Fatima College (Autonomous) Madurai – 18

The Minutes of the Board of Studies
Department of Chemistry
(To be implemented from 2023 - 2024 onwards)
Convened on 3.4.2023 Convened at 2p.m.
Venue : R3

Members Present

| S.NO. | Name | Designation |
|---|---|---|
| 1. | Dr B. Medona, Head & Associate Professor, Dept of Chemistry 3/4/23. | Head of the Department |
| 2. | Dr. P. Suresh, Assistant Professor Department of Natural Products Chemistry School of Chemistry, Madurai Kamaraj University, Madurai 3/4/23 | University Nominee. |
| 3. | Dr. N. Manimaran, Associate Professor, Department of Chemistry, Bharathidhasan University, Trichy 3/4/23 | Subject Expert (Other than Parent University) |
| 4. | Dr. A. Mary Imelda Jayaseeli, Head & Associate Professor, Jayaraj Annapackiam College for Women, Periyakulam. 3/4/2023 | Subject Expert |

| | | |
|---|---|---|
| 5 | S. Manikandan, Senior Research Associate, Par Pharma, R&D Department. Chengalpattu. | Industrialist |
| 6 | Ms. B. Shobana, Research Scholar, Research Department, Thiagarajar College. S. Shobana (03/04/2023) | Alumna. |
| 7. | Dr. A. Rajeswari, Assistant Professor, Dept. of Chemistry, Fatima College | 3/4/2023 Dean of Academic Affairs. |

Staff Members

| | |
|---|---|
| Dr. S. Sukumari | S. Sukumari |
| Dr. B. Vinosha | B. Vinosha |
| Dr. B. Suganthana | B. Suganthana |
| Dr. J. Arulmary | Sr. Arulmary |
| Dr. V. Arul Deepa | V. Arul Deepa |
| Dr. M. Priyadharsani | M. Priyadharsani |
| Dr. K.R. Subimol | K.R. Subimol |
| Dr. J. Belinda Asha | J. Belinda Asha |
| Dr. J. Jone Celestina | For N. Vimala Sundari |

Minutes of the Board of Studies: UG

1. Presentation of the Action Taken Report

# Action Taken Report for 2022-2023

| S.No | Common Suggestions offered in the previous Board | Action Taken for the Academic year 2022-2023 |
|---|---|---|
| 1. | No need to have External Exam for Self Learning Courses | As per the suggestion Question Paper Setting is done Internally. |

## Change of Course Title

| S No | old Course Code | New Course Code | old Course Title | New Course Title | Need for Change |
|---|---|---|---|---|---|
| 1. | 19C4SB2 | 19C4SB2 | Natural and Synthetic Dyes | Dyes and Pigments | As per Recommendation of Course Teacher |
| 2. | 19C5CC16 | 19C5CC16 | Green Chemistry Practicals | Conventional and Green Synthesis | To include experiments of removed Lab course |

## New Courses Introduced

| S.No | Course Code | Course Title | Relevance to | | | | Scope for | | | Need for Introduction |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | R | N | G | EMP | ENTRE | SD | |
| 1 | 21N4SLC4 | Textile Colouration | | | N | | Emp | Entre | | To make learners Entrepreneurs. |

## Revised Courses

| S.No | Course code | Course Title | No. & Title of units Revised with Content | % of Revision | Need for Revision | Relevance to | | | | Scope for | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | L | R | N | G | Emp | ENTRE | SD |
| 1. | 19C4SB2 | Dyes & Pigments | Unit-IV Title can be changed as Pigments. | 20 | Course Teacher Recommendation | | | N | | Emp | | |
| 2 | 19C5CC16 | Conventional and Green Synthesis | 3 New Conventional Expts. were Included & Greener methods & Reagents were Increased. | 50 | To include removed Experiments | | | | G | Emp | | |

2. updation of Open Educational Resources — Nil.

3. Revision of Courses.

| S.No | Course Code | Course Title | No. & Title of units Revised with the Revised Content Specified if it is not the whole unit. | % of Revision | Need for Revision | Relevance to | | | | Scope for | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | L | R | N | G | Emp | ENTRE | SD |
| 1. | 19C4CC10 | Inorganic | Unit I - Inclusion of Structural | 10 | | | | | G | Emp | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Chemistry – III | Isomerism (Ionisation, linkage, ligand, hydrate & Co-ordinate Position Isomerism) & in Unit – III – Reaction Mechanism in 6 coordinate complexes – $S_N1$ & $S_N2$, Acid hydrolysis, Base Hydrolysis, SN'CB can be included. | | | | | | |
| 2 | 19C5ME1 Spectroscopy | Unit-I – Basic Problems. Unit-II & III – Problems involving Small molecule. Unit-V. Problems involving Simple fragmentation (150-200) with Nitrogen & Halogen functional Groups | 5 | | | | G | E M P S |
| 3 | 19C6CC17 Organic Chemistry – IV | Deletion of the following Unit I – Preparation & Properties of 1,2-, 1,4- & 2,6-Naphtha quinones, Naphthoic acids, 9,10-anthraquinone & Phenanthraquinone Unit-III. Stereochemistry of amino acids, Primary structure and denaturation of Proteins – Fribrous & Globular Proteins. Unit-IV – Structure and Synthesis of Camphor & Zingiberene & in Unit-V – Structure & Synthesis of Quinine | 20% | Since the Course is found to be too heavy for Students | | | G | E M P |
| 4 | 19C6ME3 Advanced Organic Chemistry | Unit-III – Contents in organic Photochemistry – Elaborated Unit-IV – In Contents, only Name of the Rearrangements can be specified Unit-V – Title can be changed as Reagents & Rearrangements can be deleted in Title & Contents | 15% | As per the suggestions Given by subject Experts & course Teachers | | | G | E P |

4. New Courses Introduced.

III UG (OBE)

| S.No | Course Code | Course Title | Relevance to | | | | Scope for | | | Need for Introduction |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | R | N | G | EMP | ENTRE | SD | |
| 1 | 23U6SL ZC | Herbal Cosmetics | | | N | | EMP | ENTRE | SD | To develope Entrepreneurial Skill of Learners [Beautician course] |

I UG (TANSCHE SYLLABUS)

CORE COURSES INTRODUCED (PART-III)

| S.No | Course Code | Course Title & Semester | Relevance To | | | | Scope for | | | Need for Introduction |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | R | N | G | EMP | EMP RE | SD | |
| 1 | CC1 | Inorganic Chemistry - I & I Semester | | | | G | EMP | | | |
| 2 | CC2 | Organic Chemistry - I & I Semester | | | | G | EMP | | | |
| 3 | CC3 | Volumetric Analysis - I & I Semester | | | | G | EMP | | SD | |
| 4 | CC4 | Inorganic Chemistry - II & II Semester | | | | G | EMP | | | |
| 5 | CC5 | Organic Chemistry - II & II Semester | | | | G | EMP | | | |
| 6 | CC6 | Volumetric Analysis - II & II Semester | | | | G | EMP | | SD | |

Elective courses Introduced (Part-III)

| S.NO | Generic/ Discipline specific & Semester | Course code | Course Title | Relevance to | | | | Scope for | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | R | N | G | EMP | ENTRE | SD |
| 1. | Generic & I Semester | EC1 | Basic concepts of Chemistry for Biological Sciences | | | N | | EMP | | |
| 2 | Generic & I Semester | EC2 | Organic Qualitative & Volumetric Analysis | | | N | | EMP | | SD |

Skill Enhancement/ Fourdation/ Ability Enhancement Course (Part-IV)

| S No | SEC/FC/AECC & Semester | Course Code | Course Title | Relevance to L | R | N | G | Scope for Emp | ENTRE | SD | Need for Introd. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | SEC(NME) & I Semester | SEC-1 | Profitable Home Industries | | | N | | Emp | ENTRE | | |
| 2. | FC & I Semester | FC | Concepts of Chemistry to Beginners | | | | G | Emp | | SD | |
| 3. | SEC(NME) & II Semester | SEC-2 | Profitable Home Industries | | | N | | Emp | ENTRE | | |
| 4 | SEC (Discipline specific) & II Semester | SEC-3 | Dyes & Pigments | | | N | | Emp | | | |

5. Introduction of Purely Skill Embedded Certificate/Diploma Advanced Diploma Value added Course other than that already offered : NIL
6. Approval of Ph.D Course work Syllabus : NIL
7. Rubrics for Internship/Project : NIL

*The Syllabus for all the above I UG courses are framed & passed in the Board

Other Suggestions

1. In FC, Problems can be included in contents, Teaching and Testing can be focused on Problem Solving method
2. The title Volumetric Analysis-I can be renamed as Green Volumetic Analysis.
3. for Organic chemistry I & II - Morrison R.T. & Boyd R.N - organic chemistry Book can be included as one of the Text Books

Commendations:

Our UG Syllabus is Good & too heavy

Minutes of the Board of Studies: PG

1. Presentation of the Action Taken Report for 2022-2023

| S.No | Common Suggestions offered in the Previous Board | Action taken for the Academic year 2022-23 |
|---|---|---|
| 1 | 19PG4C17 - Unit-I - Absorption, Emission, LASER, EMR Interaction and Einsteins Coefficient can be deleted | The given Suggestion is incorporated in 19PG4C17 |

Change of Course Title:

| S.No | Old Course Code | New Course Code | old course Title | New course Title | Need for change |
|---|---|---|---|---|---|
| 1 | 19PG1C5 | 19PG1C5 | Organic Qualitative Analysis | Organic Qualitative Analysis & Preparation - I | Recommendation of course Teacher & subject Experts |
| 2 | 19PG2C10 | 19PG2C10 | Organic Quantitative Analysis and Preparations | Organic Estimation & Preparation - II | Recommendation of Course Teachers & subject Experts |

New Courses Introduced

| S.No | Course Code | Course Title | Relevance To | | | | Scope for | | | Need for Introduction |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | R | N | G | EMP | ENTRE | SD | |
| 1 | 22PGC4 SLCP | Batteries and its applications | | | N | | EMP | Entre | | To increase Employability & Entrepreneurship |

Revised Courses

| S. NO | Course Code | Course Title | NO. & Title of units Revised with the Revised content | % of Revision | Need for Revision | Relevance to | | | | Scope for | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | L | R | N | G | EMP | ENTRE | SD |
| 1. | 19PG1C5 | Organic Qualitative Analysis & Preparation-I | Spectral Analysis of Compounds using IR and UV can be included | 10% | | | | N | | EMP | | SD |
| 2 | 19PG2C10 | Organic Estimation & Preparation-II | Inclusion of Estimation of Aniline & Phenol | | | | | | | | | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | instead of Glucose by Eynon & Lane Method, Spectral Analysis of Compounds using IR & UV can be included | 20% | | | | N | Emp | | | | |
| 3 | 19PG4 CI7 | Physical Chemistry -IV | Title of Units I, II & III changed as Rotational & Vibrational, Electronic & Resonance and Mossbauer Spectroscopy. In Unit-I-Inclusion of NMR Instrumentation Frequency & comparison with ESR frequency can be included. | 15% | | | | G | Emp | EN TRE | | | |
| 4 | 19PG4 CE4 | Analytical Chemistry | Title of unit I, II & V are changed as Error Analysis, Chromatography & Computers in Chemistry with minor changes in content and in unit-III - DTA can be Included. | 10% | | | | G | Emp | EN TRE | | | |

2. Updation of Open Educational Resources in the list of references of each courses : NIL
3. Revision of Courses : NIL (for II PG-OBE Syllabus)
4. New Courses Introduced : NIL (for II PG-OBE Syllabus)

I PG (TANSCHE SYLLABUS)

Core Courses Introduced (Part A)

| S. No. | Course code | Course Title & Semester | Relevance to L | R | N | G | Scope for Emp | EN TRE | SD | Need for Introduc |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. | PG-CC1 | Inorganic Chemistry -I & I Semester | | | | G | Emp | | | |
| 2 | PG-CC2 | Organic Chemistry-I & I Semester | | | | G | Emp | | | |
| 3. | PG-CC3 | Physical Chemistry-I & I Semester | | | | G | Emp | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | PG-CC4 | Inorganic chemistry-II & II Semester | | | | G | EMP | | | | |
| 5 | PG-CC5 | Organic Chemistry - II & II Semester | | | | G | EMP | | | | |
| 6 | PG-CC6 | Physical Chemistry - II & II Semester | | | | G | EMP | | | | |

Elective courses Introduced (Part-A)

| S.No | Generic/ Discipline Specific & Semester | Course Code | Course Title | Relevance to | | | | Scope for | | | Need for |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | R | N | G | EMP | ENTRE | SD | Introduction |
| 1. | Discipline Specific I Semester | PG-EC1 Lab | Inorganic Qualitative Analysis | | | | G | EMP | | SD | |
| 2. | Discipline Specific I Semester | PG-EC2 Lab | Organic chemistry Practical | | | | G | EMP | | SD | |
| 3 | Generic & II Semester | PG-EC3 | Analysis of Soil, Water, Food, Cosmetics and Fertilizer | | | N | | EMP | ENTRE | | |
| 4 | Discipline Specific & II Semester | PG-EC4 | Inorganic Quantitative Analysis | | | | G | EMP | | SD | |

Skill Enhancement/Ability Enhancement Course (Part-B)

| S.No | SEC/AEC & Semester | Course Code | Course Title | Relevance to | | | | Scope for | | | Need for Introduction |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | R | N | G | Emp | ENTRE | SD | |
| 1. | SEC - I Semester | PG-SEC-1 | Computational Chemistry | | | N | | Emp | | SD | |
| 2 | SEC - II Semester | PG-SEC-2 | Preparation of Consumer Products. | | | N | | Emp | ENTRE | | |

5. Introduction of Purely Skill-Embedded Certificate/Diploma, Advanced Diploma, value added course Other than that is already being offered : NIL

6. Approval of Ph.D. Course work Syllabus : NIL

7. Rubrics for Internship/Project : NIL

8. Details of Proposed/Signed MoU :

Signed MoU with Material Research Centre, Coimbatore on 20.04.2022 for Three years.

The Syllabus for all the above I year PG Courses are reviewed and passed in the Board. The front page for II year courses are framed and reviewed.

Other Suggestions

1. Jerry March. A. - Advanced organic Chemistry - Book can be removed from Reference for organic chemistry I & II Courses.
2. NPTEL Study Material can be included under references.

Commendations.

1. The syllabus for all the courses are very Good

3. Puri, Sharma & Pathania - Principles of Physical Chemistry Book can be included in PG-CC3

| | | | Signature |
|---|---|---|---|
| 1. | Head of the Department | Dr. B. Nedona | B. Tedone. |
| 2. | University Nominee. | Dr. P. Suresh | 3/04/23 |
| 3. | Subject Expert. | Dr. N. Manimaran | 3/4/23 |
| 4. | Subject Expert | Dr. A. Mary Imelda Jeyaseeli | 3/4/2023 |
| 5 | Industrialist. | S. Manikandan | |
| 6. | Alumna | Ms. B Shobana | 3/4/2023 |
| 7. | Dean of Academic affairs | Dr. A Rajeswari. | 3/4/2023 |
| 8. | Staff Members. | | |
| | Dr. S. Sukumari | | |
| | Dr. B. Vinosha | | |
| | Dr. B. Sugantham | | |
| | Dr. J. Arul Mary | | |
| | Dr. V. Arul Deepa | | |
| | Dr. M. Priyadharsani | | |
| | Dr. K. R. Subimol | | |
| | Dr. J. Berlinda Asha | | |
| | Dr. J. Jona Celestina | | For N. Vimala Sundari |

10%

**II B.Sc. Chemistry**

**SEMESTER –IV**

***For those who joined in 2019 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/WEEK | CREDITS |
|---|---|---|---|---|---|
| UACH | 19C4CC10 | Coordination Chemistry | Major Core | 5 | 4 |

**COURSE DESCRIPTION:** The Course enables the students to gainknowledge on the chemistry of coordination compounds, carbonyl compounds and "F' block elements.

**COURSE OBJECTIVES:** This course provides an extensive study of coordination complexes, including their spectral and magnetic properties and 'F' block elements

**UNITS**

**UNIT –I** Theories of Coordination – I **( 15HRS.)**

a). Introduction – classification of ligands, nomenclature, preparation of complexes and detection of complexes using solubility,colour change,conductance measurements and visible absorption studies. Basis for isomerism in complexes and different types of isomerism.

b). Werner's theory –merits & demerits.Sidgwick's electronic concept of effective atomic number and EAN rule as applied to carbonyls

**Self Study**:Chemical test for distinguishing *cis-trans* isomers.

**UNIT –II** Theories of Coordination – II **( 15HRS.)**

a).Valence bond theory – Introduction, Hybridisation,$sp^3$, $dsp^2$, $dsp^3$, $d^2sp^3$,

& $sp^3d^2$, merits & demerits.

b).Crystal Field theory – Introduction, crystal field splitting in octahedral, tetrahedral & square planar arrangement of ligands. Spectro chemical series, ligand field effect and colour, crystal field stabilization energy , factors affecting the magnitude of $\Delta_0$ and its application.Distortion of octahedral complexes and John-Teller theorem. Limitations of CFT.

c).M.O.Theory – M.O. Theory as applied to octahedral complexes, Pi- bonding and M.O. theory, Merits.

**Self Study:** Structure of Spinels

**UNIT –III** Mechanism in coordination complexes **(15 HRS.)**

a).Kinetics of complexes – stability – Kinetic and thermodynamic stability – Factors affecting stability and lability Stepwise and over all stability constants (determination not required)

**a)** Mechanism of hydrolysis reactions in octahedral complexes.

**b)** Mechanism of ligand substitution reaction in square planar complexes, Trans effect, trans effect in synthesis, Mechanism of trans effect.

**c)** Spectroscopic states: L-S coupling & J-J coupling schemes, derivation of spectroscopic states for free C-atom.

**Self Study:** Mechanism of trans effect.

**UNIT –IV** Organometallic Chemistry **( 15HRS.)**

Preparation and structure of metal carbonyls – $Ni(CO)_4$, $Fe(CO)_5$, $[V(CO)_6]$ & $Mn_2(CO)_{10}$. Metal nitrosyls – sodium nitroprusside and nitoso ferrous sulphate.Ferrocene (structure based on VBT).

**Self Study:** $Co_2(CO)_8$and $Fe_2(CO)_9$

**UNIT –V** :'F' Block Elements **(15 HRS.)**

a). The lanthanide series electronic configuration, Oxidation states, spectral and magnetic properties of $ce^{3+}$ and $yb^{3+}$ , causes and consequences of lanthanide contraction - separation of lanthanides by fractional crystallization, solvent extraction, precipitation, change in oxidation state and Ion exchange chromatography.

b). Actinides The actinide series and electronic configuration.Extraction of Uranium from pitchblende.

**Self Study:** Extraction of thorium from monazite

**REFERENCES:**


1. R.D.Madan, Wahid U.Malik&G.D.Tuli, -*Selected topics in Inorganic Chemistry* - S.Chand& Company LTD. 2010 - For Units I, II and III
2. B.R.Puri, L.R.Sharma& K.C. Kalia. *"Principles of Inorganic Chemistry"*Milestone Publishers, 2014, For Unit IV.
3. James E HuheeyInorganic Chemistry, II Edn.,.Published by Dorling Kindersley (India) Pvt.Ltd. 2009 - For Unit III - (d)


## COURSE CONTENTS & LECTURE SCHEDULE:

| Module No. | Topic | No. of Lectures | Teaching Pedagogy | Teaching Aids |
|---|---|---|---|---|
| **UNIT -1** | Theories of Coordination – I | **( 15HRS)** | | |
| 1.1 | Introduction | 1 | Chalk & Talk | Black Board |
| 1.2 | Classification of ligands | 2 | Chalk & Talk | Black Board |
| 1.3 | Nomenclature | 3 | Lecture | Black Board |
| 1.4 | Preparation of complexes | 1 | Lecture | Black Board |

| | | | | |
|---|---|---|---|---|
| 1.5 | Detection of complexes using solubility,colour change,conductance measurements and visible absorption studies | 2 | Lecture | Black Board |
| 1.6 | Basis for isomerism in complexes | 1 | Discussion | Black Board |
| 1.7 | Different types of isomerism. | 2 | Lecture | Black Board |
| 1.8 | Werner's theory –merits & demerits | 1 | Discussion | Black Board |
| 1.9 | EAN rule as applied to carbonyls | 2 | Problem solving | Black Board |
| **UNIT -2** | Theories of Coordination – II | **( 15HRS** | | |
| 2.1 | Valence bond theory – | 3 | Lecture | Black |

| **Module No.** | **Topic** | **No. of Lectures** | **Teaching Pedagogy** | **Teaching Aids** |
|---|---|---|---|---|
| | Introduction, Hybridisation,$sp^3$, $dsp^2$, $dsp^3$, $d^2sp^3$, & $sp^3d^2$, merits & demerits. | | | Board & Models |
| 2.2 | Crystal Field theory – Introduction, crystal field splitting in octahedral, tetrahedral & square planar arrangement of ligands. | 2 | Chalk & Talk | Black Board |
| 2.3 | Spectro chemical series, ligand field effect and colour &crystal field stabilization energy . | 3 | Problem solving | Black Board |
| 2.4 | Factors affecting the magnitude of $\Delta_0$ and its application | 2 | Chalk & Talk | Black Board |
| 2.4 | Tetrahedral Vs Octahed Complexes.Distortion of octahed complexes and John-Tell theorem.Limitations of CFT | 2 | Chalk & Talk | Black Board |

| | | | | |
|---|---|---|---|---|
| 2.5 | M.O.Theory – M.O. Theory as applied to octahedral complexes, | 2 | Chalk & Talk | Black Board |
| 2.6 | Pi- bonding and M.O. theo Merits. | 1 | Discussion | Black Board |
| **UNIT -3 MECHANISM IN COORDINATION COMPLEXES (15Hours)** | | | | |
| 3.1 | Kinetics of complexes – stability – Kinetic and thermodynamic stability | 2 | Chalk & Talk | Black Board |
| 3.2 | Factors affecting stability and lability | 2 | Chalk & Talk | Black Board |
| 3.3 | Stepwise and over all stability constants (determination not required) | 2 | Chalk & Talk | Black Board |

| Module No. | Topic | No. of Lectures | Teaching Pedagogy | Teaching Aids |
|---|---|---|---|---|
| 3.4 | Mechanism of hydrolysis reactio in octahedral complexes. | 2 | Chalk & Talk | Black Board |
| 3.5 | Mechanism of ligand substitut reaction in square plan complexes, Trans effect, trans effe in synthesis, Mechanism of tra effect. | 3 | Chalk & Talk | Power point |
| 3.6 | Spectroscopic states: L-S coupling & J-J coupling schemes. | 2 | Chalk & Talk | Black Board |
| 3.7 | Derivation of spectroscopicstates for free C-atom | 2 | Derivation | Black Board |
| **UNIT -4 ORGANOMETALLIC CHEMISTRY (15Hours)** | | | | |

| | | | | |
|---|---|---|---|---|
| 4.1 | Preparation of metal carbonyls | 2 | Chalk & Talk | Black Board |
| 4.2 | $Ni(CO)_4$, $Fe(CO)_5$, $[V(CO)_6]$, | 3 | Seminar | Black Board |
| 4.3 | $Mn_2(CO)_{10}$, $Co_2(CO)_8$and $Fe_2(CO)_9$. | 1 | Chalk & Talk | Black Board |
| 4.4 | EAN calculation | 2 | Chalk & Talk | Black Board |
| 4.5 | Metal nitrosyls – sodium nitroprusside and nitoso ferrous sulphate. | 3 | Chalk & Talk | Black Board |
| 4.6 | Ferrocene (structure based on VBT) | 4 | Chalk & Talk | Black Board |
| **UNIT-5 'F' BLOCK ELEMENTS (15Hours)** | | | | |

| Module No. | Topic | No. of Lectures | Teaching Pedagogy | Teaching Aids |
|---|---|---|---|---|
| 5.1 | The lanthanide series electronic configuration, Oxidation states, spectral and magnetic properties of $ce^{3+}$ and $yb^{3+}$ | 4 | Chalk & Talk | Black Board |
| 5.2 | Causes and consequences of lanthanide contraction | 1 | Chalk & Talk | Black Board |
| 5.3 | Separation of lanthanides by fractional crystallization, solvent extraction, precipitation, change in oxidation state and Ion exchange chromatography | 3 | Chalk & Talk | Black Board & Models |
| 5.4 | The actinide series and electronic configuration | 3 | Chalk & Talk | Black Board |
| 5.5 | Extraction of Uranium from pitchblende and thorium from monazite. | 5 | Chalk & Talk | Black Board |

| Levels | C1 | C2 | C3 | C4 | C5 | Total Scholastic Marks | Non Scholastic Marks C6 | CIA Total | % of Assessment |
|---|---|---|---|---|---|---|---|---|---|
| | T1<br>10 Mks. | T2<br>10 Mks. | Quiz<br>5 Mks. | Assignment<br>5 Mks | OBT/PPT<br>5 Mks | 35 Mks. | 5 Mks. | 40Mks. | |
| K1 | 2 | 2 | - | - | - | 4 | - | 4 | 10 % |
| K2 | 2 | 2 | 5 | - | - | 9 | - | 9 | 22.5 % |
| K3 | 3 | 3 | - | - | 5 | 11 | - | 11 | 27.5 % |
| K4 | 3 | 3 | - | 5 | - | 11 | - | 11 | 27.5 % |
| Non Scholastic | - | - | - | - | - | | 5 | 5 | 12.5 % |
| Total | 10 | 10 | 5 | 5 | 5 | 35 | 5 | 40 | 100 % |

| CIA | |
|---|---|
| Scholastic | 35 |
| Non Scholastic | 5 |
| | 40 |

- ✓ **All the course outcomes are to be assessed in the various CIA components.**
- ✓ **The levels of CIA Assessment based on Revised Bloom's Taxonomy for I UG are :**

**K1-** Remember, **K2-**Understand, **K3-**Apply, **K4-**Analyse

- ✓ **The I UG course teachers are requested to start conducting S1, W1, M1,in due intervals of time.**
- ✓

## EVALUATION PATTERN

| SCHOLASTIC | | | | NON - SCHOLASTIC | MARKS | | |
|---|---|---|---|---|---|---|---|
| C1 | C2 | C3 | C4 | C5 | CIA | ESE | Total |
| 5 | 10 | 15 | 5 | 5 | 40 | 60 | 100 |

**C1** – Average of Two Session Wise Tests

**C2** – Average of Two Monthly Tests

**C3** - Mid Sem Test

**C4** – Best of Two Weekly Tests

**C5** – Non - Scholastic

## COURSE OUTCOMES

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

| NO. | COURSE OUTCOMES | KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY) | PSOs ADDRESSED |
|---|---|---|---|
| CO 1 | Know the structure and bonding of important coordination compounds | K1, K2, K3 & K4 | PSO1& PSO2 |
| CO 2 | Apply the rules to calculate the magnetic properties of complexes and how magnetic moments canbe employed for the interpretation of their structure | K1, K2, K3 & K4 | PSO3 |
| CO 3 | Get an overview about the reaction mechanism of metal complexes | K1, K2, K3 & K4 | PSO5 |
| CO 4 | Import the skills to elucidate the | K1, K2, K3 & | PSO7 |

| | | | |
|---|---|---|---|
| | structure and mode of bonding in organometallic compounds | K4 | |
| CO 5 | Gain knowledge about the chemistry of Lanthanides and Actinides | K1, K2, K3 & K4 | PSO7 |

## Mapping of C0s with PSOs

| CO / PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6 | PSO 7 | PSO 8 | PSO 9 |
|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 1 |
| CO2 | 2 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 1 |
| CO3 | 2 | 1 | 1 | 1 | 3 | 1 | 1 | 1 | 1 |
| CO4 | 2 | 1 | 1 | 1 | 1 | 1 | 3 | 1 | 1 |
| CO5 | 2 | 1 | 1 | 1 | 1 | 1 | 3 | 1 | 1 |

### Mapping of C0s with POs

| CO / PSO | PO1 | PO2 | PO3 | PO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | 2 |
| CO2 | 3 | 3 | 2 | 2 |
| CO3 | 3 | 2 | 2 | 2 |
| CO4 | 3 | 2 | 2 | 2 |
| CO5 | 3 | 2 | 2 | 2 |

**Note**: ♦ Strongly Correlated – **3** ♦ Moderately Correlated – **2**
♦ Wakly Correlated -**1**

**COURSE DESIGNER:**

1. **Dr.A. Rajeswari**
2. **Ms. RM Nagalakshmi**

**Forwarded By**

**HOD'S Signature**

**II B.Sc. Chemistry**

**SEMESTER –IV**

***For those who joined in 2019 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/WEEK | CREDITS |
|---|---|---|---|---|---|
| UACH | 19C4CC10 | Coordination Chemistry | Major Core | 5 | 4 |

**COURSE DESCRIPTION:** The Course enables the students to gainknowledge on the chemistry of coordination compounds, carbonyl compounds and "F' block elements.

**COURSE OBJECTIVES:** This course provides an extensive study of coordination complexes, including their spectral and magnetic properties and 'F' block elements

**UNITS**

**UNIT –I** Theories of Coordination – I **( 15HRS.)**

Introduction – classification of ligands, nomenclature, preparation of complexes anddetection of complexes using solubility,colour change,conductance measurements and visible absorption studies. Basis for isomerism in complexes and different types of isomerism. Structural isomerism (Ionisation, linkage, ligand, hydrate and co-ordination position isomerism

c). Werner's theory –merits & demerits.Sidgwick's electronic concept of effective atomic number and EAN rule as applied to carbonyls

**Self Study**:Chemical test for distinguishing *cis-trans* isomers.

**UNIT –II** Theories of Coordination – II **( 15HRS.)**

a).Valence bond theory – Introduction, Hybridisation,$sp^3$, $dsp^2$, $dsp^3$, $d^2sp^3$,

& $sp^3d^2$, merits & demerits.

b).Crystal Field theory – Introduction, crystal field splitting in octahedral, tetrahedral & square planar arrangement of ligands. Spectro chemical series, ligand field effect and colour, crystal field stabilization energy , factors affecting the magnitude of $\Delta_0$ and its application.Distortion of octahedral complexes and John-Teller theorem. Limitations of CFT.

c).M.O.Theory – M.O. Theory as applied to octahedral complexes, Pi- bonding and M.O. theory, Merits.

**Self Study:** Structure of Spinels

**UNIT –III** Mechanism in coordination complexes **(15 HRS.)**

a).Kinetics of complexes – stability – Kinetic and thermodynamic stability – Factors affecting stability and lability Stepwise and over all stability constants (determination not required)

**d)** Mechanism of hydrolysis reactions in octahedral complexes.

**e)** Mechanism of ligand substitution reaction in square planar complexes, Trans effect, trans effect in synthesis, Mechanism of trans effect.

**f)** Spectroscopic states: L-S coupling & J-J coupling schemes, derivation of spectroscopic states for free C-atom. Reaction Mechanism in 6-coordinate complexes $SN_1$ and $SN_2$, Acid hydrolysis, Base hydrolysis $SN_1CB$

**Self Study:** Mechanism of trans effect.

**UNIT –IV** Organometallic Chemistry **( 15HRS.)**

Preparation and structure of metal carbonyls – $Ni(CO)_4$, $Fe(CO)_5$, $[V(CO)_6]$ & $Mn_2(CO)_{10}$. Metal nitrosyls – sodium nitroprusside and nitoso ferrous sulphate.Ferrocene (structure based on VBT).

**Self Study:** $Co_2(CO)_8$and $Fe_2(CO)_9$

**UNIT –V** :'F' Block Elements **(15 HRS.)**

a). The lanthanide series electronic configuration, Oxidation states, spectral and magnetic properties of $ce^{3+}$ and $yb^{3+}$ , causes and consequences of lanthanide contraction - separation of lanthanides by fractional crystallization, solvent extraction, precipitation, change in

oxidation state and Ion exchange chromatography.

b). Actinides The actinide series and electronic configuration.Extraction of Uranium from pitchblende.

**Self Study:** Extraction of thorium from monazite

**REFERENCES:**


1. R.D.Madan, Wahid U.Malik&G.D.Tuli, -*Selected topics in Inorganic Chemistry* - S.Chand& Company LTD. 2010 - For Units I, II and III
2. B.R.Puri, L.R.Sharma& K.C. Kalia. "*Principles of Inorganic Chemistry"*Milestone Publishers, 2014, For Unit IV.
3. James E HuheeyInorganic Chemistry, II Edn.,.Published by Dorling Kindersley (India) Pvt.Ltd. 2009 - For Unit III - (d)


## COURSE CONTENTS & LECTURE SCHEDULE:

| Module No. | Topic | No. of Lectures | Teaching Pedagogy | Teaching Aids |
|---|---|---|---|---|
| **UNIT -1** | Theories of Coordination – I | **( 15HRS)** | | |
| 1.1 | Introduction | 1 | Chalk & Talk | Black Board |
| 1.2 | Classification of ligands | 2 | Chalk & Talk | Black Board |
| 1.3 | Nomenclature | 3 | Lecture | Black Board |
| 1.4 | Preparation of complexes | 1 | Lecture | Black Board |

| | | | | |
|---|---|---|---|---|
| 1.5 | Detection of complexes using solubility,colour change,conductance measurements and visible absorption studies | 2 | Lecture | Black Board |
| 1.6 | Basis for isomerism in complexes | 1 | Discussion | Black Board |
| 1.7 | Different types of isomerism. | 2 | Lecture | Black Board |
| 1.8 | Werner's theory –merits & demerits | 1 | Discussion | Black Board |
| 1.9 | EAN rule as applied to carbonyls | 2 | Problem solving | Black Board |
| **UNIT -2** | Theories of Coordination – II | **( 15HRS** | | |
| 2.1 | Valence bond theory – | 3 | Lecture | Black |

| **Module No.** | **Topic** | **No. of Lectures** | **Teaching Pedagogy** | **Teaching Aids** |
|---|---|---|---|---|
| | Introduction, Hybridisation,$sp^3$, $dsp^2$, $dsp^3$, $d^2sp^3$, & $sp^3d^2$, merits & demerits. | | | Board & Models |
| 2.2 | Crystal Field theory – Introduction, crystal field splitting in octahedral, tetrahedral & square planar arrangement of ligands. | 2 | Chalk & Talk | Black Board |
| 2.3 | Spectro chemical series, ligand field effect and colour &crystal field stabilization energy . | 3 | Problem solving | Black Board |
| 2.4 | Factors affecting the magnitude of $\Delta_0$ and its application | 2 | Chalk & Talk | Black Board |

| | | | | |
|---|---|---|---|---|
| 2.4 | Tetrahedral Vs Octahed Complexes.Distortion of octahed complexes and John-Tell theorem.Limitations of CFT | 2 | Chalk & Talk | Black Board |
| 2.5 | M.O.Theory – M.O. Theory as applied to octahedral complexes, | 2 | Chalk & Talk | Black Board |
| 2.6 | Pi- bonding and M.O. theo Merits. | 1 | Discussion | Black Board |
| **UNIT -3 MECHANISM IN COORDINATION COMPLEXES (15Hours)** | | | | |
| 3.1 | Kinetics of complexes – stability – Kinetic and thermodynamic stability | 2 | Chalk & Talk | Black Board |
| 3.2 | Factors affecting stability and lability | 2 | Chalk & Talk | Black Board |
| 3.3 | Stepwise and over all stability constants (determination not required) | 2 | Chalk & Talk | Black Board |

| Module No. | Topic | No. of Lectures | Teaching Pedagogy | Teaching Aids |
|---|---|---|---|---|
| 3.4 | Mechanism of hydrolysis reactio in octahedral complexes. | 2 | Chalk & Talk | Black Board |
| 3.5 | Mechanism of ligand substitut reaction in square plan complexes, Trans effect, trans effe in synthesis, Mechanism of tra effect. | 3 | Chalk & Talk | Power point |

| | | | | |
|---|---|---|---|---|
| 3.6 | Spectroscopic states: L-S coupling & J-J coupling schemes. | 2 | Chalk & Talk | Black Board |
| 3.7 | Derivation of spectroscopicstates for free C-atom | 2 | Derivation | Black Board |
| **UNIT -4 ORGANOMETALLIC CHEMISTRY (15Hours)** | | | | |
| 4.1 | Preparation of metal carbonyls | 2 | Chalk & Talk | Black Board |
| 4.2 | $Ni(CO)_4$, $Fe(CO)_5$, $[V(CO)_6]$, | 3 | Seminar | Black Board |
| 4.3 | $Mn_2(CO)_{10}$, $Co_2(CO)_8$and $Fe_2(CO)_9$. | 1 | Chalk & Talk | Black Board |
| 4.4 | EAN calculation | 2 | Chalk & Talk | Black Board |
| 4.5 | Metal nitrosyls – sodium nitroprusside and nitoso ferrous sulphate. | 3 | Chalk & Talk | Black Board |
| 4.6 | Ferrocene (structure based on VBT) | 4 | Chalk & Talk | Black Board |
| **UNIT-5 'F' BLOCK ELEMENTS (15Hours)** | | | | |

| Module No. | Topic | No. of Lectures | Teaching Pedagogy | Teaching Aids |
|---|---|---|---|---|
| 5.1 | The lanthanide series electronic configuration, Oxidation states, spectral and magnetic properties of $ce^{3+}$ and $yb^{3+}$ | 4 | Chalk & Talk | Black Board |
| 5.2 | Causes and consequences of lanthanide contraction | 1 | Chalk & Talk | Black Board |
| 5.3 | Separation of lanthanides by fractional crystallization, solvent extraction, precipitation, change in oxidation state and Ion exchange chromatography | 3 | Chalk & Talk | Black Board & Models |

| | | | | |
|---|---|---|---|---|
| 5.4 | The actinide series and electronic configuration | 3 | Chalk & Talk | Black Board |
| 5.5 | Extraction of Uranium from pitchblende and thorium from monazite. | 5 | Chalk & Talk | Black Board |

## COURSE OUTCOMES

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

| NO. | COURSE OUTCOMES | KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY) | PSOs ADDRESSED |
|---|---|---|---|
| CO 1 | Know the structure and bonding of important coordination compounds | K1, K2, K3 & K4 | PSO1& PSO2 |
| CO 2 | Apply the rules to calculate the magnetic properties of complexes and how magnetic moments canbe employed for the interpretation of their structure | K1, K2, K3 & K4 | PSO3 |
| CO 3 | Get an overview about the reaction mechanism of metal complexes | K1, K2, K3 & K4 | PSO5 |
| CO 4 | Import the skills to elucidate the structure and mode of bonding in organometallic compounds | K1, K2, K3 & K4 | PSO7 |
| CO 5 | Gain knowledge about the chemistry of Lanthanides and Actinides | K1, K2, K3 & K4 | PSO7 |

## Mapping of C0s with PSOs

| CO / PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6 | PSO 7 | PSO 8 | PSO 9 |
|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 1 |
| CO2 | 2 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 1 |
| CO3 | 2 | 1 | 1 | 1 | 3 | 1 | 1 | 1 | 1 |
| CO4 | 2 | 1 | 1 | 1 | 1 | 1 | 3 | 1 | 1 |
| CO5 | 2 | 1 | 1 | 1 | 1 | 1 | 3 | 1 | 1 |

## Mapping of C0s with POs

| CO / PSO | PO1 | PO2 | PO3 | PO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | 2 |
| CO2 | 3 | 3 | 2 | 2 |
| CO3 | 3 | 2 | 2 | 2 |
| CO4 | 3 | 2 | 2 | 2 |
| CO5 | 3 | 2 | 2 | 2 |

**Note**: ♦ Strongly Correlated – **3** ♦ Moderately Correlated – **2**
♦ Wakly Correlated -**1**

**COURSE DESIGNER:**

3. **Dr.A. Rajeswari**
4. **Ms. RM Nagalakshmi**

5%

# III B.Sc. CHEMISTRY

## 5SEMESTER –V

***For those who joined in 2019 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/WEEK | CREDITS |
|---|---|---|---|---|---|
| UACH | 19C5ME1 | SPECTROSCOPY | Elective | 5 | 5 |

**COURSE DESCRIPTION**

This course will focus on interpretation of spectra and application of these tools to address questions of structures.

**COURSE OBJECTIVES**

In this course the students are exposed to various spectroscopic techniques that are used in structural elucidation. This paper will be of much use of the students to take up higher studies.

**UNITS**

**UNIT –I UV-VISIBLE SPECTROSCOPY ( 15HRS.)**

Introduction, Absorption laws – instrumentation. Types of electronic transitions Absorption and intensity shifts – solvents effects.λmax calculation using Woodward rules for dienes (Open chain and alicyclic) and unsaturated carbonyl compounds.

**Self Study:** Applications of UV spectroscopy.

**UNIT –II FT-IR SPECTROSCOPY (15HRS.)**

Introduction, molecular vibrations vibrational frequency – Number of fundamental vibrations – Factors influencing vibrational frequencies – Instrumentation – Sampling technique Finger print region – skeletal and group vibrations.

**Self Study:** Applications of FT-IR spectroscopy.

**UNIT –III $^{1}$H-NMR SPECTROSCOPY (15HRS.)**

Introduction, principle, Number of signals, position of signals(chemical shift) – shielding and deshielding effects. Factors influencing chemical shift. Instrumentation, Solvents used -peak area – splitting of the signals. Coupling constant (J) geminal Vicinal (cis&trans) and aromatic coupling (J- ortho, J-meta & J-para).

**Self Study:** Applications of $^{1}$H-NMR spectroscopy.

**UNIT –IV $^{13}$C AND ESR SPECTROSCOPY (15HRS.)**

Natural abundance of $^{13}$C – Resolution, multiplicity – $H_1$ decoupling – Noise decoupling. NOE Signal enhancement -broad bands – off resonance – proton decoupling. Chemical shifts for $^{13}$C in various kind of carbon. ($sp^3$,$sp^2$, sp, hybridized carbon and carbonyl carbon) comparison of $^{13}$C NMR &PMR (elementary level).

Introduction, Hyperfine splitting in Hydrogen atom, $CH_3$ free radicals, Benzene anion radical, bissalicylaldimine Copper(II)Complex.

**Self Study:**Zero field splitting &Kramers's degeneracy.

**UNIT –V MASS SPECTROSCOPY (15HRS.)**

Basic principles, Instrumentation, Determination of molecular formula using nitrogen rule – Molecular ion peal – base peak (M+1), (M+2) peaks metastable peaks. General fragmentation modes, simple cleavage – Retro Diels Alder reaction. Hydrogen transfer rearrangements – McLafferty rearrangement, problems.

**Self Study:**Applications in Mass spectroscopy.

**REFERENCES:**


1. Y.R. Sharma, Organic Spectroscopy, Fourth revised and enlarged Edn., 2007, S. Chand & Co.
2. Puri, Sharma &Pathania, Principles of Physical Chemistry, 3rd Edn., Vishal publishing Company.

3. P. S. Kalsi, Stereochemistry of carbon compounds, 3rdEdn., New Age International Publishers, 1995.

4. R. S. Drago, *Physical Methods in Chemistry*; Saunders: Philadelphia, 1977.

5. C. N. Banwell and E. M. Mc Cash, *Fundamentals of Molecular Spectroscopy*, 4th Edn., Tata Mc Graw Hill, New Delhi, 2000.

# COURSE CONTENTS & LECTURE SCHEDULE

| Module No. | Topic | No. of Lectures | Teaching Pedagogy | Teaching Aids |
|---|---|---|---|---|
| **UNIT -1 UV-VISIBLE SPECTROSCOPY** | | | | |
| 1.1 | Introduction, Absorption laws | 2 | Chalk & Talk | Black Board |
| 1.2 | Instrumentation | 1 | Chalk & Talk | LCD |
| 1.3 | Types of electronic transitions | 1 | Lecture | Black Board |
| 1.4 | Absorption and intensity shifts | 3 | Lecture | Black Board |
| 1.5 | Solvents effects | 3 | Lecture | Black Board |
| 1.6 | λmax calculation using Woodward rules for dienes | 2 | Lecture | Chalk and Talk |
| 1.7 | λmax calculation using Woodward rules for Open chain and alicyclic compounds | 1 | Lecture | PPT & White board |
| 1.8 | λmax calculation using Woodward rules for unsaturated carbonyl compounds. | 2 | Discussion | Black Board |
| **UNIT -2 FT-IR SPECTROSCOPY** | | | | |
| 2.1 | Introduction | 1 | Lecture | Black Board |

| Module No. | Topic | No. of Lectures | Teaching Pedagogy | Teaching Aids |
|---|---|---|---|---|
| 2.2 | Molecular vibrations vibrational frequency | 2 | Chalk & Talk | Green Board |
| 2.3 | Number of fundamental vibrations | 2 | Chalk & Talk | Black Board |
| 2.4 | Factors influencing vibrational frequencies | 3 | Lecture | PPT & White board |
| 2.5 | Instrumentation | 2 | Discussion | LCD |
| 2.6 | Sampling technique Finger print region | 1 | Lecture | Black Board |
| 2.7 | Skeletal and group vibrations. | 4 | Lecture | PPT & White board |
| **UNIT -3 $^{1}$H-NMR SPECTROSCOPY** | | | | |
| 3.1 | Introduction, principle | 2 | Lecture | Black Board |
| 3.2 | Number of signals, position of signals(chemical shift). | 3 | Discussion | LCD |
| 3.3 | Shielding and deshielding effects. | 3 | Lecture | PPT & White Board |
| 3.4 | Factors influencing chemical shift. | 2 | Lecture | Black Board |
| 3.5 | Instrumentation | 1 | Discussion | LCD |
| 3.6 | Solvents used -peak area – splitting of the signals. | 2 | Lecture | Black Board |
| 3.7 | Coupling constant (J) geminal Vicinal (cis&trans) | 1 | Lecture | Black Board |
| 3.8 | Aromatic coupling (J- ortho, J-meta & J-para). | 1 | Lecture | Black Board |

| Module No. | Topic | No. of Lectures | Teaching Pedagogy | Teaching Aids |
|---|---|---|---|---|
| **UNIT -4 $^{13}$CAND ESR SPECTROSCOPY** | | | | |
| 4.1 | Natural abundance of $^{13}C$ – Resolution, multiplicity. | 1 | Lecture | Black Board |
| 4.2 | $H_1$ decoupling – Noise decoupling. | 3 | Chalk & Talk | Green Board |
| 4.3 | NOE Signal enhancement -broad bands – off resonance – proton decoupling. | 2 | Chalk & Talk | Black Board |
| 4.4 | Chemical shifts for $^{13}C$ in various kind of carbon. ($sp^3$,$sp^2$, sp, hybridized carbon and carbonyl carbon) | 3 | Lecture | PPT & White board |
| 4.5 | Comparison of $^{13}C$ NMR &PMR (elementary level). | 1 | Discussion | LCD |
| 4.6 | Introduction, Hyperfine splitting in Hydrogen atom | 1 | Lecture | Black Board |
| 4.7 | $CH_3$ free radicals, Benzene anion radical | 2 | Lecture | PPT & White board |
| 4.8 | bissalicylaldimine Copper(II) complex. | 2 | Lecture | Black Board |
| **UNIT -5 MASS SPECTROSCOPY** | | | | |
| 5.1 | Basic principles, Instrumentation | 2 | Lecture | Black Board |
| 5.2 | Determination of molecular formula using nitrogen rule | 2 | Chalk & Talk | Green Board |
| 5.3 | Molecular ion peak – base peak (M+1), (M+2) peaks metastable peaks | 3 | Chalk & Talk | Black Board |
| 5.4 | General fragmentation modes | 1 | Lecture | PPT & White board |

| Module No. | Topic | No. of Lectures | Teaching Pedagogy | Teaching Aids |
|---|---|---|---|---|
| 5.5 | Simple cleavage | 2 | Discussion | LCD |
| 5.6 | Retro Diels Alder reaction | 1 | Lecture | Black Board |
| 5.7 | Hydrogentransfer rearrangements | 2 | Lecture | PPT & White board |
| 5.8 | McLafferty rearrangement, problems. | 2 | Lecture | Black Board |

| Levels | C1 | C2 | C3 | C4 | Total Scholastic Marks | Non Scholastic Marks C5 | CIA Total | % of Assessment |
|---|---|---|---|---|---|---|---|---|
| | Session - wise Average<br>5 Mks. | Better of W1, W2<br>5 Mks | M1+M2<br>5+5=10 Mks. | MID-SEM TEST<br>15 Mks | 35 Mks. | 5 Mks. | 40Mks. | |
| **K1** | **5** | **-** | **-** | **2 ½** | **7.5** | - | **7.5** | 18.75 % |
| **K2** | **-** | **5** | **4** | **2 ½** | **11.5** | - | **11.5** | 28.75 % |
| **K3** | **-** | **-** | **3** | **5** | **8** | - | **8** | 20 % |
| **K4** | **-** | **-** | **3** | **5** | **8** | - | **8** | 20 % |
| **Non Scholastic** | **-** | **-** | **-** | - | | **5** | **5** | 12.5 % |
| **Total** | **5** | **5** | **10** | **15** | **35** | **5** | **40** | **100 %** |

| CIA | |
|---|---|
| **Scholastic** | **35** |
| **Non Scholastic** | **5** |
| | **40** |

- ✓ **All the course outcomes are to be assessed in the various CIA components.**
- ✓ **The levels of CIA Assessment based on Revised Bloom's Taxonomy for :**

**K1-** Remember, **K2-**Understand, **K3-**Apply, **K4-**Analyse

## EVALUATION PATTERN

| SCHOLASTIC | | | | NON - SCHOLASTIC | MARKS | | |
|---|---|---|---|---|---|---|---|
| **C1** | **C2** | **C3** | **C4** | **C5** | **CIA** | **ESE** | **Total** |
| **5** | **10** | **15** | **5** | **5** | **40** | **60** | **100** |

**C1** – Average of Two Session Wise Tests

**C2** – Average of Two Monthly Tests

**C3** - Mid Sem Test

**C4** – Best of Two Weekly Tests

**C5** – Non - Scholastic

## COURSE OUTCOMES

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

| NO. | COURSE OUTCOMES | KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY) | PSOs ADDRESSED |
|---|---|---|---|
| CO 1 | to calculate λmax values for different organic molecules and to identify the systems using UV spectroscopy. | K1, K2,K3 &K4 | PSO1& PSO2 |
| CO 2 | to identify various functional groups present in organic molecules using IR frequency. | K1, K2,K3 &K4 | PSO3 |
| CO 3 | to predict the number and nature of protons/ carbons in organic moleculesin $^{1}$H-NMR/ $^{13}$C-NMR spectroscopy. | K1, K2,K3 &K4 | PSO5 |
| CO 4 | to study the structures of systems with unpaired electrons using ESR spectroscopy. | K1, K2,K3&K4 | PSO3 |
| CO 5 | to findoutthe mass of the molecule and to arrive at the formulae of the molecules using fragmentation patterns. | K1, K2,K3 &K4 | PSO2 |

## Mapping of C0s with PSOs

| CO / PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6 | PSO 7 | PSO 8 |
|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | 1 | 2 | 1 | 1 |
| CO2 | 2 | 1 | 3 | 2 | 2 | 1 | 2 | 1 |
| CO3 | 2 | 1 | 2 | 2 | 3 | 2 | 1 | 2 |
| CO4 | 2 | 2 | 1 | 1 | 2 | 3 | 2 | 1 |
| CO5 | 1 | 2 | 1 | 2 | 2 | 2 | 3 | 1 |

## Mapping of C0s with Pos

| CO / PSO | PO1 | PO2 | PO3 | PO4 |
|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | 1 |
| CO2 | 2 | 3 | 1 | 1 |
| CO3 | 3 | 2 | 1 | 1 |
| CO4 | 2 | 3 | 1 | 1 |
| CO5 | 3 | 2 | 1 | 1 |

**Note**: ♦ Strongly Correlated – **3** ♦ Moderately Correlated – **2**
♦ WeaklyCorrelated -**1**

**COURSE DESIGNER:**

**1.Dr.M.Priyadharsani**

**2.Dr.V.Aruldeepa**

**Forwarded By**

**HOD'S Signature**

# III B.Sc.

# CHEMISTRY

# SEMESTER –V

***For those who joined in 2021 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/WEEK | CREDITS |
|---|---|---|---|---|---|
| UACH | 19C5ME1 | SPECTROSCOPY | Elective | 5 | 5 |

**COURSE DESCRIPTION**

This course will focus on interpretation of spectra and application of these tools to address questions of structures.

**COURSE OBJECTIVES**

In this course the students are exposed to various spectroscopic techniques that are used in structural elucidation. This paper will be of much use of the students to take up higher studies.

**UNITS**

**UNIT –I UV-VISIBLE SPECTROSCOPY ( 15HRS.)**

Introduction, Absorption laws – instrumentation. Types of electronic transitions Absorption and intensity shifts – solvents effects.$\lambda$max calculation using Woodward rules for dienes (Open chain and alicyclic) and unsaturated carbonyl compounds. Basic Problems only

**Self Study:** Applications of UV spectroscopy.

**UNIT –II FT-IR SPECTROSCOPY (15HRS.)**

Introduction, molecular vibrations vibrational frequency – Number of fundamental vibrations – Factors influencing vibrational frequencies – Instrumentation – Sampling technique Finger print region – skeletal and group vibrations. Problems involving small molecules only

**Self Study:** Applications of FT-IR spectroscopy.

**UNIT –III $^{1}$H-NMR SPECTROSCOPY (15HRS.)**

Introduction, principle, Number of signals, position of signals(chemical shift) – shielding and deshielding effects. Factors influencing chemical shift. Instrumentation, Solvents used -peak area – splitting of the signals. Coupling constant (J) geminal Vicinal (cis&trans) and aromatic coupling (J- ortho, J-meta & J-para). Problems involving small molecules only

**Self Study:** Applications of $^{1}$H-NMR spectroscopy.

**UNIT –IV $^{13}$C AND ESR SPECTROSCOPY (15HRS.)**

Natural abundance of $^{13}$C – Resolution, multiplicity – $H_1$ decoupling – Noise decoupling. NOE Signal enhancement -broad bands – off resonance – proton decoupling. Chemical shifts for $^{13}$C in various kind of carbon. ($sp^3$,$sp^2$, sp, hybridized carbon and carbonyl carbon) comparison of $^{13}$C NMR &PMR (elementary level).

Introduction, Hyperfine splitting in Hydrogen atom, $CH_3$ free radicals, Benzene anion radical, bissalicylaldimine Copper(II)Complex.

**Self Study:**Zero field splitting &Kramers's degeneracy.

**UNIT –V MASS SPECTROSCOPY (15HRS.)**

Basic principles, Instrumentation, Determination of molecular formula using nitrogen rule – Molecular ion peal – base peak (M+1), (M+2) peaks metastable peaks. General fragmentation modes, simple cleavage – Retro Diels Alder reaction. Hydrogen transfer rearrangements – McLafferty rearrangement, problems. Problems involving simple fragmentation (150-200) with Nitrogen and halogen functional groups.

**Self Study:**Applications in Mass spectroscopy.

**REFERENCES:**


6. Y.R. Sharma, Organic Spectroscopy, Fourth revised and enlarged Edn., 2007, S. Chand & Co.
7. Puri, Sharma &Pathania, Principles of Physical Chemistry, 3rd Edn.,

Vishal publishing Company.

8. P. S. Kalsi, Stereochemistry of carbon compounds, 3rdEdn., New Age International Publishers, 1995.
9. R. S. Drago, *Physical Methods in Chemistry*; Saunders: Philadelphia, 1977.
10. C. N. Banwell and E. M. Mc Cash, *Fundamentals of Molecular Spectroscopy*, 4th Edn., Tata Mc Graw Hill, New Delhi, 2000.

## COURSE CONTENTS & LECTURE SCHEDULE

| Module No. | Topic | No. of Lectures | Teaching Pedagogy | Teaching Aids |
|---|---|---|---|---|
| **UNIT -1 UV-VISIBLE SPECTROSCOPY** | | | | |
| 1.1 | Introduction, Absorption laws | 2 | Chalk & Talk | Black Board |
| 1.2 | Instrumentation | 1 | Chalk & Talk | LCD |
| 1.3 | Types of electronic transitions | 1 | Lecture | Black Board |
| 1.4 | Absorption and intensity shifts | 3 | Lecture | Black Board |
| 1.5 | Solvents effects | 3 | Lecture | Black Board |
| 1.6 | λmax calculation using Woodward rules for dienes | 2 | Lecture | Chalk and Talk |
| 1.7 | λmax calculation using Woodward rules for Open chain and alicyclic compounds | 1 | Lecture | PPT & White board |
| 1.8 | λmax calculation using Woodward rules for unsaturated carbonyl compounds. | 2 | Discussion | Black Board |
| **UNIT -2 FT-IR SPECTROSCOPY** | | | | |

| | | | | |
|---|---|---|---|---|
| 2.1 | Introduction | 1 | Lecture | Black Board |

| Module No. | Topic | No. of Lectures | Teaching Pedagogy | Teaching Aids |
|---|---|---|---|---|
| 2.2 | Molecular vibrations vibrational frequency | 2 | Chalk & Talk | Green Board |
| 2.3 | Number of fundamental vibrations | 2 | Chalk & Talk | Black Board |
| 2.4 | Factors influencing vibrational frequencies | 3 | Lecture | PPT & White board |
| 2.5 | Instrumentation | 2 | Discussion | LCD |
| 2.6 | Sampling technique Finger print region | 1 | Lecture | Black Board |
| 2.7 | Skeletal and group vibrations. | 4 | Lecture | PPT & White board |
| **UNIT -3 $^{1}$H-NMR SPECTROSCOPY** | | | | |
| 3.1 | Introduction, principle | 2 | Lecture | Black Board |
| 3.2 | Number of signals, position of signals(chemical shift). | 3 | Discussion | LCD |
| 3.3 | Shielding and deshielding effects. | 3 | Lecture | PPT & White Board |
| 3.4 | Factors influencing chemical shift. | 2 | Lecture | Black Board |
| 3.5 | Instrumentation | 1 | Discussion | LCD |
| 3.6 | Solvents used -peak area – splitting of the signals. | 2 | Lecture | Black Board |
| 3.7 | Coupling constant (J) geminal Vicinal (cis&trans) | 1 | Lecture | Black Board |
| 3.8 | Aromatic coupling (J- ortho, J-meta & J-para). | 1 | Lecture | Black Board |

| Module No. | Topic | No. of Lectures | Teaching Pedagogy | Teaching Aids |
|---|---|---|---|---|
| **UNIT -4 $^{13}$CAND ESR SPECTROSCOPY** | | | | |
| 4.1 | Natural abundance of $^{13}C$ – Resolution, multiplicity. | 1 | Lecture | Black Board |
| 4.2 | $H_1$ decoupling – Noise decoupling. | 3 | Chalk & Talk | Green Board |
| 4.3 | NOE Signal enhancement -broad bands – off resonance – proton decoupling. | 2 | Chalk & Talk | Black Board |
| 4.4 | Chemical shifts for $^{13}C$ in various kind of carbon. ($sp^3$,$sp^2$, sp, hybridized carbon and carbonyl carbon) | 3 | Lecture | PPT & White board |
| 4.5 | Comparison of $^{13}C$ NMR &PMR (elementary level). | 1 | Discussion | LCD |
| 4.6 | Introduction, Hyperfine splitting in Hydrogen atom | 1 | Lecture | Black Board |
| 4.7 | $CH_3$ free radicals, Benzene anion radical | 2 | Lecture | PPT & White board |
| 4.8 | bissalicylaldimine Copper(II) complex. | 2 | Lecture | Black Board |
| **UNIT -5 MASS SPECTROSCOPY** | | | | |
| 5.1 | Basic principles, Instrumentation | 2 | Lecture | Black Board |
| 5.2 | Determination of molecular formula using nitrogen rule | 2 | Chalk & Talk | Green Board |
| 5.3 | Molecular ion peak – base peak (M+1), (M+2) peaks metastable peaks | 3 | Chalk & Talk | Black Board |
| 5.4 | General fragmentation modes | 1 | Lecture | PPT & White board |

| Module No. | Topic | No. of Lectures | Teaching Pedagogy | Teaching Aids |
|---|---|---|---|---|
| 5.5 | Simple cleavage | 2 | Discussion | LCD |
| 5.6 | Retro Diels Alder reaction | 1 | Lecture | Black Board |
| 5.7 | Hydrogentransfer rearrangements | 2 | Lecture | PPT & White board |
| 5.8 | McLafferty rearrangement, problems. | 2 | Lecture | Black Board |

## COURSE OUTCOMES

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

| NO. | COURSE OUTCOMES | KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY) | PSOs ADDRESSED |
|---|---|---|---|
| CO 1 | to calculate λmax values for different organic molecules and to identify the systems using UV spectroscopy. | K1, K2,K3 &K4 | PSO1& PSO2 |
| CO 2 | to identify various functional groups present in organic molecules using IR frequency. | K1, K2,K3 &K4 | PSO3 |
| CO 3 | to predict the number and nature of protons/ carbons in organic moleculesin $^{1}$H-NMR/ $^{13}$C-NMR spectroscopy. | K1, K2,K3 &K4 | PSO5 |
| CO 4 | to study the structures of systems with unpaired electrons using ESR spectroscopy. | K1, K2,K3&K4 | PSO3 |

| | | | |
|---|---|---|---|
| CO 5 | to findoutthe mass of the molecule and to arrive at the formulae of the molecules using fragmentation patterns. | K1, K2,K3 &K4 | PSO2 |

## Mapping of C0s with PSOs

| CO/ PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6 | PSO 7 | PSO 8 |
|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | 1 | 2 | 1 | 1 |
| CO2 | 2 | 1 | 3 | 2 | 2 | 1 | 2 | 1 |
| CO3 | 2 | 1 | 2 | 2 | 3 | 2 | 1 | 2 |
| CO4 | 2 | 2 | 1 | 1 | 2 | 3 | 2 | 1 |
| CO5 | 1 | 2 | 1 | 2 | 2 | 2 | 3 | 1 |

### Mapping of C0s with Pos

| CO/ PSO | PO1 | PO2 | PO3 | PO4 |
|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | 1 |
| CO2 | 2 | 3 | 1 | 1 |
| CO3 | 3 | 2 | 1 | 1 |
| CO4 | 2 | 3 | 1 | 1 |
| CO5 | 3 | 2 | 1 | 1 |

**Note**: ♦ Strongly Correlated – **3** ♦ Moderately Correlated – **2**
♦ WeaklyCorrelated -**1**

**COURSE DESIGNER:**
**1.Dr.M.Priyadharsani**

**2.Dr.V.Aruldeepa**

**Forwarded By**

**HOD'S Signature**

20%

**III B.Sc. CHEMISTRY**

**SEMESTER –VI**

***For those who joined in 2019 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/WEEK | CREDITS |
|---|---|---|---|---|---|
| UACH | 19C6CC17 | ORGANIC CHEMISTRY – IV | Major Core | 5 | 4 |

**COURSE DESCRIPTION**

This paper includes the topics, Polynuclear Hydrocarbons, Heterocyclic Compounds, Amino Acids and Proteins, Terpenes and Alkaloids.

**COURSE OBJECTIVES**

In this course the students are exposed to develop efficient, synthetic methods in organic chemistry. And to be familiar with properties and reactions of most important poly nuclear hydrocarbons, heterocyclic compounds, amino acids, peptides, proteins. And gain advanced knowledge and understanding in aspect of alkaloids and terpenes.

**UNITS**

**UNIT I. POLY NUCLEAR HYDROCARBONS (15 Hrs.)**

Structure of Naphthalene, aromaticity, preparation-Haworth and Fitting's synthesis. Chemical properties- reduction, oxidation, electrophilic substitution. Derivatives of naphthalene 1- Naphthol and 2- Naphthol – Preparation and chemical properties. 1-Naphthylamine and 2-Naphthylamine, Preparation- Bucherer reaction, and Chemical properties. Naphthaquinone-

Preparation and properties of 1, 2-Naphthaquinone, 1,4-Naphthaquinoneand 2,6- Naphthaquinone, Naphthoic acids.

Structure of Anthracene, aromaticity, preparation- Fridel-Crafts reaction. Chemical properties- Electrophilic substitution, oxidation, reduction and Diels –Alder reaction. Preparation and property of 9,10-Anthraquinone. Preparation- Pschorr and Haworth synthesis and properties of Phenanthrene. Preparation and property and phenanthra quinone.

Fused polynuclear heterocyclic systems- Quinoline and Isoquinoline-Preparation of quinoline –Skraup's and Friedlander's synthesis, Chemical properties of quinoline- electrophilic, nucleophilic substitution, oxidation, and reductions reactions. Preparation of isoquinoline –Bischler-Napieralski reaction, and chemical properties.

**UNIT II. HETEROCYCLIC COMPOUNDS (15 Hrs.)**

Introduction, numbering the position in heterocyclic compounds. Five membered heterocyclic compounds of pyrrole, furan, thiophene. Structure and aromaticity,general methods of preparations of pyrrole, furan, thiophene, Preparation of pyrrole (Knorr-pyrrole, Hanstzchsynthesis),Chemical properties of pyrrole, furan, thiophene-electrophilic substitution, reduction reactions, Kolbes-Schmitt reaction in pyrrole and Diels-Alder reaction of furan. Comparison of reactivity of furan, pyrrole and thiophene.

Six- membered heterocyclic compound – Pyridine- Structure aromaticity and basicity. Preparation and Chemical properties of pyridine-electrophilic, nucleophilic substitution and reduction reactions. Indole-preparation- Fischer's indole, Madelung, Reissert synthesis. Electrophilic substitution and reduction reactions. Five membered heterocyclic containingtwo hetero atoms: Pyrazole

**UNIT III. AMINO ACIDS AND PROTEINS (15 Hrs.)**

Amino acids – Classification based on chemical structure and on nutrition importance, Stereochemistry of amino acids - methods of preparation- Perkin et al., Gabriel phthalimide, Strecker, Malonicester, The

Darapsky, and Erlenmeyer azalctone synthesis. Physical properties - Zwitterions and isoelectric points. Chemical properties- Reactions due to amino groups, Reactions due to carboxylic group and reactions due to both - $NH_2$ and –COOH groups.

Peptides and their synthesis- Use of protecting group in synthesis of polypeptides, protection of amino group, synthesis of peptide using protected amino and carboxylic acid ends, and Merrifield solid phase polypeptide synthesis. End group Analysis - N- terminal - DNP, Dansyl methods and Edman's degradation. C- terminal- Carboxypeptidase and Kumpfs method. Primary, Secondary and Tertiary structure of proteins. Colour reactions of proteins and denaturation of proteins – Fibrous & globular proteins.

**UNIT IV.TERPENES (15Hrs.)**

Introduction, Occurrence classification, Isolation, general properties, isoprene and special isoprene rule. Gem-dialkylerule. Structure, synthesis of Citral, Limonene and Camphor, Zingiberene.

**UNIT V. ALKALOIDS (15Hrs.)**

Definition, occurrence, extraction and general methods for determining the structure-functional nature of oxygen, Nitrogen, Herzigmayer and Kuhnroth method for estimation of C-methyl group.Degradation of alkaloids- Hofmann exhaustive methylation, Emde's degradation, Von Braun's.Reductive degradation, alkali fusion and oxidation. Structure and synthesis of Coniine, Piperine, Nicotine and Quinine.

**Text Books**

**Unit I ,II andIII**


1. I.L.Finar Organic Chemistry Vol II, 5$^{th}$Edn, ELBS &Longmann group Ltd.
2. I.L FinarOrganic ChemistryVol. I –, 6$^{th}$Edn., ELBS &Longmann group Ltd.

3. BhupinderMetha and Manjumetha – organic chemistry-Fifth printing Published by Asoke. K.Ghosh

**Unit IV**

1. GurdeepR.Chatwal Organic chemistry of Natural products Vol.II, 5thEdn, Himalaya publishing housePvt.ltd.

**Unit V**

1. Gurdeep .R.Chatwal Organic chemistry of Natural products Vol.I, 4thEdn, Himalaya publishing house Pvt.ltd.

**III B.Sc. CHEMISTRY**

**SEMESTER –VI**

***For those who joined in 2021 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/WEEK | CREDITS |
|---|---|---|---|---|---|
| UACH | 19C6CC17 | ORGANIC CHEMISTRY – IV | Major Core | 5 | 4 |

**COURSE DESCRIPTION**

This paper includes the topics, Polynuclear Hydrocarbons, Heterocyclic Compounds, Amino Acids and Proteins, Terpenes and Alkaloids.

**COURSE OBJECTIVES**

In this course the students are exposed to develop efficient, synthetic methods in organic chemistry. And to be familiar with properties and reactions of most important poly nuclear hydrocarbons, heterocyclic compounds, amino acids, peptides, proteins. And gain advanced knowledge and understanding in aspect of alkaloids and terpenes.

**UNITS**

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Preparation and properties of 1, 2-Naphthaquinone, 1,4-Naphthaquinoneand 2,6- Naphthaquinone, Naphthoic acids.

Structure of Anthracene, aromaticity, preparation- Fridel-Crafts reaction. Chemical properties- Electrophilic substitution, oxidation, reduction and Diels –Alder reaction. Preparation and property of 9,10-Anthraquinone. Preparation- Pschorr and Haworth synthesis and properties of Phenanthrene. Preparation and property and phenanthra quinone.

Fused polynuclear heterocyclic systems- Quinoline and Isoquinoline- Preparation of quinoline –Skraup's and Friedlander's synthesis, Chemical properties of quinoline- electrophilic, nucleophilic substitution, oxidation, and reductions reactions. Preparation of isoquinoline –Bischler-Napieralski reaction, and chemical properties.

**UNIT II. HETEROCYCLIC COMPOUNDS (15 Hrs.)**

Introduction, numbering the position in heterocyclic compounds. Five membered heterocyclic compounds of pyrrole, furan, thiophene. Structure and aromaticity,general methods of preparations of pyrrole, furan, thiophene, Preparation of pyrrole (Knorr-pyrrole, Hanstzchsynthesis),Chemical properties of pyrrole, furan, thiophene-electrophilic substitution, reduction reactions, Kolbes-Schmitt reaction in pyrrole and Diels-Alder reaction of furan. Comparison of reactivity of furan, pyrrole and thiophene.

Six- membered heterocyclic compound – Pyridine- Structure aromaticity and basicity. Preparation and Chemical properties of pyridine-electrophilic, nucleophilic substitution and reduction reactions. Indole-preparation- Fischer's indole, Madelung, Reissert synthesis. Electrophilic substitution and reduction reactions. Five membered heterocyclic containingtwo hetero atoms: Pyrazole

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Peptides and their synthesis- Use of protecting group in synthesis of polypeptides, protection of amino group, synthesis of peptide using protected amino and carboxylic acid ends, and Merrifield solid phase polypeptide synthesis. End group Analysis - N- terminal - DNP, Dansyl methods and Edman's degradation. C- terminal- Carboxypeptidase and Kumpfs method. Primary, Secondary and Tertiary structure of proteins. Colour reactions of proteins and denaturation of proteins – Fibrous & globular proteins.

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**Text Books**

**Unit I ,II andIII**


4. I.L.Finar Organic Chemistry Vol II, 5$^{th}$Edn, ELBS &Longmann group Ltd.
5. I.L FinarOrganic ChemistryVol. I –, 6$^{th}$Edn., ELBS &Longmann group Ltd.

6. BhupinderMetha and Manjumetha – organic chemistry-Fifth printing Published by Asoke. K.Ghosh

**Unit IV**

1. GurdeepR.Chatwal Organic chemistry of Natural products Vol.II, 5thEdn, Himalaya publishing housePvt.ltd.

**Unit V**

2. Gurdeep .R.Chatwal Organic chemistry of Natural products Vol.I, 4thEdn, Himalaya publishing house Pvt.ltd.

# III B.Sc. CHEMISTRY

# SEMESTER –VI

15%

***For those who joined in 2019 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/ WEEK | CREDITS |
|---|---|---|---|---|---|
| UACH | 19C6ME3 | ADVANCED ORGANIC CHEMISTRY (CONFORMATIONAL ANALYSIS, ORGANIC PHOTOCHEMISTRY AND MOLECULAR REARRANGEMENTS) | Elective | 5 | 5 |

**COURSE DESCRIPTION**

The course is offered to expose the advanced topics in the field of organic chemistry.

**COURSE OBJECTIVES**

This course helps the students to acquire a thorough knowledge of the advanced topics of organic chemistry related to conformational analysis of cyclohexanes, Photochemistry and molecular rearrangements.

**UNITS**

**UNIT –I CONFORMATIONAL ANALYSIS- I (15 HRS.)**

Stereoisomerism of ring systems- number and kind of stereoisomers- cyclopropane, cyclobutane, cyclopentane and cyclohexane. Conformations of ethane and n-butane-conformational energy diagram. Conformation of mono substituted cyclohexane-stability and optical activity-conformation of disubstitutedcyclohexanes-stability and optical activity and decalins their stability and optical activity.

**UNIT –II CONFORMATIONAL ANALYSIS- II (15 HRS.)**

Conformation and physical properties, and conformation and chemical

reactivity-$S_N1$, $S_N2$, ionic eliminations, rearrangements, NGP, epoxide ring closure and ring opening reactions, addition to cyclohexene derivatives, pyrolysis of acetates, xanthates and amine oxides.

**UNIT –III ORGANIC PHOTOCHEMISTRY (15 HRS.)**

Organic photochemistry –Photochemical Elimination in carbonyl compounds and nitrites- Norrish type-I & Norrish type-II, Barton reaction. Photochemical reduction, oxidation and cis-trans isomerisation, Intermolecular cycloaddition $(2\pi + 2\pi)$ & $(4\pi + 2\pi)$ cycloadditions, supara and antara overlap-FMO approach, and electrocyclic reactions- 4n & 4n+2 systems. Conrotation, disrotation. FMO approach to predict stereochemistry.

**UNIT –IV MOLECULAR REARRANGEMENTS-I (15 HRS.)**

Rearrangement to electron deficient atom or nucleophilic rearrangements – Mechanism of Pinacol-Pinacolone, Wagner-Meerwin, Hoffman and benzilic acid rearrangement. Rearrangements to electron rich atom or electrophilic rearrangements – Stevens rearrangements. Aromatic rearrangements – Claisen, Benzidine and Fries rearrangement.

**UNIT –V MOLECULAR REARRANGEMENTS –II (15 HRS.)**

Favorski, Baeyer Villiger, Cope, Curtius and Beckmann rearrangements, Synthetic importance of N – Bromosuccinimide, Osmium tetroxide, Selenium dioxide, PyridiniumChloro Chromite, Lithium Aluminium Hydride and Sodium Boro Hydride.

**REFERENCES:**

**1.**Eliel- Stereochemistry of carbon compounds, Tata Mc-Graw Hill Edn, 1995.

**2.**Dr.P. Ramesh, Basic principles of Organic Stereochemistry, First Edn, Meenu Publications.

**3.**Morrison & Boyd, -Organic chemistry , 6th Edn, Prentice-hall of India pvt, Ltd, 2005.

**4.** Jagdamba Singh, Photochemistry and Pericyclic Reactions, New age international publishers, 2009.

**5**.I.L.Finar, Vol-I, Organic Chemistry, sixth Edn., ELBS & Longmann group Ltd.

**6.**V.K.Ahluwalia & R.K.Prashar, Organic Reaction Mechanism, First Edn, 2002, Narosa publishing House.

**7**. K. K. Rohatgi-Mukherjee, fundamentals of photochemistry, New age international publishers, 2006.

## COURSE CONTENTS & LECTURE SCHEDULE:

| Module No. | Topic | No. of Lectures | Teaching Pedagogy | Teaching Aids |
|---|---|---|---|---|
| **UNIT -1 CONFORMATIONAL ANALYSIS-I** | | | | |
| 1.1 | Stereoisomerism of ring systems-number and kind of stereoisomers - cyclopropane, cyclobutane, cyclopentane and cyclohexane. | 2 | Chalk & Talk | Black Board |
| 1.2 | Conformations of ethane | 1 | Chalk & Talk | LCD |
| 1.3 | Conformations of n-butane-conformational energy diagram | 1 | Lecture | Ball & Stick Models |
| 1.4 | Conformation of mono substituted cyclohexane-stability and optical activity | 3 | Lecture | Black Board |

| | | | | |
|---|---|---|---|---|
| 1.5 | conformation of disubstituted cyclohexanes stability | 3 | Lecture | Ball & Stick Models |
| 1.6 | conformation of disubstituted cyclohexanes optical activity | 2 | Lecture | Ball & Stick Models |
| 1.7 | decalins their stability | 1 | Lecture | PPT & White board |
| 1.8 | Decalins optical activity. | 2 | Discussion | Black Board |
| **UNIT -2** | **CONFORMATIONAL ANALYSIS- II** | | | |
| 2.1 | Conformation and physical properties | 1 | Lecture | Black Board |
| 2.2 | conformation and chemical reactivity | 2 | Chalk & Talk | Green Board |
| 2.3 | $S_N1$, $S_N2$, ionic eliminations | 2 | Chalk & Talk | Black Board |
| 2.4 | Rearrangements, NGP | 3 | Lecture | PPT & White board |
| 2.5 | Epoxide ring closure and ring opening reactions | 2 | Discussion | LCD |
| 2.6 | Addition to cyclohexene derivatives | 1 | Lecture | Black Board |
| 2.7 | Pyrolysis of acetates | 2 | Lecture | PPT & White board |
| 2.8 | Pyrolysis of xanthates and amine oxides | 2 | Lecture | Black Board |
| **UNIT -3** | **ORGANIC PHOTOCHEMISTRY** | | | |
| 3.1 | Organic photochemistry – Photochemical Elimination in carbonyl compounds and nitrites | 2 | Lecture | Black Board |
| 3.2 | Norrish type-I & Norrish type-II, Barton reaction | 3 | Discussion | LCD |
| 3.3 | Photochemical reduction, oxidation and cis-trans isomerisation | 3 | Lecture | PPT & White Board |
| 3.4 | Intermolecular cycloaddition ($2\pi + 2\pi$) & ($4\pi + 2\pi$) cycloadditions | 2 | Lecture | Black Board |

| | | | | |
|---|---|---|---|---|
| 3.5 | supara and antara overlap-FMO approach | 1 | Discussion | LCD |
| 3.6 | electrocyclic reactions- 4n & 4n+2 systems | 2 | Lecture | Black Board |
| 3.7 | Conrotation, disroattion | 1 | Lecture | Black Board |
| 3.8 | FMO approach to predict stereochemistry | 1 | Lecture | Black Board |
| **UNIT -4** | **MOLECULAR REARRANGEMENTS-I** | | | |
| 4.1 | Rearrangement to electron deficient atom or nucleophilic rearrangements | 1 | Lecture | Black Board |
| 4.2 | Mechanism of Pinacol-Pinacolone rearrangement | 3 | Chalk & Talk | Green Board |
| 4.3 | Mechanism of Wagner-Meerwin rearrangement | 2 | Chalk & Talk | Black Board |
| 4.4 | Mechanism of Hoffman and benzilic acid rearrangements | 3 | Lecture | PPT & White board |
| 4.5 | Rearrangements to electron rich atom or electrophilic rearrangements | 1 | Discussion | LCD |
| 4.6 | Mechanism of Stevens rearrangement | 1 | Lecture | Black Board |
| 4.7 | Aromatic rearrangements – Mechanism of Claisen rearrangement | 2 | Lecture | PPT & White board |
| 4.8 | Mechanism of Benzidine and Fries rearrangements. | 2 | Lecture | Black Board |
| **UNIT -5** | **MOLECULAR REARRANGEMENTS-I I** | | | |
| 5.1 | Favorski rearrangement | 2 | Lecture | Black Board |
| 5.2 | Baeyer Villiger rearrangement | 2 | Chalk & Talk | Green Board |
| 5.3 | Cope and Curtius rearrangements | 3 | Chalk & Talk | Black Board |
| 5.4 | Beckmann rearrangement | 1 | Lecture | PPT & White board |

| | | | | |
|---|---|---|---|---|
| 5.5 | Synthetic importance of N – Bromosuccinimide and Osmium tetroxide | 2 | Discussion | LCD |
| 5.6 | Synthetic importance of Selenium dioxide | 1 | Lecture | Black Board |
| 5.7 | Synthetic importance of Pyridinium Chloro Chromite | 2 | Lecture | PPT & White board |
| 5.8 | Synthetic importance of Lithium Aluminium Hydride and Sodium Boro Hydride | 2 | Lecture | Black Board |

| Levels | C1 | C2 | C3 | C4 | Total Scholastic Marks | Non Scholastic Marks C5 | CIA Total | % of Assessment |
|---|---|---|---|---|---|---|---|---|
| | Session-wise Average 5 Mks. | Better of W1, W2 5 Mks | M1+M2 5+5=10 Mks. | MID-SEM TEST 15 Mks | 35 Mks. | 5 Mks. | 40Mks. | |
| **K1** | **5** | **-** | **-** | **2 ½** | **7.5** | - | **7.5** | 18.75 % |
| **K2** | **-** | **5** | **4** | **2 ½** | **11.5** | - | **11.5** | 28.75 % |
| **K3** | **-** | **-** | **3** | **5** | **8** | - | **8** | 20 % |
| **K4** | **-** | **-** | **3** | **5** | **8** | - | **8** | 20 % |
| **Non Scholastic** | **-** | **-** | **-** | - | | **5** | **5** | 12.5 % |
| **Total** | **5** | **5** | **10** | **15** | **35** | **5** | **40** | **100 %** |

CIA

Scholastic **35**

Non Scholastic **5**

✔**All the course outcomes are to be assessed in the various CIA components.**

✔**The levels of CIA Assessment based on Revised Bloom's Taxonomy for :**

**K1-** Remember**,** **K2-**Understand**,** **K3-**Apply**,** **K4-**Analyse

## EVALUATION PATTERN

| SCHOLASTIC | | | | NON – SCHOLASTIC | MARKS | | |
|---|---|---|---|---|---|---|---|
| C1 | C2 | C3 | C4 | C5 | CIA | ESE | Total |
| 5 | 10 | 15 | 5 | 5 | 40 | 60 | 100 |

**C1** – Average of Two Session Wise Tests

**C2** – Average of Two Monthly Tests

**C3** - Mid Sem Test

**C4** – Best of Two Weekly Tests

**C5** – Non - Scholastic

## COURSE OUTCOMES

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

| NO. | COURSE OUTCOMES | KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY) | PSOs ADDRESSED |
|---|---|---|---|

| | | | |
|---|---|---|---|
| CO 1 | To interpret the concept of conformations of acyclic and cyclic alkanes and to discuss mono and disubstituted cyclohexanes. | K1, K2, K3 &K4 | PSO1& PSO2 |
| CO 2 | To explore reactivity patterns of cyclohexanes and to employ conformational reactivity in cis and trans decalins. | K1, K2, K3 &K4 | PSO2 &PSO3 |
| CO 3 | To sketch Frontier molecular orbitals in photochemistry and to dramatize photochemical and electrocyclic reactions | K1, K2, K3 &K4 | PSO3 &PS05 |
| CO 4 | To differentiate the molecular rearrangements and to solve the simple problems | K1, K2, K3 &K4 | PS03&PS05 |
| CO 5 | To prepare the various organic reagents and to recall its synthetic importance and to categorize the reducing and oxidizing agents and its applications. | K1, K2, K3 &K4 | PS05 &PSO7 |

## Mapping of C0s with PSOs

| CO / PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6 | PSO 7 | PSO 8 |
|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 1 | 1 | 1 | 1 | 1 |
| CO2 | 2 | 3 | 3 | 1 | 1 | 1 | 1 | 1 |
| CO3 | 2 | 2 | 3 | 1 | 3 | 1 | 1 | 1 |
| CO4 | 2 | 1 | 3 | 1 | 3 | 1 | 1 | 1 |
| CO5 | 2 | 1 | 1 | 1 | 3 | 1 | 3 | 1 |

## Mapping of C0s with POs

| CO / PSO | PO1 | PO2 | PO3 | PO4 |
|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 2 |
| CO2 | 3 | 2 | 2 | 2 |
| CO3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 2 | 3 | 3 |
| CO5 | 3 | 2 | 2 | 3 |

**Note**:  Strongly Correlated – **3**  ModeratelyCorrelated – **2**
 WeaklyCorrelated -**1**

**COURSE DESIGNER:**

**1.Dr.M.Priyadharsani**

**2.Dr.B.Vinosha**

**Forwarded By**

**HoD Signature**

# III B.Sc.

# CHEMISTRY

# SEMESTER –VI

***For those who joined in 2021 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/WEEK | CREDITS |
|---|---|---|---|---|---|
| UACH | 19C6ME3 | ADVANCED ORGANIC CHEMISTRY (CONFORMATIONAL ANALYSIS, ORGANIC PHOTOCHEMISTRY AND MOLECULAR REARRANGEMENTS) | Elective | 5 | 5 |

**COURSE DESCRIPTION**

The course is offered to expose the advanced topics in the field of organic chemistry.

**COURSE OBJECTIVES**

This course helps the students to acquire a thorough knowledge of the advanced topics of organic chemistry related to conformational analysis of cyclohexanes, Photochemistry and molecular rearrangements.

**UNITS**

**UNIT –I CONFORMATIONAL ANALYSIS- I (15 HRS.)**

Stereoisomerism of ring systems- number and kind of stereoisomers- cyclopropane, cyclobutane, cyclopentane and cyclohexane. Conformations of ethane and n-butane-conformational energy diagram. Conformation of mono substituted cyclohexane-stability and optical activity-conformation of disubstitutedcyclohexanes-stability and optical activity and decalins their

stability and optical activity.

**UNIT –II CONFORMATIONAL ANALYSIS- II (15 HRS.)**

Conformation and physical properties, and conformation and chemical reactivity-$S_N1$, $S_N2$, ionic eliminations, rearrangements, NGP, epoxide ring closure and ring opening reactions, addition to cyclohexene derivatives, pyrolysis of acetates, xanthates and amine oxides.

**UNIT –III ORGANIC PHOTOCHEMISTRY (15 HRS.)**

Organic photochemistry –Photochemical Elimination in carbonyl compounds and nitrites- Norrish type-I & Norrish type-II, Barton reaction. Photochemical reduction, oxidation and cis-trans isomerisation, Intermolecular cycloaddition $(2\pi + 2\pi)$ & $(4\pi + 2\pi)$ cycloadditions, supara and antara overlap-FMO approach, and electrocyclic reactions ring opening and ring closure reactions- 4n & 4n+2 systems. Conrotation, disrotation. FMO approach to predict stereochemistry.

**UNIT –IV MOLECULAR REARRANGEMENTS-I (15HRS.)**

Rearrangement to electron deficient atom or nucleophilic rearrangements – Mechanism of Pinacol-Pinacolone, Wagner-Meerwin, Hoffman and benzilic acid rearrangement. Rearrangements to electron rich atom or electrophilic rearrangements – Stevens rearrangements. Aromatic rearrangements – Claisen, Benzidine and Fries rearrangement.

**UNIT –V MOLECULAR REARRANGEMENTS –II AND REAGENTS (15 HRS.)**

Favorski, Baeyer Villiger, Cope, Curtius and Beckmann rearrangements, Synthetic importance of N – Bromosuccinimide, Osmium tetroxide, Selenium dioxide, PyridiniumChloro Chromite, Lithium Aluminium Hydride and Sodium Boro Hydride.

**REFERENCES:**

**5.**Eliel- Stereochemistry of carbon compounds, Tata Mc-Graw Hill Edn, 1995.

**6.**Dr.P. Ramesh, Basic principles of Organic Stereochemistry, First Edn, Meenu Publications.

**7.**Morrison & Boyd, -Organic chemistry , 6th Edn, Prentice-hall of India pvt, Ltd, 2005.

**8.** Jagdamba Singh, Photochemistry and Pericyclic Reactions, New age international publishers, 2009.

**5**.I.L.Finar, Vol-I, Organic Chemistry, sixth Edn., ELBS & Longmann group Ltd.

**6.**V.K.Ahluwalia & R.K.Prashar, Organic Reaction Mechanism, First Edn, 2002, Narosa publishing House.

**7**. K. K. Rohatgi-Mukherjee, fundamentals of photochemistry, New age international publishers, 2006.

## COURSE CONTENTS & LECTURE SCHEDULE:

| Module No. | Topic | No. of Lectures | Teaching Pedagogy | Teaching Aids |
|---|---|---|---|---|
| **UNIT -1 CONFORMATIONAL ANALYSIS-I** | | | | |
| 1.1 | Stereoisomerism of ring systems-number and kind of stereoisomers - cyclopropane, cyclobutane, cyclopentane and cyclohexane. | 2 | Chalk & Talk | Black Board |
| 1.2 | Conformations of ethane | 1 | Chalk & Talk | LCD |
| 1.3 | Conformations of n-butane-conformational energy diagram | 1 | Lecture | Ball & Stick Models |
| 1.4 | Conformation of mono substituted cyclohexane-stability and optical activity | 3 | Lecture | Black Board |

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|---|---|---|---|---|
| 1.5 | conformation of disubstituted cyclohexanes stability | 3 | Lecture | Ball & Stick Models |
| 1.6 | conformation of disubstituted cyclohexanes optical activity | 2 | Lecture | Ball & Stick Models |
| 1.7 | decalins their stability | 1 | Lecture | PPT & White board |
| 1.8 | Decalins optical activity. | 2 | Discussion | Black Board |
| **UNIT -2** | **CONFORMATIONAL ANALYSIS- II** | | | |
| 2.1 | Conformation and physical properties | 1 | Lecture | Black Board |
| 2.2 | conformation and chemical reactivity | 2 | Chalk & Talk | Green Board |
| 2.3 | $S_N1$, $S_N2$, ionic eliminations | 2 | Chalk & Talk | Black Board |
| 2.4 | Rearrangements, NGP | 3 | Lecture | PPT & White board |
| 2.5 | Epoxide ring closure and ring opening reactions | 2 | Discussion | LCD |
| 2.6 | Addition to cyclohexene derivatives | 1 | Lecture | Black Board |
| 2.7 | Pyrolysis of acetates | 2 | Lecture | PPT & White board |
| 2.8 | Pyrolysis of xanthates and amine oxides | 2 | Lecture | Black Board |
| **UNIT -3** | **ORGANIC PHOTOCHEMISTRY** | | | |
| 3.1 | Organic photochemistry – Photochemical Elimination in carbonyl compounds and nitrites | 2 | Lecture | Black Board |
| 3.2 | Norrish type-I & Norrish type-II, Barton reaction | 3 | Discussion | LCD |
| 3.3 | Photochemical reduction, oxidation and cis-trans isomerisation | 3 | Lecture | PPT & White Board |
| 3.4 | Intermolecular cycloaddition ($2\pi + 2\pi$) & ($4\pi + 2\pi$) cycloadditions | 2 | Lecture | Black Board |

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|---|---|---|---|---|
| 3.5 | supara and antara overlap-FMO approach | 1 | Discussion | LCD |
| 3.6 | electrocyclic reactions- 4n & 4n+2 systems | 2 | Lecture | Black Board |
| 3.7 | Conrotation, disroattion | 1 | Lecture | Black Board |
| 3.8 | FMO approach to predict stereochemistry | 1 | Lecture | Black Board |
| **UNIT -4** | **MOLECULAR REARRANGEMENTS-I** | | | |
| 4.1 | Rearrangement to electron deficient atom or nucleophilic rearrangements | 1 | Lecture | Black Board |
| 4.2 | Mechanism of Pinacol-Pinacolone rearrangement | 3 | Chalk & Talk | Green Board |
| 4.3 | Mechanism of Wagner-Meerwin rearrangement | 2 | Chalk & Talk | Black Board |
| 4.4 | Mechanism of Hoffman and benzilic acid rearrangements | 3 | Lecture | PPT & White board |
| 4.5 | Rearrangements to electron rich atom or electrophilic rearrangements | 1 | Discussion | LCD |
| 4.6 | Mechanism of Stevens rearrangement | 1 | Lecture | Black Board |
| 4.7 | Aromatic rearrangements – Mechanism of Claisen rearrangement | 2 | Lecture | PPT & White board |
| 4.8 | Mechanism of Benzidine and Fries rearrangements. | 2 | Lecture | Black Board |
| **UNIT -5** | **MOLECULAR REARRANGEMENTS-I I** | | | |
| 5.1 | Favorski rearrangement | 2 | Lecture | Black Board |
| 5.2 | Baeyer Villiger rearrangement | 2 | Chalk & Talk | Green Board |
| 5.3 | Cope and Curtius rearrangements | 3 | Chalk & Talk | Black Board |
| 5.4 | Beckmann rearrangement | 1 | Lecture | PPT & White board |

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| 5.5 | Synthetic importance of N – Bromosuccinimide and Osmium tetroxide | 2 | Discussion | LCD |
| 5.6 | Synthetic importance of Selenium dioxide | 1 | Lecture | Black Board |
| 5.7 | Synthetic importance of Pyridinium Chloro Chromite | 2 | Lecture | PPT & White board |
| 5.8 | Synthetic importance of Lithium Aluminium Hydride and Sodium Boro Hydride | 2 | Lecture | Black Board |

| Levels | C1 | C2 | C3 | C4 | Total Scholastic Marks | Non Scholastic Marks C5 | CIA Total | % of Assessment |
|---|---|---|---|---|---|---|---|---|
| | Session-wise Average 5 Mks. | Better of W1, W2 5 Mks | M1+M2 5+5=10 Mks. | MID-SEM TEST 15 Mks | 35 Mks. | 5 Mks. | 40Mks. | |
| **K1** | **5** | **-** | **-** | **2 ½** | **7.5** | - | **7.5** | 18.75 % |
| **K2** | **-** | **5** | **4** | **2 ½** | **11.5** | - | **11.5** | 28.75 % |
| **K3** | **-** | **-** | **3** | **5** | **8** | - | **8** | 20 % |
| **K4** | **-** | **-** | **3** | **5** | **8** | - | **8** | 20 % |
| **Non Scholastic** | **-** | **-** | **-** | - | | **5** | **5** | 12.5 % |
| **Total** | **5** | **5** | **10** | **15** | **35** | **5** | **40** | **100 %** |

CIA

Scholastic **35**

Non Scholastic **5**

✔**All the course outcomes are to be assessed in the various CIA components.**

✔**The levels of CIA Assessment based on Revised Bloom's Taxonomy for :**

**K1-** Remember**,** **K2-**Understand**,** **K3-**Apply**,** **K4-**Analyse

## EVALUATION PATTERN

| SCHOLASTIC | | | | NON – SCHOLASTIC | MARKS | | |
|---|---|---|---|---|---|---|---|
| C1 | C2 | C3 | C4 | C5 | CIA | ESE | Total |
| 5 | 10 | 15 | 5 | 5 | 40 | 60 | 100 |

**C1** – Average of Two Session Wise Tests

**C2** – Average of Two Monthly Tests

**C3** - Mid Sem Test

**C4** – Best of Two Weekly Tests

**C5** – Non - Scholastic

## COURSE OUTCOMES

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

| NO. | COURSE OUTCOMES | KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY) | PSOs ADDRESSED |
|---|---|---|---|

| | | | |
|---|---|---|---|
| CO 1 | To interpret the concept of conformations of acyclic and cyclic alkanes and to discuss mono and disubstituted cyclohexanes. | K1, K2, K3 &K4 | PSO1& PSO2 |
| CO 2 | To explore reactivity patterns of cyclohexanes and to employ conformational reactivity in cis and trans decalins. | K1, K2, K3 &K4 | PSO2 &PSO3 |
| CO 3 | To sketch Frontier molecular orbitals in photochemistry and to dramatize photochemical and electrocyclic reactions | K1, K2, K3 &K4 | PSO3 &PS05 |
| CO 4 | To differentiate the molecular rearrangements and to solve the simple problems | K1, K2, K3 &K4 | PS03&PS05 |
| CO 5 | To prepare the various organic reagents and to recall its synthetic importance and to categorize the reducing and oxidizing agents and its applications. | K1, K2, K3 &K4 | PS05 &PSO7 |

## Mapping of C0s with PSOs

| CO / PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6 | PSO 7 | PSO 8 |
|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 1 | 1 | 1 | 1 | 1 |
| CO2 | 2 | 3 | 3 | 1 | 1 | 1 | 1 | 1 |
| CO3 | 2 | 2 | 3 | 1 | 3 | 1 | 1 | 1 |
| CO4 | 2 | 1 | 3 | 1 | 3 | 1 | 1 | 1 |
| CO5 | 2 | 1 | 1 | 1 | 3 | 1 | 3 | 1 |

## Mapping of C0s with POs

| CO / PSO | PO1 | PO2 | PO3 | PO4 |
|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 2 |
| CO2 | 3 | 2 | 2 | 2 |
| CO3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 2 | 3 | 3 |
| CO5 | 3 | 2 | 2 | 3 |

**Note**:  Strongly Correlated – **3**  ModeratelyCorrelated – **2**

 WeaklyCorrelated -**1**

**COURSE DESIGNER:**

**1.Dr.M.Priyadharsani2.Dr.B.Vinosha**

**Forwarded**

**HoD Signature**