Teaching Methods

Power point Presentations, Group discussions, Seminar, Quiz, Assignment.

### Text Books

| <b>S.No</b> | <b>Author(s)</b>                              | <b>Title of the Book</b>                             | <b>Publisher</b>                        | <b>Year of Publication</b> |
|-------------|---|--|---|----------------------------|
| 1           | Puri. B.R., Sharma. L.R. and Madan S.Pathania | Principles of Physical Chemistry, Millennium Edition | Vishal Publishing House                 | 2007                       |
| 2           | Gurdeep Raj                                   | Chemical Kinetics, 6 <sup>th</sup> Revised Edition   | Goel publishing house                   | 1997                       |
| 3           | Jain and Jain                                 | Engineering Chemistry, 5 <sup>th</sup> Edition       | Dhanpat Rai Publishing Company (P) Ltd. | 2005                       |

## References

| S.No | Author(s)                             | Title of the Book   | Publisher                          | Year of Publication |
|------|---------------------------------------|---|------------------------------------|---------------------|
| 1    | Samuel H.Maroon and<br>Carl F.Prutton | Principles of<br>Physical Chemistry,<br>Millennium Edition      | Amerind publishing<br>Co. Pvt.Ltd. | 1972                |
| 2    | Negi. A.S. and<br>Anand.S.C           | A Text book of<br>Physical<br>chemistry,4 <sup>th</sup> Edition | New Age<br>International (P) Ltd   | 1995                |
| 3    | Chakrabarty. D.K                      | An introduction to<br>Physical Chemistry                        | Narosa Publishing<br>House         | 1996                |

## Mapping with Programme Outcomes

| CO \ PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|----------|------|------|------|------|------|
| CO1      | H    | S    | S    | H    | S    |
| CO2      | H    | S    | H    | S    | H    |
| CO3      | S    | S    | S    | S    | S    |
| CO4      | S    | H    | H    | S    | H    |

S-Strong; H-High; M-Medium; L-Low

| Compiled by<br>Name with<br>Signature | Verified by<br>HOD Name with<br>Signature | CDC            | COE               |
|---------------------------------------|---|----------------|-------------------|
| Dr.M.Amutha                           | Dr.A.Ayyasamy                             | Dr.M.Durairaju | Dr.R.Muthukumaran |

|                        |          |                           |                 |           |
|------------------------|----------|---------------------------|-----------------|-----------|
| <b>Programme code:</b> | B.Sc.    | <b>Programme Title :</b>  | CHEMISTRY       |           |
| <b>Course Code:</b>    | 19UCY6E3 | <b>Title</b>              | <b>Batch :</b>  | 2019-2022 |
|                        |          | <b>Core Elective – II</b> | <b>Semester</b> | V I       |
| <b>Hrs/Week:</b>       | 4        | <b>Polymer Chemistry</b>  | <b>Credits:</b> | 5         |

### Course Objective

- (i) To highlight the commercially important polymers and their various forms
- ii) To understand various industrial polymerization processes

### Course Outcome

| <b>Knowledge Level</b> | <b>CO Number</b> | <b>CO Statement</b>  |
|------------------------|------------------|--|
| K1                     | CO1              | To recognize the principles of polymer recycling and can select appropriate recycle or reuse methods to balance economics and environmental responsibility |
| K2                     | CO2              | To describe the mechanisms of chain polymerizations, and can predict reaction rates  |
| K3                     | CO3              | To identify the repeat units of particular polymers and specify the isomeric structures which can exist for those repeat units                             |
| K4                     | CO4              | To estimate the number- and weight-average molecular masses of polymer samples given the degree of polymerisation and mass fraction of chains present      |

## Syllabus

| Unit       | Content  | Hrs       |
|------------|--|-----------|
| <b>I</b>   | <p>Biodegradable Polymers: Preparation, Properties and application of Poly Lactic Acid. Basic Concepts: Monomers, Polymers, Polymerization, Degree of polymerization. Classification of polymers: Plastics: Definition – Thermoplastic, Thermosetting plastics and Reinforced Plastic.</p> <p>Elastomers: Definition – Natural &amp; synthetic rubber – smoked rubber Reclaimed rubber – Foam rubber – Spongy rubber – Laminate rubber.</p> <p>Adhesives: Definition – thermosetting – thermoresins.</p> <p>Fibres: Definition – Natural and synthetic. Classification: comfort – safety – Industrial fibres.</p> <p>Thermal stabilisers- Antioxidants-photostabilisers.</p> <p>Polymerization Techniques: Bulk, Solution, Suspension and Emulsion Polymerization.</p> | <b>11</b> |
| <b>II</b>  | <p>Types of polymerization reactions: Addition Polymerization and Condensation polymerization.</p> <p>Types of Initiators. Inhibitors. Chain transfer agents.</p> <p>Addition Polymerization – Free radical Mechanism</p> <p>Ionic Polymerisation: Anionic and Cationic Polymerizations.</p> <p>Step growth of polymerisation (Condensation polymerisation)</p> <p>Co-Polymerisation: Random - Alternating – Block and Graft co polymers.</p>  | <b>10</b> |
| <b>III</b> | <p>Stereo Regular Polymers: Isotactic, syndiotactic &amp; Atactic. Geometrical isomers. Factors influencing Structural regularity.</p> <p>Ziegler – Natta Catalysts – Bi metallic and Mono metallic mechanisms.</p> <p>Glass transition temperature (T<sub>g</sub>) and T<sub>m</sub>. Determination of T<sub>g</sub> by differential scanning calorimeter. Factors affecting T<sub>g</sub>, T<sub>g</sub> of copolymers.</p> <p>Degradation - Types of degradation - Thermal, Photo, High energy radiation and Oxidative method.</p>  | <b>11</b> |

|           |  |           |
|-----------|--|-----------|
| <b>IV</b> | Molecular weights of polymers: Number-Average, Weight-Average, Sedimentation-Average & Viscosity-Average molecular weights. Molecular weight distribution – GPC method .Determination of Average molecular weight: Ebulliometry method, Cryoscopy method, osmometry method, Light Scattering method and Viscosity method   | <b>10</b> |
| <b>V</b>  | Polymer processing techniques: Calendaring, film casting, compression moulding, injection moulding, blow moulding, extrusion moulding foaming and filament winding technique<br>Preparation and uses of the following polymers:<br><i>Polyethylene (LDPE &amp; HDPE), P.V.C, Teflon, polystyrene, Nylon-6, Nylon-66, Polyester, Phenol formaldehyde resins and Polycarbonates.</i> | <b>10</b> |
|           | <b>Total hours/Semester</b>  | <b>52</b> |

**\*Italics denotes self study topics**

### Teaching Methods

Power point Presentations, Group discussions, Seminar, Quiz, Assignment.

### Text Books

| <b>S.No</b> | <b>Author(s)</b>  | <b>Title of the Book</b>                        | <b>Publisher</b>                                    | <b>Year of Publication</b> |
|-------------|---|---|---|----------------------------|
| 1           | Gowariker.V.R.<br>Viswanathan. N.V,<br>Jeyadev Sreedhar | Polymer Science,<br>13th reprint                | New Age<br>International (P)<br>Limited, Publishers | 1999                       |
| 2           | Fred.W.Billmeyer, Jr                                    | Text Book of<br>Polymer Science,<br>2nd edition | Wiley –Interscience<br>and Sons.Inc                 | 2011                       |
| 3           | Madan.R.L., and<br>Tuli.G.D.                            | Physical chemistry, I<br>edition                | S.Chand and<br>Company Ltd                          | 1999                       |



## References

| S.No | Author(s)                              | Title of the Book   | Publisher                                  | Year of Publication |
|------|--|---|--|---------------------|
| 1    | Misra. G.S.                            | Polymer Chemistry,<br>2nd Reprint   | New age International(P)<br>Ltd            | 1989                |
| 2    | Charles<br>G.Geberlein,<br>Brown. Wm.C | Chemistry and Our<br>World  | Publishers(Singapore),<br>ISBN 069716574-4 | 1997                |
| 3    | M.Gopala Rao<br>and Marshall<br>Sitig  | Drydens Outlines of<br>Chemical Technology<br>for the 21 st Century,<br>3 <sup>rd</sup> Edition | East-West Press                            | 1997                |

## Mapping with Programme Outcomes

| CO \ PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|----------|------|------|------|------|------|
| CO1      | H    | S    | S    | H    | S    |
| CO2      | H    | S    | H    | S    | H    |
| CO3      | S    | S    | S    | H    | S    |
| CO4      | S    | H    | H    | S    | H    |

trong; H-High; M-Medium; L-Low

| Compiled by<br>Name with Signature | Verified by<br>HOD Name with<br>Signature | CDC            | COE               |
|------------------------------------|---|----------------|-------------------|
| Dr.M.Selladurai                    | Dr.A.Ayyasamy                             | Dr.M.Durairaju | Dr.R.Muthukumaran |

|                        |          |                                |                 |           |
|------------------------|----------|--------------------------------|-----------------|-----------|
| <b>Programme code:</b> | B.Sc.    | <b>Programme Title :</b>       | CHEMISTRY       |           |
| <b>Course Code:</b>    | 19UCY614 | <b>Title</b>                   | <b>Batch :</b>  | 2019-2022 |
|                        |          | <b>Core Elective Paper-III</b> | <b>Semester</b> | VI        |
| <b>Hrs/Week:</b>       | 6        | <b>Project</b>                 | <b>Credits:</b> | 5         |

### Course Objective

To enable the students to

- acquire knowledge about the qualitative analysis of potable water
- gain awareness about research
- create research aptitude

### Course Outcome

| <b>Knowledge Level</b> | <b>CO Number</b> | <b>CO Statement</b>  |
|------------------------|------------------|--|
| K4                     | CO1              | To understand the importance of analyzing the quality of potable water   |
| K4, K3                 | CO2              | To analyse, compare and interpret the results of water quality in all the locations  |
| K4, K5                 | CO3              | To decide and interpret the precautionary measures to be taken to save and improve the quality of water in different locations |

## Syllabus

| Unit | Content  | Hrs       |
|------|--|-----------|
|      | To test the quality of potable water in and around Pollachi taluk and assign the geochemical type of water available. To create awareness among the people about the quality of drinking water presently used by them and to take necessary precautionary measures to save and improve the quality of water in their area. |           |
|      | <b>Total Hrs/semester</b>  | <b>78</b> |

## Teaching Methods

Field work, lab analysis, Power point presentations, Group discussions, Seminar, Lab activity, Quiz, Assignment, Experience Discussions, Demonstration,

## Text Book

| S.No. | Author(s)      | Title of the Book                                 | Publisher             | Year of Publication |
|-------|----------------|---|-----------------------|---------------------|
| 1.    | Satinder Ahuja | Monitoring water quality, 1 <sup>st</sup> edition | Elsevier Publications | 2013                |

## Reference Book

| S.No. | Author(s) | Title of the Book  | Publisher          | Year of Publication |
|-------|-----------|--|--------------------|---------------------|
| 1.    |           | Standard Methods for the Examination of Water and Wastewater, 22 <sup>nd</sup> edition | APHA, AWWA and WEF | 2012                |

### Mapping with Programme Outcomes

| CO \ PSO   | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|------------|------|------|------|------|------|
| <b>CO1</b> | S    | S    | S    | S    | H    |
| <b>CO2</b> | H    | S    | H    | S    | S    |
| <b>CO3</b> | S    | S    | S    | H    | S    |

S-Strong; H-High; M-Medium; L-Low

| <b>Compiled by<br/>Name with Signature</b> | <b>Verified by<br/>HOD Name with<br/>Signature</b> | <b>CDC</b>      | <b>COE</b>        |
|--|--|-----------------|-------------------|
| Dr.A. Ayyasamy                             | Dr.A. Ayyasamy                                     | Dr.M. Durairaju | Dr.R.Muthukumaran |

|                        |          |  |                 |           |
|------------------------|----------|--|-----------------|-----------|
| <b>Programme code:</b> | B.Sc.    | <b>Programme Title :</b>                           | CHEMISTRY       |           |
| <b>Course Code:</b>    | 19UCY615 | <b>Title</b>                                       | <b>Batch :</b>  | 2019-2022 |
|                        |          | <b>Core Practical – III</b>                        | <b>Semester</b> | VI        |
| <b>Hrs/Week:</b>       | 6        | <b>Gravimetric analysis and physical chemistry</b> | <b>Credits:</b> | 5         |

### Course Objective

To develop analytical skills in gravimetric analysis and Physical Chemistry

### Course Outcome

| <b>Knowledge Level</b> | <b>CO Number</b> | <b>CO Statement</b>   |
|------------------------|------------------|---|
| K1                     | CO1              | To understand the basic concept of gravimetric analysis                                   |
| K2                     | CO2              | To get the idea about Physical chemistry experiments                                      |
| K3                     | CO3              | To enable the students to acquire analytical skills (qualitative and quantitative skills) |
| K4                     | CO4              | To develop practical skills in analytical and Physical chemistry experiments              |

## Syllabus

| Unit | Content  | Hrs |
|------|--|-----|
|      | <p><b>I: Gravimetric Estimations:</b></p> <ol style="list-style-type: none"> <li>1. Lead as Lead Chromate</li> <li>2. Barium as Barium Chromate</li> <li>3. Barium as Barium Sulphate</li> <li>4. Calcium as Calcium oxalate</li> <li>5. Lead as Lead sulphate</li> <li>6. Magnesium as Magnesium oxinate</li> <li>7. Nickel as dimethyl glyoxime complex</li> </ol> <p><b>(any Four )</b></p> <p><b>II: Physical Chemistry:</b></p> <ol style="list-style-type: none"> <li>1. <b>Heterogeneous Equilibria:</b> <ol style="list-style-type: none"> <li>i) Determination of transition temperature (thermometric method) <ol style="list-style-type: none"> <li>a) Sodium acetate</li> <li>b) Sodium thiosulphate</li> <li>c) Strontium chloride</li> <li>d) Sodium bromide</li> </ol> </li> <li>ii) Eutectic systems : <ol style="list-style-type: none"> <li>a) Naphthalene and diphenyl</li> <li>b) Naphthalene and diphenylamine</li> <li>c) Naphthalene and benzophenone</li> <li>d) Naphthalene and p-nitrotoluene</li> </ol> </li> <li>iii) Critical solution temperature: <ol style="list-style-type: none"> <li>a) Phenol – Water system.</li> <li>b) Effect of NaCl on C.S.T. (between 1 to 2.0%)</li> <li>c) Effect of Succinic acid on C.S.T. (between 1 to 2.0%)</li> </ol> </li> <li>iv) Molecular weight: <p>Rast's method</p> <p>Solvents – Naphthalene and diphenyl.</p> </li> </ol> </li> <li>2. <b>Kinetics:</b> <ol style="list-style-type: none"> <li>a) Acid catalysed hydrolysis of methyl acetate</li> <li>b) Potassium persulphate oxidation.</li> </ol> </li> </ol> |     |

|  |   |           |
|--|---|-----------|
|  | <b>3. Conductivity Experiments:</b><br>a) Cell constant<br>b) Verification of Debye – Huckel Onsager Equation.<br>c) Conductometric Acid – Base titrations (HCl x NaOH).<br><br><b>4. Potentiometric Titrations</b><br>a) Acid – Base titration (HCl x NaOH).<br>b) Redox titrations (FeSO <sub>4</sub> x K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> ) |           |
|  | <b>Total Hrs/semester</b>   | <b>78</b> |

### Teaching Methods

Demonstration, Seminar, discussions, Assignment

### Text Book

| S.No | Author(s)  | Title of the Book                          | Publisher              | Year of Publication |
|------|--|--|------------------------|---------------------|
| 1    | Venkateswaran. V.,<br>Veeraswamy. R.and<br>Kulandaivelu. A.R | Basic principles of<br>Practical chemistry | Sultan Chand &<br>Sons | 1997                |

### Reference

| S.No | Author(s)    | Title of the Book                                  | Publisher                 | Year of Publication |
|------|--------------|--|---------------------------|---------------------|
| 1    | Thomas. A.O. | Practical Chemistry<br>for B.Sc., Main<br>Students | Scientific Book<br>Centre | 1985                |

### Mapping with Programme Outcomes

| CO \ PSO   | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|------------|------|------|------|------|------|
| <b>CO1</b> | H    | S    | S    | H    | S    |
| <b>CO2</b> | H    | S    | S    | S    | H    |
| <b>CO3</b> | S    | S    | S    | H    | S    |
| <b>CO4</b> | S    | H    | S    | H    | S    |

S-Strong; H-High; M-Medium; L-Low

| <b>Compiled by</b><br><b>Name with Signature</b> | <b>Verified by</b><br><b>HOD Name with Signature</b> | <b>CDC</b>     | <b>COE</b>        |
|--|--|----------------|-------------------|
| Dr.Indumathy<br>Ramasamy                         | Dr.A.Ayyasamy  | Dr.M.Durairaju | Dr.R.Muthukumaran |



|                        |          |                                 |                 |           |
|------------------------|----------|---------------------------------|-----------------|-----------|
| <b>Programme code:</b> | B.Sc.    | <b>Programme Title :</b>        | CHEMISTRY       |           |
| <b>Course Code:</b>    | 19UCY6S3 | <b>Title</b>                    | <b>Batch :</b>  | 2019-2022 |
|                        |          | <b>Skill Based Elective –II</b> | <b>Semester</b> | VI        |
| <b>Hrs/Week:</b>       | 1        | <b>Green Chemistry</b>          | <b>Credits:</b> | 2         |

### Course Objective

To develop the skill to aesthetically appreciate Green Chemistry.

### Course Outcome

| <b>Knowledge Level</b> | <b>CO Number</b> | <b>CO Statement</b>  |
|------------------------|------------------|--|
| K1                     | CO1              | To recollect the principles of green chemistry   |
| K2                     | CO2              | To understand the awareness on environment friendly technologies and working conditions                      |
| K3                     | CO3              | To apply eco-friendly and less wasteful manufacturing process for the sustainable development of our country |
| K4                     | CO4              | To acquire awareness about research in the field of green chemistry  |

## Syllabus

| Unit | Content  | Hrs       |
|------|--|-----------|
| I    | The need for green chemistry: Sustainability and cleaner production. Green chemistry and Eco- efficiency. Environmental Protection Laws. Challenges ahead for a chemist. Green chemistry education.  | 3         |
| II   | <i>Twelve Principles of Green Chemistry- Explanation with examples. Awards for Green Chemistry.</i>  | 2         |
| III  | Water as greener solvent.<br>An alternative approach to solvent chemistry: Solvent free reactions. Solvent free microwave assisted organic synthesis.<br>Ionic Liquids: Prospects and retrospects  | 3         |
| IV   | Super critical fluid extraction: Supercritical fluids. Advantages and applications of super fluid extraction technology.<br>Carbon dioxide as a super critical fluid: Advantages and industrial applications.                                    | 2         |
| V    | Green Techniques:<br>Use of Bio- catalysis, Transition metal catalysts, Supported metal catalysts for green synthesis. Solventless synthesis. Oxidation technology for waste water treatment. Agrochemicals from nature. Chitin – Green polymer. | 3         |
|      | <b>Total contact Hrs/Semester</b>  | <b>13</b> |

**\*Italics denotes self study topics**

## Teaching Methods

Lecture by Chalk & Talk, Power point Presentations, Group discussions, Seminar, Quiz, Assignment.

**Text Book**

| <b>S.No</b> | <b>Author(s)</b>                  | <b>Title of the Book</b>  | <b>Publisher</b>                    | <b>Year of Publication</b> |
|-------------|-----------------------------------|---|-------------------------------------|----------------------------|
| 1           | Rashmi Sanghi and M.M. Srivastava | Green Chemistry, (Environment Friendly Alternatives), First Edition | Narosa Publishing House, New Delhi. | 2007                       |

**References**

| <b>S.No</b> | <b>Author(s)</b> | <b>Title of the Book</b>  | <b>Publisher</b>                    | <b>Year of Publication</b> |
|-------------|------------------|---|-------------------------------------|----------------------------|
| 1           | V.K. Ahluwalia   | Green Chemistry, (Environmentally Benign Reaction), First Edition | Ane Books Pvt.Ltd., New Delhi       | 2006                       |
| 2           | Samuel Delvin    | Green Chemistry, First Edition                                    | IVY Publishing House, New Delhi.    | 2006                       |
| 3           | Asim K. Das      | Environmental Chemistry with Green Chemistry, First edition       | Books and Allied (P) Ltd., Kolkata. | 2010                       |

### Mapping with Programme Outcomes

| CO \ PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|----------|------|------|------|------|------|
| CO1      | H    | S    | H    | H    | S    |
| CO2      | H    | S    | H    | S    | H    |
| CO3      | S    | H    | M    | S    | H    |
| CO4      | S    | H    | H    | S    | H    |

S-Strong; H-High; M-Medium; L-Low

| Compiled by<br>Name with Signature | Verified by<br>HOD Name with<br>Signature | CDC            | COE               |
|------------------------------------|---|----------------|-------------------|
| Ms.R.Sudha                         | Dr.A.Ayyasamy                             | Dr.M.Durairaju | Dr.R.Muthukumaran |

|                        |          |  |                 |           |
|------------------------|----------|--|-----------------|-----------|
| <b>Programme code:</b> | B.Sc.    | <b>Programme Title :</b>                 | CHEMISTRY       |           |
| <b>Course Code:</b>    | 19UCY6S4 | <b>Title</b>                             | <b>Batch :</b>  | 2019-2022 |
|                        |          | <b>Skill Based Elective-II</b>           | <b>Semester</b> | VI        |
| <b>Hrs/Week:</b>       | 1        | <b>Theory behind practical chemistry</b> | <b>Credits:</b> | 2         |

### Course Objective

To develop the theoretical knowledge in practical chemistry

### Course Outcome

| <b>Knowledge Level</b> | <b>CO Number</b> | <b>CO Statement</b>  |
|------------------------|------------------|--|
| K1                     | CO1              | To remember the basic chemical principles in analysis                    |
| K2                     | CO2              | To understand the theoretical concepts pertaining to practical chemistry |
| K3                     | CO3              | To develop reasoning ability in practical chemistry                      |
| K4                     | CO4              | To ensure  |

## Syllabus

| Unit | Content  | Hrs       |
|------|--|-----------|
| I    | <p>The students get their hands on training in Inorganic Qualitative Analysis using Semi-Micro Techniques during their first year programme. In the second year, the students are trained in volumetric Estimations and Organic qualitative analysis. During their final year programme, the students are skilled in performing estimations using Gravimetric analysis and Physical Chemistry experiments. Therefore, the students have been trained well in both qualitative and quantitative chemical analysis.</p> <p>This course aims to bring out the students understanding and reasoning ability, and application of their practical knowledge gained during their programme.</p> |           |
|      | <b>Total contact Hrs/Semester</b>  | <b>13</b> |

**\*Italics denotes self study topics**

## Teaching Methods

Online MCQ , online test

## Text Book

| S.No | Author(s)  | Title of the Book                          | Publisher           | Year of Publication |
|------|--|--|---------------------|---------------------|
| 1    | Venkateswaran. V.,<br>Veeraswamy. R.and<br>Kulandaivelu. A.R | Basic principles of<br>Practical chemistry | Sultan Chand & Sons | 1997                |

## References

| S.No. | Author(s)    | Title of the Book                                  | Publisher              | Year of Publication |
|-------|--------------|--|------------------------|---------------------|
| 1     | Thomas. A.O. | Practical Chemistry<br>for B.Sc., Main<br>Students | Scientific Book Centre | 1985                |

### Mapping with Programme Outcomes

| CO \ PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|----------|------|------|------|------|------|
| CO1      | H    | S    | S    | H    | S    |
| CO2      | H    | S    | H    | S    | H    |
| CO3      | M    | S    | S    | H    | S    |
| CO4      | S    | H    | H    | S    | H    |

S-Strong; H-High; M-Medium; L-Low

| Compiled by<br>Name with Signature | Verified by<br>HOD Name with<br>Signature | CDC            | COE               |
|------------------------------------|---|----------------|-------------------|
| Ms.R.Sudha                         | Dr.A.Ayyasamy                             | Dr.M.Durairaju | Dr.R.Muthukumaran |

**DEPARTMENT OF CHEMISTRY****B.Sc., PHYSICS/B.Sc., BOTANY/ B.Sc., ZOOLOGY DEGREE COURSES****III AND IV SEMESTERS****SCHEME OF EXAMINATIONS**

| SEM. | SUBJECT<br>CODE                     | TITLE   | HRS/<br>EXAM | HRS/<br>WEEK | MAXIMUM<br>MARKS |     | TOTAL<br>MARKS | CREDITS |
|------|-------------------------------------|---|--------------|--------------|------------------|-----|----------------|---------|
|      |                                     |   |              |              | INT              | EXT |                |         |
| III  | 19UPS3A3/<br>19UBY3A4/<br>19UZY3A4  | ALLIED CHEMISTRY<br>PAPER – I<br>INORGANIC, ORGANIC<br>AND PHYSICAL<br>CHEMISTRY  | 3            | 6            | 25               | 75  | 100            | 4       |
| IV   | 19UPS4A4/<br>19UBY4A5/<br>19UZY4A5  | ALLIED CHEMISTRY<br>PAPER – II<br>INORGANIC, ORGANIC<br>AND PHYSICAL<br>CHEMISTRY | 3            | 6            | 25               | 75  | 100            | 4       |
| IV   | 19UPS 4A5/<br>19UBY4A6/<br>19UZY4A6 | ANCILLARY<br>CHEMISTRY<br>PRACTICAL   | 3            | 2            | 40               | 60  | 100            | 2       |



|                        |                       |   |                 |           |
|------------------------|-----------------------|---|-----------------|-----------|
| <b>Programme code:</b> | B.Sc.                 | <b>Programme Title :</b>  | CHEMISTRY       |           |
| <b>Course Code:</b>    | 19UPS3A3/             | <b>Title</b>  | <b>Batch :</b>  | 2019-2022 |
|                        | 19UBY3A4/<br>19UZY3A4 | <b>Allied Chemistry Paper – I<br/>Inorganic, organic and physical<br/>chemistry</b> | <b>Semester</b> | III       |
| <b>Hrs/Week:</b>       | 6                     |   | <b>Credits:</b> | 4         |

### Course Objective

To develop the skill to aesthetically appreciate General Chemistry

### Course Outcome

| <b>Knowledge Level</b> | <b>CO Number</b> | <b>CO Statement</b>   |
|------------------------|------------------|---|
| K1                     | CO1              | To understand the principles of coordination chemistry and applications to biologically important molecules |
| K2                     | CO2              | To gain knowledge on industrially important materials and water treatment                                   |
| K3                     | CO3              | To understand the principles of volumetric analysis   |
| K4                     | CO4              | To know the basic principles of electro chemistry   |

## Syllabus

| Unit       | Content   | Hrs       |
|------------|---|-----------|
| <b>I</b>   | <p>Chemical bonding: Molecular orbital theory - bonding, anti-bonding and non-bonding orbitals, Application of Molecular orbital theory – MO configuration and bond order of <math>H_2</math>, <math>N_2</math>, <math>O_2</math>, <math>F_2</math>.</p> <p>Coordination Chemistry: Ligands–Mono and bidentate ligands; Coordination number. Nomenclature – Mononuclear complexes. Werner &amp; Sidgwick Theories; Chelation and its industrial importance with reference to EDTA. Biological role of Haemoglobin and Chlorophyll. Applications in qualitative and quantitative analyses.</p> | <b>16</b> |
| <b>II</b>  | <p>Volumetric Analysis: Primary and Secondary standards. Principles of volumetric analysis. Preparation of normal, molal and molar solutions. Principle of acid - base titrations.</p> <p>Water treatment: Hardness of water. Temporary and permanent hardness. Units of hardness. Disadvantages of hard water. Softening of hard water – Zeolite process and De-mineralization process – Purification of water for domestic use – Disinfection by Chlorine, Ozone and UV light.</p>  | <b>16</b> |
| <b>III</b> | <p>Organic compounds: Classification-Covalent bond, Orbital overlap, hybridization, geometry of organic molecules – <math>CH_4</math>, <math>C_2H_4</math>, <math>C_2H_2</math>, <math>C_6H_6</math>. Inductive, Electrometric, Mesomeric, Hyperconjugative and Steric effects. Effect in properties of compounds.</p> <p>Aromatic compounds: Electrophilic substitution in benzene. Mechanism of nitration, halogenation, alkylation, acylation and sulphonation.</p>  | <b>15</b> |
| <b>IV</b>  | <p>Chemotherapy : Introduction, Sulphadrugs : Mode of action.</p> <p>Antimalarials : Classification and use of chloroquine and Pamaquine.</p> <p>Antiseptics : Definition and uses of chloramines – T, Iodoform and Dettol.</p> <p>Anaesthetics : Classification, characteristics and uses of procaine and pentothal sodium.</p> <p>Antibiotics : Introduction, use of Penicillin, Chloromycetin, Streptomycin and Tetracyclin.</p>   | <b>16</b> |

|          |   |           |
|----------|---|-----------|
|          | <p>Vitamins : Classifications, occurrence and deficiency diseases caused by Vitamin A, B complex, C, D, E and K.</p> <p><b>(Note : Structure of the compounds is not required.)</b></p>   |           |
| <b>V</b> | <p>Electrochemistry: Electronic and electrolytic conductors – Faraday’s laws of electrolysis – Arrhenius theory of electrolytic dissociation – Ostwald’s dilution law.</p> <p>Conductance: Specific and molar conductance, Variation of conductance with dilution. Determination of molar conductance of an electrolyte, Kohlrausch law and its applications.</p> <p><i>pH: Definition, Buffer solutions, Importance of buffer in the living systems.</i></p> <p><i>Corrosion and its prevention.</i></p> | <b>15</b> |
|          | <b>Total contact Hrs/Semester</b>   | <b>78</b> |

**\*Italics denotes self study topics**

### Teaching Methods

Lecture by Chalk & Talk, Power point Presentations, Group discussions, Seminar, Quiz, Assignment.

### Text Books

| S.No | Author(s)   | Title of the Book                            | Publisher                 | Year of Publication |
|------|---|--|---------------------------|---------------------|
| 1    | Yadav, M.S  | Electrochemistry, 2 <sup>nd</sup> Edition    | Anmol Publications        | 2001                |
| 2    | Veeraiyan., V. and Vasudevan, A.N.S.                | Ancillary chemistry, 1 <sup>st</sup> Edition | Einstein publishing house | 2001                |
| 3    | Vaidyanathan, K., Venkateswaran, A. and Ramasamy, R | Allied chemistry, 1 <sup>st</sup> Edition    | Priya publications.       | 2005                |

## References

| S.No | Author(s)                  | Title of the Book                               | Publisher                              | Year of Publication |
|------|----------------------------|---|--|---------------------|
| 1    | Puri, Sharma and Pathania  | Principles of Physical Chemistry                | Vishal Publishing House                | 2007                |
| 2    | Jain, P.C. and Monica Jain | Engineering Chemistry, 17 <sup>th</sup> Edition | Dhanpat Rai Publishing Company(P) Ltd. | 2005                |

## Mapping with Programme Outcomes

| CO \ PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|----------|------|------|------|------|------|
| CO1      | H    | S    | S    | H    | S    |
| CO2      | H    | S    | H    | S    | H    |
| CO3      | H    | S    | S    | M    | S    |
| CO4      | S    | H    | H    | S    | H    |

S-Strong; H-High; M-Medium; L-Low

| Compiled by<br>Name with Signature                 | Verified by<br>HOD Name with Signature | CDC            | COE               |
|--|--|----------------|-------------------|
| Dr.M.Selladurai<br>Ms.R.Sudha<br>Ms.C.Umamaheswari | Dr.A.Ayyasamy                          | Dr.M.Durairaju | Dr.R.Muthukumaran |

|                        |                                    |  |                 |           |
|------------------------|------------------------------------|--|-----------------|-----------|
| <b>Programme Code:</b> | B.Sc.                              | <b>Programme Title :</b>   | CHEMISTRY       |           |
| <b>Course Code:</b>    | 19UPS4A4/<br>19UBY4A5/<br>19UZY4A5 | <b>Title</b>   | <b>Batch :</b>  | 2019-2022 |
|                        |                                    | <b>Allied Chemistry Paper – II<br/>Inorganic, Organic and<br/>Physical Chemistry</b> | <b>Semester</b> | IV        |
| <b>Hrs/Week:</b>       | 6                                  |  | <b>Credits:</b> | 4         |

### Course Objective

To develop the skill to aesthetically appreciate General Chemistry

### Course Outcome

| <b>Knowledge Level</b> | <b>CO Number</b> | <b>CO Statement</b>   |
|------------------------|------------------|---|
| K1                     | CO1              | To have a basic ideas on synthetic dyes                         |
| K2                     | CO2              | To understand the chemistry of biologically important molecules |
| K3                     | CO3              | To know the common drugs and their use                          |
| K4                     | CO4              | To have a basic idea in polymers & Fuels                        |

## Syllabus

| Unit       | Content   | Hrs       |
|------------|---|-----------|
| <b>I</b>   | <p>Fuels: Types of fuels. Characteristics of a good fuel. Calorific value of a fuel. Advantages of gaseous fuels. Natural gas, water gas, producer gas, oil gas, <b>LPG and Gobar gas – Composition and uses (manufacturing details not needed)</b></p> <p>Fertilizers: Manufacture of urea, ammonium sulphate, super phosphate of lime, Triple super phosphate and potassium nitrate.</p> <p>Silicones: Preparation, properties and uses.</p> <p>Glass: Manufacture, types of glass – soft glass, hard glass, flint glass, Pyrex glass and Coloured glass.</p>   | <b>16</b> |
| <b>II</b>  | <p>Synthetic Dyes :</p> <p>Definition, classification based on structure and application. Colour and constitution – Chromophore – Auxochrome Theory. Synthesis and uses of the following dyes: Azo dyes – methyl orange Vat dyes – Indigo (from anthranillic acid) Anthraquinone dyes (Alizarin) Phthalein dyes – Phenolphthalein.</p> <p>Synthetic Polymers :</p> <p>Classification – Homo and copolymers – Natural, Synthetic, organic, Inorganic polymers. Thermo plastics and thermosetting plastics. Types of polymerization, PVC, polystyrene, Bakelite, Teflon, Nylon – 6.6, Buna – S rubber – Preparation and uses.</p> | <b>16</b> |
| <b>III</b> | <p>Amino acids and Protein Classification of amino acids. Preparation and properties of Glycine. Action of heat on amino acids. Peptides. Synthesis of glycylalanine by carbobenzoxy method.</p> <p>Proteins: Classification, simple and conjugated proteins. Denaturation and colour reactions of proteins. Primary and secondary structure. Biological functions.</p>   | <b>16</b> |
|            | Carbohydrates: Classification – preparation and properties of Glucose and Fructose. Elucidation of structure of Glucose. Comparison of properties of  |           |

|           |  |           |
|-----------|--|-----------|
| <b>IV</b> | glucose and fructose. Conversion of Glucose to Fructose and Fructose to Glucose.<br>Sucrose: Preparation, properties and structure (Elucidation of structure not necessary) Starch and Cellulose : Properties and uses (Elucidation of structure not necessary). | <b>15</b> |
| <b>V</b>  | Colloidal solution: Types of colloids. Preparation and properties of colloids and applications.<br>Emulsions and gels: Preparation, properties and applications.<br>Catalysis: Characteristics, types, mechanism of catalytic action and Industrial application  | <b>15</b> |
|           | <b>Total contact Hrs/Semester</b>  | <b>78</b> |

**\*Italics denotes self study topics**

### **Teaching Methods**

Lecture by chalk & Talk, Power point Presentations, Group discussions, Seminar, Quiz, Assignment.

### **Text Books**

| <b>S.No</b> | <b>Author(s)</b>  | <b>Title of the Book</b>                              | <b>Publisher</b>             | <b>Year of Publication</b> |
|-------------|---|---|------------------------------|----------------------------|
| 1           | Vaidyanathan, K.,<br>Venkateswaran, A.<br>and Ramasamy, R | Allied chemistry, 1 <sup>st</sup><br>Edition          | Priya publications,<br>Karur | 2005                       |
| 2           | Bahl, B.S. and Arun<br>Bhal                               | Advanced Organic<br>Chemistry 1 <sup>st</sup> Edition | S.Chand &<br>Company Ltd.    | 2007                       |

## References

| S.No | Author(s)                 | Title of the Book  | Publisher                               | Year of Publication |
|------|---------------------------|--|---|---------------------|
| 1    | Tyagi, O.D.,<br>Yadav, M. | A Text Book of Synthetic Dyes,<br>1 <sup>st</sup> Edition            | Anmol publications<br>Pvt. Ltd.         | 2001                |
| 2    | Soni, P.L.                | Text book of Organic<br>Chemistry, 28 <sup>th</sup> Revised Edition  | Sultan Chand &<br>Sons                  | 2002                |
| 3    | Lubs, H.A.                | Chemistry of Synthetic Dyes<br>and Pigments, 1 <sup>st</sup> Edition | Robert E. Krieger<br>publishing company | 1995                |

## Mapping with Programme Outcomes

| <div> <div>PSO</div> <div>CO</div> </div> | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|------|------|------|------|------|
| CO1                                       | H    | S    | S    | H    | S    |
| CO2                                       | H    | S    | H    | S    | H    |
| CO3                                       | M    | S    | S    | S    | H    |
| CO4                                       | S    | H    | H    | S    | H    |

S-Strong; H-High; M-Medium; L-Low

| Compiled by  | Verified by             |                |                   |
|--|-------------------------|----------------|-------------------|
| Name with Signature                                | HOD Name with Signature | CDC            | COE               |
| Dr.M.Selladurai<br>Ms.R.Sudha<br>Ms.C.Umamaheswari | Dr.A.Ayyasamy           | Dr.M.Durairaju | Dr.R.Muthukumaran |



|                        |                       |                                      |                 |           |
|------------------------|-----------------------|--------------------------------------|-----------------|-----------|
| <b>Programme code:</b> | B.Sc.                 | <b>Programme Title :</b>             | CHEMISTRY       |           |
| <b>Course Code:</b>    | 19UPS 4A5/            | <b>Title</b>                         | <b>Batch :</b>  | 2019-2022 |
|                        | 19UBY4A6/<br>19UZY4A6 | <b>Ancillary Chemistry Practical</b> | <b>Semester</b> | III & IV  |
|                        |                       |                                      | <b>Credits:</b> | 2         |

### Course Objective

To develop analytical skills in volumetric and organic qualitative analysis

### Course Outcome

| <b>Knowledge Level</b> | <b>CO Number</b> | <b>CO Statement</b>   |
|------------------------|------------------|---|
| K1                     | CO1              | To understand the basic concept of volumetric analysis                              |
| K2                     | CO2              | To get the idea about organic qualitative analysis                                  |
| K3                     | CO3              | To distinguish between aliphatic and aromatic, saturated and unsaturated compounds. |
| K4                     | CO4              | To analyze the functional groups of organic compounds                               |

## Syllabus

| Unit | Contents   | Hours     |
|------|--|-----------|
|      | <p><b>Volumetric Analysis:</b></p> <ol style="list-style-type: none"> <li>1. Estimation of sodium carbonate.</li> <li>2. Estimation of oxalic acid (Acidimetry)</li> <li>3. Estimation of ferrous ion.</li> <li>4. Estimation of oxalic acid.(Permanganometry)</li> <li>5. Estimation of potassium dichromate using sodium thiosulphate</li> <li>6. Estimation of temporary, permanent and total hardness of water</li> <li>7. Estimation of Zinc using EDTA.</li> <li>8. Estimation of Mg using EDTA.</li> </ol> <p><b>Organic analysis:</b><br/>Detection of elements. Nitrogen, Sulphur and Halogens.</p> <ol style="list-style-type: none"> <li>1. To distinguish between aliphatic and aromatic, saturated and unsaturated compounds.</li> <li>2. Functional group tests for :               <ol style="list-style-type: none"> <li>i) Mono and Dicarboxylic acids;</li> <li>ii) Phenols</li> <li>iii) Carbohydrates(Reducing and non reducing)</li> <li>iv) Aromatic primary amines and</li> <li>v) Amides.</li> </ol> </li> </ol> |           |
|      | <b>Total contact Hrs/Semester</b>  | <b>26</b> |

### Teaching Methods

Demonstration, Group discussions, Quiz, Experience discussion.

### Text Book

| S.No | Author(s)   | Title of the Book  | Publisher              | Year of Publication |
|------|---|--|------------------------|---------------------|
| 1    | Venkateswaran. V,<br>Veeraswamy. R and<br>Kulandaivelu. A.R | Basic principles of<br>Practical chemistry, 1 <sup>st</sup><br>Edition | Sultan Chand &<br>Sons | 1997                |

**Reference**

| <b>S.No</b> | <b>Author(s)</b> | <b>Title of the Book</b>   | <b>Publisher</b>       | <b>Year of Publication</b> |
|-------------|------------------|--|------------------------|----------------------------|
| 1           | Thomas. A.O      | Practical Chemistry for B.Sc., Main Students,. 3 <sup>rd</sup> Edition | Scientific Book Centre | 1985                       |

**Mapping with Programme Outcomes**

| <div> <div>PSO</div> <div>CO</div> </div> | <b>PSO1</b> | <b>PSO2</b> | <b>PSO3</b> | <b>PSO4</b> | <b>PSO5</b> |
|---|-------------|-------------|-------------|-------------|-------------|
| <b>CO1</b>                                | H           | S           | S           | H           | S           |
| <b>CO2</b>                                | H           | S           | H           | S           | H           |
| <b>CO3</b>                                | S           | S           | S           | H           | H           |
| <b>CO4</b>                                | H           | S           | H           | S           | H           |

S-Strong; H-High; M-Medium; L-Low

| <b>Compiled by</b>                                 | <b>Verified by</b>             |                |                   |
|--|--------------------------------|----------------|-------------------|
| <b>Name with Signature</b>                         | <b>HOD Name with Signature</b> | <b>CDC</b>     | <b>COE</b>        |
| Dr.M.Selladurai<br>Ms.R.Sudha<br>Ms.C.Umamaheswari | Dr.A.Ayyasamy                  | Dr.M.Durairaju | Dr.R.Muthukumaran |

**Question paper pattern for major and ancillary from the academic year 2017-2018 and onwards**

**Duration of Examination – 3 Hours**

**Section-A– 10 x 1 = 10 marks**

**Q.No 1-5- Multiple choice questions with four choices, one question from each unit**

**Q.No-6-10- Short answer- one question from each unit**

**Section-B- 5 x 5 = 25 marks**

**Q.No. 11-15 Either / (or) type (like 1.a (or) b)**

**Short answers - two questions from each unit**

**Section-C– 4 x 10 = 40 marks**

**Essay type**

**Q.No. 16-21 Four out of Six. Out of which the Q.No. 16 is compulsory.**