**V.V.VANNIAPERUMAL COLLEGE FOR WOMEN**
(Belonging to Virudhunagar Hindu Nadars)
An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
*Reaccredited with 'A++' Grade (4th Cycle) by NAAC*
**VIRUDHUNAGAR**
**Quality Education with Wisdom and Values**

# OUTCOME BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM REGULATIONS AND SYLLABUS

**(with effect from Academic Year 2023 - 2024)**

V.V.Vanniaperumal College for Women, Virudhunagar, established in 1962, offers 13 UG Programmes(Aided), 15 UG Programmes(SF), 15 PG Programmes and 6 Ph.D. Programmes. The curricula for all these Programmes, except Ph.D. Programmes, have been framed as per the guidelines given by the University Grants Commission (UGC) &Tamil Nadu State Council for Higher Education (TANSCHE) under Choice Based Credit System (CBCS) and the guidelines for Outcome Based Education (OBE).

The Departments of Commerce, English, History, Mathematics, Biochemistry and Tamil upgraded as Research Centres offer Ph.D. Programmes as per the norms and regulations of Madurai Kamaraj University, Madurai and do not come under the purview of CBCS.

## A. CHOICE BASED CREDIT SYSTEM (CBCS)

The CBCS provides an opportunity for the students to choose Courses from the prescribed Courses. The CBCS is followed as per the guidelines formulated by the UGC. The performance of students is evaluated based on the uniform grading system. Computation of the Cumulative Grade Point Average (CGPA) is made to ensure uniformity in evaluation system.

**List of Programmes in which CBCS/Elective Course System is implemented**

**UG PROGRAMMES**

| | | |
|---|---|---|
| Arts & Humanities | : | History (E.M. & T.M.), English, Tamil |
| Physical & Life Sciences | : | Mathematics, Zoology, Chemistry, Physics, Biochemistry, Home Science - Nutrition and Dietetics, Costume Design and Fashion, Microbiology, Biotechnology, Computer Science, Information Technology, Data Science, Computer Applications and Computer Applications - Graphic Design |
| Commerce & Management | : | Commerce, Commerce (Computer Applications), Commerce (Professional Accounting), Business Administration |

**PG PROGRAMMES**

| | | |
|---|---|---|
| Arts & Humanities | : | History, English, Tamil |
| Physical & Life Sciences | : | Mathematics, Physics, Chemistry, Zoology, Biochemistry, Home Science - Nutrition and Dietetics, Biotechnology, Computer Science, Computer Science (Data Science) and Computer Applications (MCA) * |
| Commerce & Management | : | Commerce, Business Administration (MBA) * |

* AICTE approved Programmes

**OUTLINE OF CHOICE BASED CREDIT SYSTEM – UG**

1. Core Courses
2. Elective Courses
    - Generic Elective Courses
    - Discipline Specific Elective Courses (DSEC)
    - Non Major Elective Courses (NMEC)
3. Skill Enhancement Courses (SEC)
4. Environmental Studies (EVS)
5. Value Education
6. Self Study Courses (Online)
7. Extra Credit Courses (Self Study Courses) (Optional)

**List of Non Major Elective Courses (NME)**

**(2023-2024 onwards)**

**UG PROGRAMMES**

| Name of the Course | Course Code | Semester | Department |
|---|---|---|---|
| Introduction to Tourism | 23UHIN11 | I | History(EM) |
| Indian Constitution | 23UHIN21 | II | History(EM) |
| சுற்றுலா ஓர் அறிமுகம் | 23UHIN11 | I | History (TM) |
| இந்திய அரசியலமைப்பு | 23UHIN21 | II | History(TM) |
| Popular Literature and Culture | 23UENN11 | I | English |
| English for Professions | 23UENN21 | II | |
| பேச்சுக்கலைத்திறன் | 23UTAN11 | I | Tamil |
| பயன்முறைத் தமிழ் | 23UTAN21 | II | |
| Practical Banking<br>Basic Accounting Principles | 23UCON11<br>23UCON22 | I<br>II | Commerce (Aided) |
| Financial Literacy-I<br>Financial Literacy -II | 23UCON12<br>23UCON21 | I<br>II | Commerce (SF) |

| | | | |
|---|---|---|---|
| Self-Employment and Startup Business<br>Fundamentals of Marketing | 23UCCN11<br>23UCCN21 | I<br>II | Commerce CA (SF) |
| Women Protection Laws | 23UCPN11 | I | Commerce (Professional Accounting) |
| Basic Labour Laws | 23UCPN21 | II | |
| Basics of Event Management | 23UBAN11 | I | Business Administration |
| Business Management | 23UBAN21 | II | |
| Quantitative Aptitude I | 23UMTN11 | I | Mathematics |
| Quantitative Aptitude II | 23UMTN21 | II | |
| Physics for Everyday life -I | 23UPHN11 | I | Physics |
| Physics for Everyday life -II | 23UPHN21 | II | |
| Food Chemistry | 23UCHN11 | I | Chemistry |
| Drugs and Natural Products | 23UCHN21 | II | |
| Ornamental fish farming and Management | 23UZYN11 | I | Zoology |
| Biocomposting for Entrepreneurship | 23UZYN21 | II | |
| Foundations of Baking and Confectionery | 23UHSN11 | I | Home Science – Nutrition and Dietetics |
| Basic Nutrition and Dietetics | 23UHSN21 | II | |
| Nutrition and Health | 23UBCN11 | I | Biochemistry |
| Life Style Diseases | 23UBCN21 | II | |
| Social and Preventive Medicine | 23UMBN11 | I | Microbiology |
| Nutrition & Health Hygiene | 23UMBN21 | II | |
| Herbal Medicine | 23UBON11 | I | Biotechnology |
| Organic farming and Health Management | 23UBON21 | II | |
| Basics of Fashion | 23UCFN11 | I | Costume Design And Fashion |
| Interior Designing | 23UCFN21 | II | |
| Office Automation | 23UCSN11 | I | Computer Science |
| Introduction to Internet and HTML 5 | 23UCSN21 | II | |
| Office Automation | 23UITN11 | I | Information Technology |
| Introduction to HTML | 23UITN21 | II | |
| Introduction to HTML | 23UCAN11 | I | Computer Applications |
| Fundamentals of Computers | 23UCAN21 | II | |
| Introduction to HTML | 23UGDN11 | I | Computer Applications - Graphic Design |
| Fundamentals of Computers | 23UGDN21 | II | |
| Organic Farming | 23UBYN11 | I | Botany |
| Nursery and Landscaping | 23UBYN12 | | |
| Mushroom Cultivation | 23UBYN21 | II | |
| Medicinal Botany | 23UBYN22 | | |
| Cadet Corps for Career Development I | 23UNCN11 | I | National Cadet Corps |
| Cadet Corps for Career Development II | 23UNCN21 | II | |

## B. OUTCOME BASED EDUCATION (OBE) FRAMEWORK

The core philosophy of Outcome Based Education rests in employing a student - centric learning approach to measure the performance of students based on a set of pre-determined outcomes. The significant advantage of OBE is that it enables a revamp of the curriculum based on the learning outcomes, upgrade of academic resources, quality enhancement in research and

integration of technology in the teaching –learning process. It also helps in bringing clarity among students as to what is expected of them after completion of the Programme in general and the Course in particular. The OBE directs the teachers to channelize their teaching methodologies and evaluation strategies to attain the PEOs and fulfill the Vision and Mission of the Institution.

**Vision of the Institution**

The founding vision of the Institution is to impart Quality Education to the rural womenfolk and to empower them with knowledge and leadership quality.

**Mission of the Institution**

The mission of the Institution is to impart liberal education committed to quality and excellence. Its quest is to mould learners into globally competent individuals instilling in them life-oriented skills, personal integrity, leadership qualities and service mindedness.

## B.1 Programme Educational Objectives, Programme Outcomes and Programme Specific Outcomes

It is imperative for the institution to set the Programme Educational Objectives (PEOs), Programme Outcomes (POs) and Course Outcomes (COs), consistent with its Vision and Mission statements. The PEOs and the POs should be driven by the mission of the institution and should provide distinctive paths to achieve the stated goals. The PEOs for each Programme have to fulfill the Vision and Mission of the Department offering the Programme.

**Vision of the Department of Chemistry**

To empower rural young women through quality education in the field of chemical sciences with both theoretical and technical knowledge to pursue higher education to fulfill the regional, national and global demands.

**Mission of the Department of Chemistry**

- Offering learners deep knowledge in the theoretical and practical chemistry for their profession development.
- Developing research aptitude and personality.
- Facilitating learners to recognize the applications of chemistry in everyday life to progress as entrepreneurs.
- Inculcating social awareness and responsibility.

### B.1.1 Programme Educational Objectives (PEOs)

PEOs are broad statements that describe the career and professional achievements that the Programme is preparing the graduates to achieve within the first few years after graduation. PEOs are framed for each Programme and should be consistent with the mission of the Institution.

**The Programme Educational Objectives of B.Sc., Chemistry programme**

**The students will be able to**

- To pursue further studies and succeed in academic and research Careers.
- To have opportunities to get employment at local and national level and to work as a teacher, analyst, quality controller, research assistant and in government sector jobs.
- To provide solutions for social issues such as environmental protection, occupational health and safety resource management and appropriate business skills.

| **Key components of the mission statement** | **PEO 1** | **PEO 2** | **PEO 3** |
|---|---|---|---|
| Deep knowledge in theoretical and practical chemistry | ✓ | ✓ | ✓ |
| Profession development | ✓ | ✓ | ✓ |
| Research aptitude and personality | ✓ | ✓ | - |
| Applications of chemistry in everyday life to progress as entrepreneurs | - | ✓ | ✓ |
| Social awareness and responsibility | - | ✓ | ✓ |

**B.1.2 Programme Outcomes (POs)**

POs shall be based on Graduate Attributes (GAs) of the Programme. The GAs are the attributes expected of a graduate from a Programme in terms of knowledge, skills, attitude and values. The Graduate Attributes include Disciplinary Knowledge, Communication Skills, Critical Thinking, Problem Solving, Analytical Reasoning, Research Related Skills, Co-operation/Team Work, Scientific Reasoning, Reflective Thinking, Information/Digital Literacy, Multicultural Competence, Moral and Ethical Awareness/Reasoning, Leadership Qualities and Lifelong Learning.

**On successful completion of the Programme, the students will be able to**

1 apply effectively the acquired knowledge and skill in the field of Arts, Physical Science, Life Science, Computer Science, Commerce and Management for higher studies and employment. (*Disciplinary Knowledge*)

2 articulate innovative thoughts and ideas proficiently in both in spoken and written forms. (*Communication Skills)*

3 identify, formulate and solve problems in real life situations scientifically / systematically by adapting updated skills in using modern tools and techniques. (*Scientific Reasoning and Problem Solving)*

*4* critically analyse, synthesize and evaluate data, theories and ideas to provide valid suggestions through assignments, case studies, Internship and projects for the fullfillment of the local, national and global developmental needs. (*Critical Thinking and Analytical Reasoning)*

*5* use ICT in a variety of self-directed lifelong learning activities to face career challenges in the changing environment. (*Digital Literacy, Self - directed and Lifelong Learning)*

6 self-manage and function efficiently as a member or a leader in diverse teams in a multicultural society for nation building. (*Co-operation/Team Work and Multicultural Competence)*

7 uphold the imbibed ethical and moral values in personal, professional and social life for sustainable environment. (*Moral and Ethical Awareness)*

**B.1.3 Programme Specific Outcomes (PSOs)**

Based on the Programme Outcomes, Programme Specific Outcomes are framed for each UG Programme**.** Programme Specific Outcomes denote what the students would be able to do at the time of graduation. They are Programme specific. It is mandatory thateach PO should be mapped to the respective PSO.

**On completion of B.Sc. Chemistry Programme, the students will be able to**

**PO1-***Disciplinary Knowledge*

**PSO** 1.a: Apply the gained advanced knowledge in inorganic, organic and physical chemistry and related courses to pursue higher studies and employment.

**PSO** 1.b: Apply the good laboratory practices in core and related courses by appropriate experimental methods and safety measures and thereby updating their knowledge and skills to become successful entrepreneurs.

**PO2-***Communication Skills*

**PSO 2.a:** Develop the confidence to articulate the basic concepts in chemistry in a clear and concise manner to fetch employment.

**PSO** 2b: Develop competence to draw complex chemical structures and to execute and report the results of an experiment in a systematic way.

**PO3 -***Scientific Reasoning and Problem Solving*

**PSO 3.a**: Identify chemical formulae and analyse food, water and oil samples qualitatively

and quantitatively by adapting updated skills in using modern tools and techniques for research activities..

**PSO 3.b**: Characterize the compounds extracted from natural sources by applying the basic principles of various chemical methods for recent research.

**PO4 -***Critical thinking and Analytical Reasoning*

**PSO 4.a**: Critically analyze the concepts, theories and equations in various divisions of chemistry and perceive their significance in chemical industries and to conserve the environment in daily life.

**PSO 4.b**: Apply the integrated knowledge of different sections of chemistry and associated Courses to create startup and thereby developing their research towards the development of new products.

**PO5 -***Digital Literacy, Self - directed and Lifelong learning*

PSO 5.a: Acquire the ability to engage in independent and life-long learning trained at personal/career development concerning to their area of interest using contemporary digital tools to face the alteration of personal and social circumstances.

PSO 5.b: Exhibit excellence in industrial pursuits that contribute towards the holistic development of self and community

**PO6 -***Cooperation/Team Work and Multi-Cultural Competence*

**PSO 6:** Promote self management in efficient functioning of an individual as an exemplary in representing and solving the current issues in a multicultural society for good nation building through their internship, group practical, co-curricular, extra curricular and extension activities.

**PO7**- *Moral and Ethical awareness*

**PSO 7:**Adapt the universal ethics and morals of chemical acts and practice the imbibed moral principles in their career and humanity to accomplish a green environment.

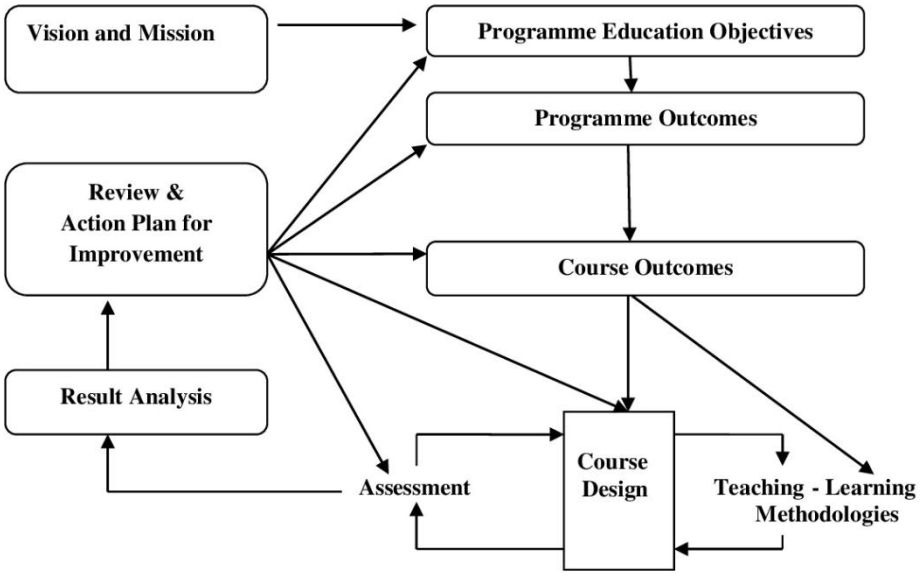
**PO-PEO Mapping Matrix**

Attainment of PEOs can be measured by a PO-PEO matrix. PEOs should evolve through constant feedback from alumnae, students, industry, management, *etc*. It is mandatory that each PEO should be mapped to at least one of the POs.

| PEOs / POs/PSOs | PEO1 | PEO2 | PEO3 |
|---|---|---|---|
| **PO1/PSO1.a** | - | ✓ | ✓ |
| **PO1/PSO1.b** | ✓ | ✓ | ✓ |
| **PO2/PSO2.a** | ✓ | ✓ | - |
| **PO2/PSO2.b** | ✓ | ✓ | - |
| **PO3/PSO3** | - | ✓ | ✓ |
| **PO4/PSO4.a** | - | ✓ | ✓ |
| **PO4/PSO4.b** | ✓ | ✓ | - |
| **PO5/PSO5** | ✓ | ✓ | - |
| **PO6/PSO6** | - | ✓ | ✓ |
| **PO7/PSO7** | - | - | ✓ |

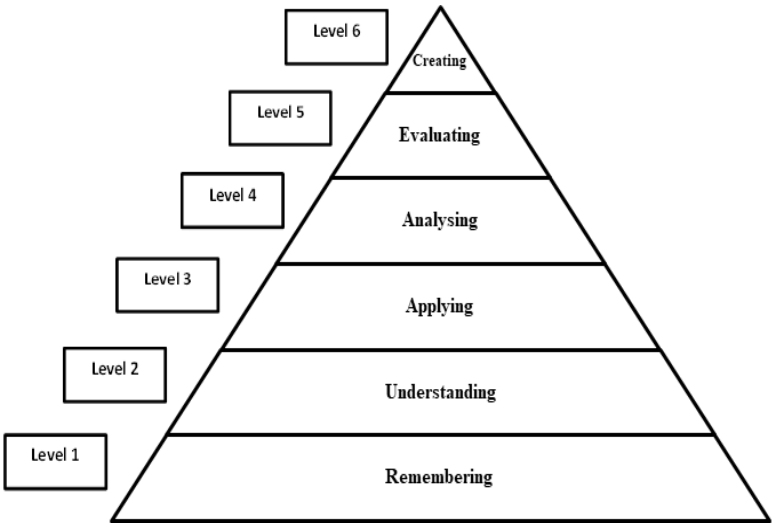
### B.1.4 Course Outcomes (COs)

Course Outcomes are narrow statements restricted to the Course contents given in five units. Course Outcomes describe what students would be capable of, after learning the contents of the Course. They reflect the level of knowledge gained, skills acquired and attributes developed by the students after learning of Course contents. COs are measurable, attainable and manageable in number. COs contribute to attain POs in such a way that each CO addresses at least one of the POs and also each PO is reasonably addressed by adequate number of COs.



It is important to determine the methods of assessment. A comprehensive assessment strategy may be outlined using the revised Bloom's Taxonomy levels.

**BLOOM'S TAXONOMY**




**CO – PO Mapping of Courses**

After framing the CO statements, the COs framed for each Course is mapped with POs based on the relationship that exists between them. The COs which are not related toany of the POs is indicated with (-), signifying Nil. Measurement Mapping is based on Four Points Scale [High (H), Medium (M), Low (L) and Nil (-)]. For calculating weighted percentage of contribution of each Course in the attainment of the respective POs, the weights assigned for H, M and L are 3, 2and 1 respectively.

**CO-PO/PSO Mapping Table (Course Articulation Matrix)**

| PO/PSOs / COs | PO1/ PSO1 | PO2/ PSO2 | PO3/ PSO3 | PO4/ PSO4 | PO5/ PSO5 | PO6/ PSO6 | PO7/ PSO7 |
|---|---|---|---|---|---|---|---|
| **CO1** | | | | | | | |
| **CO2** | | | | | | | |
| **CO3** | | | | | | | |
| **CO4** | | | | | | | |
| **CO5** | | | | | | | |

**ELIGIBILITY FOR ADMISSION**

The candidate should have passed the Higher Secondary Examination conducted by the Board of Higher Secondary Education, Tamil Nadu or any other equivalent examination accepted by the Academic Council with Mathematics/Botany as one of the subjects in Higher Secondary Course.

**DURATION OF THE PROGRAMME**

The candidates shall undergo the prescribed Programme of study for a period of three academic years (six semesters).

**MEDIUM OF INSTRUCTION**

English

**COURSES OFFERED**

| | | |
|---|---|---|
| Part I | : | Tamil/Hindi Course |
| Part II | : | English |
| Part III | : | Core Courses |
| | | Elective Courses<br>• Generic Elective Courses<br>• Discipline Specific Elective Courses |
| | | Self Study Course - online |
| Part IV | : | Skill Enhancement Courses (SEC) |
| | | Elective Course (NMEC) |
| | | Environmental Studies<br>Value Education |
| | | Field Project/Internship |
| | | Self Study Course - online |
| Part V | : | National Service Scheme/ Physical Education/ Youth Red Cross Society/ Red Ribbon Club/ Science Forum/ Eco Club/ Library and Information Science/ Consumer Club/ Health and Fitness Club/ National Cadet Corps/ Rotaract Club |

## B.2 EVALUATION SCHEME

### B.2.1.PART II

| Components | Internal Assessment Marks | Summative Examination Marks | Total Marks |
|---|---|---|---|
| Theory | 15 | 60 | 100 |
| Practical | 5 | 15 | |
| Assignment | 5 | - | |

**Three Periodic Tests - Average of the best two will be considered**

### B.2.2.Part I & PART III - Core Courses, Elective Courses (Generic, DSEC)

| Components | Internal Assessment Marks | External Examination Marks | Total Marks |
|---|---|---|---|
| Theory | 25 | 75 | **100** |

**INTERNAL ASSESSMENT**

**Distribution of Marks**

**Theory**

| Mode of Evaluation | | | Marks |
|---|---|---|---|
| Periodic Test | | : | 15 |
| Assignment | K3 Level | : | 5 |
| Quiz | K1 Level | : | 5 |
| **Total** | | **:** | **25** |

Three Periodic Tests - Average of the best two will be considered

Two Assignments - Better of the two will be considered

Three Quiz Tests - Best of the three will be considered

**Practical**

| Mode of Evaluation | | Marks |
|---|---|---|
| Practical Test* | : | 30 |
| Record & Performance | : | 10 |
| **Total** | **:** | **40** |

*Average of the Two Practical Tests will be considered

**Question Pattern for Internal Tests** **Duration: 2 Hours**

| Section | Q. No. | Types of Question | No. of Questions | No. of Questions to be answered | Marks for each Question | Total Marks |
|---|---|---|---|---|---|---|
| A | 1 - 4 | Multiple Choice | 4 | 4 | 1 | 4 |
| B | 5 -6 | Internal Choice - Either … or Type | 3 | 3 | 7 | 21 |
| C | 8 -9 | Internal Choice - Either… or Type | 2 | 2 | 10 | 20 |
| | | | | | **Total** | **45*** |

*The total marks obtained in the Periodic Test will be calculated for 15 marks

**SUMMATIVE EXAMINATION**

**Question Pattern** **Duration: 3 Hours**

**PROJECT**

**Assessment by Internal Examiner Only**

**Internal Assessment**

**Distribution of Marks**

| Mode of Evaluation | : | Marks |
|---|---|---|
| Project work and Report | : | 60 |
| Presentation and Viva –Voce | : | 40 |

| Section | Q. No. | Types of Question | No. of Questions | No. of Questions to be answered | Marks for each Question | Total Marks |
|---|---|---|---|---|---|---|
| A | 1 -10 | Multiple Choice | 10 | 10 | 1 | 10 |
| B | 11 - 15 | Internal Choice – Either …or Type | 5 | 5 | 7 | 35 |
| C | 16 - 18 | Internal Choice –Either… or Type | 3 | 3 | 10 | 30 |
| | | | | | **Total** | **75** |

| | | |
|---|---|---|
| Total | : | 100 |

## B.2.3 PART IV - Skill Enhancement Courses, Non Major Elective Courses and Foundation Course

### B.2.3.1 FOUNDATATION COURSE

**INTERNAL ASSESSMENT**
**Distribution of Marks**
**Theory**

| Mode of Evaluation | | | Marks |
|---|---|---|---|
| Periodic Test | | : | 15 |
| Assignment | K2 Level | : | 5 |
| Quiz | K1 Level | : | 5 |
| **Total** | | **:** | **25** |

Three Periodic Tests - Average of the best two will be considered

Two Assignments - Better of the two will be considered

Three Quiz Tests - Best of the three will be considered

**Question Pattern for Periodic Tests** **Duration: 1 Hour**

| Section | Q.No. | Types of Question | No. of Questions | No. of Questions to be answered | Marks for each Question | Total Marks |
|---|---|---|---|---|---|---|
| A | 1 - 3 | Internal Choice - Either …or Type | 3 | 3 | 5 | 15 |
| B | 4 | Internal Choice – Either …or Type | 1 | 1 | 10 | 10 |
| | **Total** | | | | | **25*** |

*The total marks obtained in the Periodic Test will be calculated for 15 marks

**SUMMATIVE EXAMINATION**

| **Mode of Evaluation** | | **Marks** |
|---|---|---|
| Summative Examination | : | 50 |
| Online Quiz<br>(Multiple Choice Questions - K2 Level) | : | 25 |
| **Total** | **:** | **75** |

**Question Pattern** **Duration: 2 Hours**

| **Section** | **Q.No.** | **Types of Question** | **No. of Questions** | **No. of Questions to be answered** | **Marks for each Question** | **Total Marks** |
|---|---|---|---|---|---|---|
| A | 1 - 5 | Internal Choice - Either … or Type | 5 | 5 | 6 | 30 |
| B | 6 - 7 | Internal Choice – Either… or Type | 2 | 2 | 10 | 20 |
| | **Total** | | | | | **50** |

## B.2.3.2 Skill Enhancement Course - Entrepreneurial skills

**INTERNAL ASSESSMENT ONLY**
**Distribution of Marks**

| **Mode of Evaluation** | | **Marks** |
|---|---|---|
| Periodic Test | : | 15 |
| Assignment | : | 5 |
| Quiz | : | 5 |
| Model Examinations | : | 60 |
| Online Quiz(Multiple Choice Questions - K2 Level) | : | 15 |
| **Total** | **:** | **100** |

**Question Pattern for Periodic Tests** **Duration: 1 Hour**

| **Section** | **Types of Question** | **No. of Questions** | **No. of Questions to be answered** | **Marks for each Question** | **Total Marks** |
|---|---|---|---|---|---|
| A<br>Q. No.(1- 3) | Internal Choice – Either Or Type | 3 | 3 | 6 | 18 |
| B<br>Q. No.(4) | Internal Choice – Either Or Type | 1 | 1 | 12 | 12 |
| **Total** | | | | | **30** |

Two Periodic Tests - Better of the two will be considered

Two Assignments - Better of the two will be considered

Two Quiz Tests - Better of the two will be considered

**Question Pattern for Model Examination** **Duration: 2 Hours**

| **Section** | **Types of Question** | **No. of Questions** | **No. of Questions to be answered** | **Marks for each Question** | **Total Marks** |
|---|---|---|---|---|---|
| A<br>Q. No.(1-5) | Internal Choice – Either Or Type | 5 | 5 | 6 | 30 |
| B<br>Q. No.(6- 8) | Internal Choice – Either Or Type | 3 | 3 | 10 | 30 |
| **Total** | | | | | **60** |

## B.2.3.3 Skill Enhancement Courses/ Non Major Elective Courses

**INTERNAL ASSESSMENT**

**Distribution of Marks**

**Theory**

| **Mode of Evaluation** | | | **Marks** |
|---|---|---|---|
| Periodic Test | | : | 15 |
| Assignment | K3 Level | : | 5 |
| Quiz | K2 Level | : | 5 |
| **Total** | | **:** | **25** |

Three Periodic Tests - Average of the best two will be considered

Two Assignments - Better of the two will be considered

Three Quiz Tests - Best of the three will be considered

**Question Pattern for Periodic Tests** **Duration: 1 Hour**

| **Section** | **Q.No.** | **Types of Question** | **No. of Questions** | **No. of Questions to be answered** | **Marks for each Question** | **Total Marks** |
|---|---|---|---|---|---|---|
| A | 1 - 3 | Internal Choice - Either …or Type | 3 | 3 | 5 | 15 |
| B | 4 | Internal Choice – Either …or Type | 1 | 1 | 10 | 10 |
| | **Total** | | | | | **25*** |

*The total marks obtained in the Periodic Test will be calculated for 15 marks

**SUMMATIVE EXAMINATION**

| **Mode of Evaluation** | | **Marks** |
|---|---|---|
| Summative Examination | : | 50 |
| Online Quiz | : | 25 |

| | | |
|---|---|---|
| (Multiple Choice Questions - K2 Level) | | |
| **Total** | **:** | **75** |

**Question Pattern** **Duration: 2 Hours**

| Section | Q.No. | Types of Question | No. of Questions | No. of Questions to be answered | Marks for each Question | Total Marks |
|---|---|---|---|---|---|---|
| A | 1 - 5 | Internal Choice - Either … or Type | 5 | 5 | 6 | 30 |
| B | 6 - 7 | Internal Choice – Either… or Type | 2 | 2 | 10 | 20 |
| | **Total** | | | | | **50** |

## B.2.4 PART IV- ENVIRONMENTAL STUDIES / VALUE EDUCATION

**INTERNAL ASSESSMENT ONLY**

**Evaluation Pattern**

| Mode of Evaluation | | Marks |
|---|---|---|
| Periodic Test | : | 15 |
| Assignment (Based on the listed activities) - K3 Level | : | 10 |
| Online Quiz (Multiple Choice Questions - K2 Level) | : | 25 |
| Poster Presentation - K3 Level | : | 10 |
| Report on student's Awareness creation on Environmental Protection /Ethical Values - K3 Level | : | 10 |
| Model Examination | : | 30 |
| **Total** | **:** | **100** |

Three Assignment - Best of the three will be considered

**Question Pattern for Periodic Tests** **Duration: 1 Hour**

| Section | Types of Question | No. of Questions | No. of Questions to be answered | Marks for each Question | Total Marks |
|---|---|---|---|---|---|
| A Q. No.(1- 3) | Internal Choice – Either Or Type | 3 | 3 | 6 | 18 |
| B Q. No.(4) | Internal Choice – Either Or Type | 1 | 1 | 12 | 12 |

| **Total** | **30*** |
|---|---|

Two Periodic tests - Better of the two will be considered
The total marks obtained in the Periodic test will be calculated for 15 marks

**Question Pattern for Model Examination** **Duration: 2 ½ Hours**

| **Section** | **Q.No.** | **Types of Question** | **No. of Questions** | **No. of Questions to be answered** | **Marks for each Question** | **Total Marks** |
|---|---|---|---|---|---|---|
| A | 1 - 5 | Internal Choice - Either … or Type | 5 | 5 | 6 | 30 |
| B | 6 - 8 | Internal Choice – Either… or Type | 3 | 3 | 10 | 30 |
| | **Total** | | | | | **60*** |

*The total marks obtained in the Model Examination will be calculated for 30 marks

### B.2.5 PART IV- Internship/ Field Project

Internship / Field Project is compulsory for II year UG Science Students

- **Internship:** A designated activity that carries one credit involving not less than 15 days of working in an organization under the guidance of an identified mentor
- **Field Project:** Students comprising of maximum 5 members in a team need to undertake project that involve conducting surveys inside/outside the college premises and collection of data from designated communities or natural places.
- Assessment by Internal Examiner only

| **Mode of Evaluation** | | **Marks** |
|---|---|---|
| Onsite Learning/Survey | : | 50 |
| Report | : | 25 |
| Viva-Voce | : | 25 |
| **Total** | | **100** |

### B.2.6 SELF STUDY COURSE

### B.2.6 .1 PART III - Core & Elective Courses Quiz – Online

- Assessment by Internal Examiner only
- Question Bank is prepared by the Faculty Members of the Departments for all the Core and Elective Courses offered in all the Semesters.
- No. of Questions to be taken 700.
- Multiple Choice Question pattern is followed.

- Online Test will be conducted in VI Semester for 100 Marks.
- Model Examination is conducted after two periodic tests.

**Distribution of Marks**

| Mode of Evaluation | | Marks |
|---|---|---|
| Periodic Test | : | 25 |
| Model Examination | : | 75 |
| | **:** | **100** |

Two Periodic Tests - Better of the two will be considered

**B.2.6 .2 PART IV - Practice for Competitive Examinations – Online**

Assessment by Internal Examiner only

- Question Bank prepared by the Faculty Members of the respective Departments will be followed.
- Multiple Choice Question pattern is followed.
- Online Test will be conducted in V Semester for 100 Marks.
- Model Examination is conducted after two periodic tests.

**Subject wise Allotment of Marks**

| Subject | | Marks |
|---|---|---|
| Tamil | : | 10 |
| English | : | 10 |
| History | : | 10 |
| Mathematics | : | 10 |
| Current affairs | : | 10 |
| Commerce, Law & Economics | : | 10 |
| Physical Sciences | : | 10 |
| Life Sciences | : | 15 |
| Computer Science | : | 5 |
| Food and Nutrition | : | 5 |
| Sports and Games | : | 5 |
| **Total** | **:** | **100** |

**Distribution of Marks**

| Mode of Evaluation | | Marks |
|---|---|---|
| Periodic Test | : | 25 |
| Model Examination | : | 75 |
| **Total** | **:** | **100** |

Two Periodic Tests - Better of the two will be considered

**B.2.7. Part V – Extension Activities**

**INTERNAL ASSESSMENT ONLY**

**Distribution of Marks**

| **Mode of Evaluation** | | **Marks** |
|---|---|---|
| Attendance | : | 5 |
| Performance | : | 10 |
| Report/Assignment/Project/Camp/Practical | : | 10 |
| **Total** | **:** | **25*** |

*The marks obtained will be calculated for 100 marks

**B.2.8 EXTRA CREDIT COURSES (OPTIONAL)**

**2.8.1 Extra Credit Course offered by the Department.**

Assessment by Internal Examiner Only (To be conducted along with the III Periodic Test)

**Distribution of Marks**

| **Mode of Evaluation** | | **Marks** |
|---|---|---|
| Quiz<br>(Multiple Choice Questions) | : | 25 |
| Model Examination | : | 75 |
| **Total** | **:** | **100** |

**Question Pattern for Model Examination**

| **Section** | **Types of Question** | **No. of Questions** | **No. of Questions to be answered** | **Marks for each Question** | **Total Marks** |
|---|---|---|---|---|---|
| A<br>Q.No.(1-5) | Internal Choice-Either or Type | 5 | 5 | 7 | 35 |
| B<br>Q.No.(6-9) | Internal Choice-Either or Type | 4 | 4 | 10 | 40 |
| | | | | **Total** | **75** |

**2.8.2 Extra credit Course offered by MOOC (Massive Open Online Course)**

- The Courses shall be completed within the first V Semesters of the Programme.
- The allotment of credits is as follows **(Maximum of 10 credits)**

4weeks Course - 1 credit

8 weeks Course - 2 credits

12 weeks Course - 3 credits

**ELIGIBILITY FOR THE DEGREE**

- The candidate will not be eligible for the Degree without completing the prescribed Courses of study, lab work, *etc.*, and a minimum Pass marks in all the Courses.
  - No Pass minimum for Internal Assessment.
  - Pass minimum for External Examination is 27 marks out of 75 marks for Core Courses, Elective Courses (Generic Elective, DSEC Courses)
  - Pass minimum for External Examination is 18 marks out of 50 marks for Skill Enhancement Courses and Non Major Elective Courses (NMEC).
  - The aggregate minimum pass percentage is 40.
  - Pass minimum for External Practical Examination is 21 marks out of 60 marks.
  - Pass minimum for Ability Enhancement Compulsory Courses is 40 marks.
  - Pass minimum for Self Study Courses is 40 marks.

- **ATTENDANCE**

  - For UG, PG Programmes,

(a) The students who have attended the classes for 76 days (85%) and above are permitted to appear for the Summative Examinations without any condition.

(b) The students who have only 60-75 days (66% - 84%) of attendance are permitted to appear for the Summative Examinations after paying the required fine amount and fulfilling other conditions according to the respective cases.

(c) The students who have attended the classes for 59 days and less - upto 45 days (50%- 65%) can appear for the Summative Examinations only after getting special permission from the Principal.

(d) The students who have attended the classes for 44 days or less (50%) cannot appear for the Summative Examinations and have to repeat the whole semester.

 These rules are applicable to UG, PG and M.Phil. Programmes and come into effect from 2023-2024 onwards.

- For Certificate, Diploma, Advanced Diploma and Post Graduate Diploma Programmes, the students require 75% of attendance to appear for the Theory/Practical Examinations.

## B.3 ASSESSMENT MANAGEMENT PLAN

An Assessment Management Plan that details the assessment strategy both at the Programme and the Course levels is prepared. The continuous assessment is implemented using an assessment rubric to interpret and grade students.

### B.3.1 Assessment Process for CO Attainment

Assessment is one or more processes carried out by the institution that identify, collect and prepare data to evaluate the achievement of Course Outcomes and Programme Outcomes. Course Outcome is evaluated based on the performance of students in the Continuous Internal Assessments and in End Semester Examination of a Course. Target levels of attainment shall be fixed by the Course teacher and Heads of the respective departments.

**Direct Assessment (rubric based)**-Conventional assessment tools such as Term Test, Assignment, Quiz and End Semester Summative Examination are used.

**Indirect Assessment** –Done through Course Exit Survey.

**CO Assessment Rubrics**

For the evaluation and assessment of COs and POs, rubrics are used. Internal assessment contributes 40% and End Semester assessment contributes 60% to the total attainment of a CO for the theory Courses. For the practical Courses, internal assessment contributes 50% and Semester assessment contributes 50% to the total attainment of a CO. Once the Course Outcome is measured, the PO can be measured using a CO-PO matrix.

**CO Attainment**

**Direct CO Attainment**

Course outcomes of all Courses are assessed and the CO – wise marks obtained by all the students are recorded for all the assessment tools. The respective CO attainment level is evaluated based on set attainment rubrics.

**Target Setting for Assessment Method**

For setting up the target of internal assessment tools, 55% of the maximum mark is fixedas target. For setting up the target of End Semester Examination, the average mark of the class shall be set as target.

**Formula for Attainment for each CO**

Attainment = Percentage of students who have scored more than the target marks

$$\text{Percentage of Attainment} = \frac{\text{Number of Students who Scored more than the Target}}{\text{Total Number of Students}} \times 100$$

**Attainment Levels of COs**

| **Assessment Methods** | **Attainment Levels** | |
|---|---|---|
| Internal Assessment | Level 1 | 50% of students scoring more than set target marks in Internal Assessment tools |
| | Level 2 | 55% of students scoring more than set target marks in Internal Assessment tools |
| | Level 3 | 60% of students scoring more than set target marks in internal Assessment tools |
| End Semester Summative Examination | Level 1 | 50% of students scoring more than average marks in End Semester Summative Examination |
| | Level 2 | 55% of students scoring more than average marks in End Semester Summative Examination |
| | Level 3 | 60% of students scoring more than average marks in End Semester Summative Examination |

**Indirect CO Attainment**

At the end of each Course, an exit survey is conducted to collect the opinion of the students on attainment of Course Outcomes. A questionnaire is designed to reflect the views of the students about the Course outcomes.

**Overall CO Attainment=75% of Direct CO Attainment + 25 % of Indirect CO Attainment**

In each Course, the level of attainment of each CO is compared with the predefined targets. If the target is not reached, the Course teacher takes necessary steps for the improvement to reach the target.

For continuous improvement, if the target is reached, the Course teacher can set the target as a value greater than the CO attainment of the previous year.

**B.3.2 Assessment Process for Overall PO Attainment**

With the help of CO-PO mapping, the PO attainment is calculated. PO assessment is done by giving 75% weightage to direct assessment and 25% weightage to indirect assessment. Direct assessment is based on CO attainment, where 75% weightage is given to attainment through End Semester Examination and 25% weightage is given to attainment through Internal assessments. Indirect assessment is done through Graduate Exit Survey and participation of students in Co-

curricular/Extra-curricular activities.

**PO Assessment Tools**

| Mode of Assessment | Assessment Tool | Description |
|---|---|---|
| Direct Attainment (Weightage -75%) | CO Assessment | This is computed from the calculated CO Attainment value for each Course |
| Indirect Attainment (Weightage - 25%) | Graduate Exit Survey 10% | At the end of the Programme, Graduate Exit Survey is collected from the graduates and it gives the opinion of the graduates on attainment of Programme Outcomes |
| | Co-curricular / Extracurricular activities 15% | For participation in Co-curricular / Extracurricular activities during the period of their study. |

**Programme Articulation Matrix (PAM)**

| Course Code | Course Title | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| | | | | | | | | | |
| Average Direct PO Attainment | | | | | | | | | |
| Direct PO Attainment in percentage | | | | | | | | | |

**Indirect Attainment of POs for all Courses**

| POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|---|---|---|---|---|---|---|---|---|
| Graduate Exit Survey | | | | | | | | |
| Indirect PO Attainment | | | | | | | | |

**Attainments of POs for all Courses**

| POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|---|---|---|---|---|---|---|---|---|
| Direct Attainment (Weightage - 75%) | | | | | | | | |
| Indirect Attainment (Weightage - 25%) | | | | | | | | |
| Overall PO Attainment | | | | | | | | |

**Overall PO Attainment= 75% of Direct PO Attainment +**

**25% of Indirect PO Attainment (Graduate Exit Survey**

**& Participation in Co- curricular and Extracurricular Activities)**

**Expected Level of Attainment for each of the Programme Outcomes**

| POs | Level of Attainment |
|---|---|
| Attainment Value ≥70% | Excellent |
| 60% ≤ Attainment Value < 70% | Very Good |
| 50% ≤ Attainment Value < 60% | Good |
| 40% ≤ Attainment Value < 50% | Satisfactory |
| Attainment Value <40% | Not Satisfactory |

**Level of PO attainment**

| Graduation Batch | Overall PO Attainment (in percentage) | Whether expected level of PO is achieved? (Yes/No) |
|---|---|---|
| | | |

**B.3.3 Assessment Process for PEOs**

The curriculum is designed so that all the courses contribute to the achievement of PEOs. The attainment of PEOs is measured after 5 years of completion of the programme only through Indirect methods.

**Target for PEO Attainment**

| Assessment Criteria | Target (UG) | Target (PG) |
|---|---|---|
| Record of Employment | 15% of the class strength | 30% of the class strength |
| Progression to Higher Education | 50% of the class strength | 5% of the class strength |
| Record of Entrepreneurship | 2% of the class strength | 5% of the class strength |

**Attainment of PEOs**

| Assessment Criteria &Tool | Weightage |
|---|---|
| Record of Employment | 10 |
| Progression to Higher Education | 20 |
| Record of Entrepreneurship | 10 |

| | |
|---|---|
| Feedback from Alumnae | 30 |
| Feedback from Parents | 10 |
| Feedback from Employers | 20 |
| **Total Attainment** | **100** |

$$\text{Percentage of PEO Attainment from Employment} = \frac{\text{Number of Students who have got Employment}}{\text{Target}} \times 100$$

$$\text{Percentage of PEO Attainment from Higher Education} = \frac{\text{Number of Students who pursue Higher Education}}{\text{Target}} \times 100$$

$$\text{Percentage of PEO Attainment from Entrepreneurship} = \frac{\text{Number of Students who have become Entrepreneurs}}{\text{Target}} \times 100$$

**Expected Level of Attainment for each of the Programme Educational Objectives**

| POs | Level of Attainment |
|---|---|
| Attainment Value ≥70% | Excellent |
| 60% ≤ Attainment Value < 70% | Very Good |
| 50% ≤ Attainment Value < 60% | Good |
| 40% ≤ Attainment Value < 50% | Satisfactory |
| Attainment Value <40% | Not Satisfactory |

**Level of PEO Attainment**

| Graduation Batch | Overall PEO Attainment (in percentage) | Whether expected level of PEO is achieved? (Yes/No) |
|---|---|---|
| | | |

## C. PROCESS OF REDEFINING THE PROGRMME EDUCATIONAL OBJECTIVES

The college has always been involving the key stakeholders in collecting information and suggestions with regard to curriculum development and curriculum revision. Based on the information collected the objectives of the Programme are defined, refined and are inscribed in the form of PEOs. The level of attainment of PEOs defined earlier will be analyzed and will identify the need for redefining PEOs. Based on identified changes in terms of curriculum, regulations and PEOs, the administrative system like Board of Studies, Academic Council and Governing Body may

recommend appropriate actions. As per the Outcome Based Education Framework implemented from the Academic Year 2020 -2021, the following are the Programme Structure, the Programme Contents and the Course Contents of B.Sc. Chemistry Programme.

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**VIRUDHUNAGAR**

**Quality Education with Wisdom and Values**

## BACHELOR OF SCIENCE CHEMISTRY (2017)

*Outcome Based Education with Choice Based Credit System*

Programme Structure - Allotment of Hours and Credits

For those who join in the Academic Year 2023-2024

| Components | Semester | | | | | | Total Number of Hours (Credits) |
|---|---|---|---|---|---|---|---|
| | I | II | III | IV | V | VI | |
| **Part I :** Tamil /Hindi | 6 (3) | 6 (3) | 6 (3) | 6 (3) | - | - | 24 (12) |
| **Part II :** English | 6 (3) | 6(3) | 6 (3) | 6 (3) | - | - | 24 (12) |
| **Part III :** Core Courses, Elective Courses & Self Study Course | | | | | | | |
| Core Course | 5 (5) | 5 (5) | 5 (5) | 4 (4) | 6 (5) | 6 (5) | 31 (29) |
| Core Course | - | - | - | - | 6 (5) | 6 (5) | 12 (10) |
| Core Course | - | - | - | - | 6(5) | 5(5) | 11(10) |
| Core Course Practical | 3(2) | 3 (2) | 3 (2) | 3 (2) | - | 3 (2) | 15(10) |
| Core Course Project | - | - | - | - | 1 (3) | - | 1 (3) |
| Elective Course (DSEC) | - | - | - | - | 5(4) | 5 (5) | 10 (9) |
| Elective Course (DSEC Practical) | - | - | - | - | | 3(2) | 3(2) |
| Elective Course I (Allied) | 6 (4)/ 4(4) | 3(2) & 3(2)/ 4(3) | - | - | - | - | 12(8) |
| Elective Course I Practical I(Allied) | 2(0) | 2(1) | - | - | - | - | |
| Elective Course II(Allied) | - | - | 4 (3) | 4 (3) | - | - | 8(6) |
| Elective Course II Practical II(Allied) | - | - | 2 (1) | 2 (1) | - | - | 4 (2) |
| Self Study Course | - | - | - | - | - | 0 (1) | 0 (1) |
| **Part IV :** Skill Enhancement Courses, Elective Courses, Environmental Studies, Value Education, Self Study Course &Internship/ Field Project | | | | | | | |
| SEC | 2 (2) | - | 1 (1) | 2 (2) | - | - | 5(5) |
| SEC | - | 2 (2) | 2 (2) | 2 (2) | - | 2 (2) | 8 (8) |
| Elective Course(NME) | 2 (2) | 2 | - | - | - | - | 4 (4) |
| Value Education | - | - | - | - | 2 (2) | - | 2 (2) |
| Environmental Studies | - | - | 1 (0) | 1 | - | - | 2 (2) |
| Self Study Course | - | - | - | - | 0 (1) | - | 0 (1) |
| Internship/ Field Project | - | - | - | - | 0 (1) | - | 0 (1) |
| **Part V :** Extension Activities | - | - | - | | - | 0 (1) | 0 (1) |
| **Total** | **30** | **30** | **30 (20)** | **30 (22)** | **30 (28)** | **30 (28)** | **180 (140)** |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Extra Credit Course ( Self Study Course) | - | - | - | - | 0(2) | - | 0(2) |

DSEC: Discipline Specific Elective Course; SEC- Skill Enhancement Course.

NMEC: Non Major Elective Course

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**B.Sc. Chemistry- 2017**
**Semester- I**
**2023-2024 onwards**

| S. No. | Components | | Title of the Course | Course Code | Hours Per Week | Credits | Exam. Hours | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Int. | Ext. | Total |
| 1. | **Part I** | | Tamil/Hindi | 23UTAG11/ 23UHDG11 | 6 | 3 | 3 | 25 | 75 | 100 |
| 2. | **Part II** | | English | 23UENG11 | 6 | 3 | 3 | 25 | 75 | 100 |
| 3. | **Part III** | Core Course -1 | General Chemistry–I | 23UCHC11 | 5 | 5 | 3 | 25 | 75 | 100 |
| 4. | | Core Course -2 Practical I | Quantitative Inorganic estimation (titrimetry) and Inorganic Preparations Practical | 23UCHC11P | 3 | 2 | 3 | 40 | 60 | 100 |
| 5. | | Elective Course -I | Allied Mathematics - I / Allied Botany I<br>Allied Botany Practical-I | 23UMTA11/ 23UBYA11<br>23UBYA21P | 6 / 4<br>2 | 4 / 4<br>- | 3<br>- | 25<br>- | 75<br>- | 100<br>- |
| 6. | **Part IV** | NME-1 | Food Chemistry | 23UCHN11 | 2 | 2 | 3 | 25 | 75 | 100 |
| 7. | | SEC- 1 Foundation Course | Fundamental Concepts and Laboratory Practices in Chemistry | 23UCHF11 | 2 | 2 | 3 | 25 | 75 | 100 |

| | | | | |
|---|---|---|---|---|
| **Total** | **30** | **21 / 21** | | **700** |

**B. Sc. CHEMISTRY**
**(2023 -2024 Onwards)**
**Semester- II**

| S. No. | Components | | Title of the Course | Course Code | Hours Per Week | Credits | Exam. Hours | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Int. | Ext. | Total |
| 1. | **Part I** | | Tamil/Hindi | 23UTAG21/ 23UHDG21 | 6 | 3 | 3 | 25 | 75 | 100 |
| 2. | **Part II** | | English | 23UENG21 | 6 | 3 | 3 | 25 | 75 | 100 |
| 3. | **Part III** | Core Course -3 | General Chemistry–II | 23UCHC21 | 5 | 5 | 3 | 25 | 75 | 100 |
| 4. | | Core Course -4 Practical II | Qualitative Organic Analysis and Preparation of Organic Compounds Practical | 23UCHC21P | 3 | 2 | 3 | 40 | 60 | 100 |
| 5. | | Elective Course -I | Mathematical Foundations<br><br>Statistics and Operations Research / | 23UMTA21<br><br>23UMTA22/ | 3<br><br>3 / | 2<br><br>2 / | 3<br><br>3 | 25<br><br>25 | 75<br><br>75 | 100<br><br>100/ |
| 6. | | | Allied Botany II<br>Allied Botany Practical I | 23UBYA21<br>23UBYA21P | 4<br>2 | 3<br>1 | 3<br>3 | 25<br>40 | 75<br>60 | 100<br>100 |
| 7. | **Part IV** | NME-2 | Drugs and Natural Products | 23UCHN21 | 2 | 2 | 3 | 25 | 75 | 100 |
| 8 | | SEC- 2 | Polymer Chemistry | 23UCHS21 | 2 | 2 | 3 | 25 | 75 | 100 |
| | | | | **Total** | **30** | **21 / 21** | | | | **800** |

**B.Sc. CHEMISTRY**
**(For those who joined in 2023 -2024)**

**Semester- III**

| S.No. | Components | | Title of the Course | Course Code | Hours Per Week | Credits | Exam. Hours | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Int. | Ext. | Total |
| 1. | **Part I** | | Tamil/Hindi | 23UTAG31/ 23UHDG31 | 6 | 3 | 3 | 25 | 75 | 100 |
| 2. | **Part II** | | English | 23UENG31 | 6 | 3 | 3 | 25 | 75 | 100 |
| 3. | **Part III** | Core Course -5 | General Chemistry–III | 23UCHC31 | 5 | 5 | 3 | 25 | 75 | 100 |
| 4. | | Core Course -6 | Qualitative Inorganic Analysis | 23UCHC31P | 3 | 2 | 3 | 40 | 60 | 100 |
| 5. | | Elective Course -II | General Physics | 23UPHA31 | 4 | 3 | 3 | 25 | 75 | 100 |
| 6. | | Elective Course –II Practical –II | General Physics Practical-I | 23UPHA31P | 2 | 1 | 3 | 40 | 60 | 100 |
| 7 | **Part IV** | SEC – 3 | Entrepreneurial skills in Chemistry | 23UCHS31 | 1 | 1 | 2 | 100 | - | 100 |
| 8 | | SEC- 4 | Pesticide Chemistry | 23UCHS32 | 2 | 2 | 2 | 25 | 75 | 100 |
| 9 | | | Environmental Studies | 23UGES41 | 1 | - | - | - | - | - |
| | | | | **Total** | **30** | **20** | | | | **800** |

## Semester- IV

| S.No. | Components | | Title of the Course | Course Code | Hours Per Week | Credits | Exam. Hours | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Int. | Ext. | Total |
| 1. | **Part I** | | Tamil/Hindi | 23UTAG41/ 23UHDG41 | 6 | 3 | 3 | 25 | 75 | 100 |
| 2. | **Part II** | | English | 23UENG41 | 6 | 3 | 3 | 25 | 75 | 100 |
| 3. | **Part III** | Core Course -7 | General Chemistry–IV | 23UCHC41 | 4 | 4 | 3 | 25 | 75 | 100 |
| 4. | | Core Course -8 | Physical Chemistry Practical- I | 23UCHC41P | 3 | 2 | 5 | 40 | 60 | 100 |
| 5. | | Elective Course -II | Optics and Modern Physics | 23UPHA41 | 4 | 3 | 3 | 25 | 75 | 100 |
| 6. | | Elective Course –II Practical –II | General Physics Practical-II | 23UPHA41P | 2 | 1 | 3 | 40 | 60 | 100 |
| 7 | **Part IV** | SEC – 5 | Instrumental methods of Chemical Analysis (Theory) | 23UCHS41 | 2 | 2 | 2 | 25 | 75 | 100 |
| 8 | | SEC- 6 | Forensic Science | 23UCHS42 | 2 | 2 | 2 | 25 | 75 | 100 |
| 9 | | | Environmental Studies | 23UGES41 | 1 | 2 | 2 | 100 | - | 100 |
| | | | | **Total** | **30** | **22** | | | | **900** |

**Semester- V**

| S.No. | Components | | Title of the Course | Course Code | Hours Per Week | Credits | Exam. Hours | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Int. | Ext. | Total |
| 1. | **Part III** | Core Course -9 | Organic Chemistry–I | 23UCHC51 | 6 | 5 | 3 | 25 | 75 | 100 |
| 2. | | Core Course -10 | Inorganic Chemistry-I | 23UCHC52 | 6 | 5 | 3 | 25 | 75 | 100 |
| 3. | | Core Course -11 | Physical Chemistry-I | 23UCHC53 | 6 | 5 | 3 | 25 | 75 | 100 |
| 4. | | Elective Course – I (DSEC) | Biochemistry | 23UCHE51 | 5 | 4 | 3 | 25 | 75 | 100 |
| 5. | | Elective Course – II (DSEC) | Industrial Chemistry | 23UCHE52 | 4 | 2 | 3 | 25 | 75 | 100 |
| 6. | | Core Course -12 | Project with viva-voce | 23UCHC54PR | 1 | 3 | - | 100 | - | 100 |
| 7. | **Part IV** | | Value Education | 23UGVE51 | 2 | 2 | 2 | 100 | - | 100 |
| 8. | | Self study course | Practice for competitive examinations-online | 23UGCE51 | - | 1 | - | 100 | - | 100 |
| 9. | | Internship / Industrial Visit / Field Visit(Carried out in II Year Sum vacation) (30 hours) | Field Project | 23UCHI51G | - | 1 | - | 100 | - | 100 |
| | | | | **Total** | **30** | **28** | | | | **900** |
| | Extra Credit Course (Self study course) | | Laboratory Practices and Safety Measures | 23UCHO51 | - | 2 | 3 | - | 100 | 100 |

## Semester- VI

| S.No. | Components | | Title of the Course | Course Code | Hours Per Week | Credits | Exam. Hours | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Int. | Ext. | Total |
| 1. | **Part III** | Core Course -13 | Organic Chemistry–II | 23UCHC61 | 6 | 5 | 3 | 25 | 75 | 100 |
| 2. | | Core Course -14 | Inorganic Chemistry-II | 23UCHC62 | 6 | 5 | 3 | 25 | 75 | 100 |
| 3. | | Core Course -15 | Physical Chemistry-II | 23UCHC63 | 5 | 5 | 3 | 25 | 75 | 100 |
| 4. | | Core Course -16 | Physical Chemistry Practical II | 23UCHC61P | 3 | 2 | 5 | 25 | 75 | 100 |
| 5. | | Elective Course – III (DSEC) | Fundamentals of Spectroscopy | 23UCHE61 | 5 | 5 | 3 | 25 | 75 | 100 |
| 6. | | Elective Course – IV (DSEC) | Nanoscience/ Pharmaceutical Chemistry (Elective based) | 23UCHE62 | 3 | 2 | 3 | 25 | 75 | 100 |
| 7. | | Self study course | Core courses Quiz-online | 23UCHQ61 | - | 1 | - | 100 | - | 100 |
| 8. | **Part IV** | SEC-7 | Cosmetics and Personal grooming | 23UCHS61 | 2 | 2 | 2 | 25 | 75 | 100 |
| 9. | **Part V** | Extension Activity | Extension Activity | | - | 1 | - | 100 | - | 100 |
| | | | | **Total** | **30** | **28** | | | | **900** |

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**B.Sc. CHEMISTRY**
**(2023 -2024 onwards)**

| | | | |
|---|---|---|---|
| Semester I | **GENERAL CHEMISTRY-I** | Hours/Week: 5 | |
| Core Course-1 | | Credits: 5 | |
| Course Code **23UCHC11** | | Internal 25 | External 75 |

**COURSE OUTCOME**

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

**CO1 :** **e**xplain the atomic structure, wave particle duality of matter, periodic properties bonding,and properties of compounds. [K1]

**CO2 :** classify the elements in the periodic table, types of bonds, reaction intermediates electroniceffects in organic compounds, types of reagents. [K2]

**CO3 :** illustrate the relationship existing between electronic configuration, bonding,geometry ofmolecules and reactions; structure reactivity and electronic effects. [K2]

**CO4 :** apply the theories of atomic structure, bonding, to calculate energy of a spectral transition,$\Delta x$, $\Delta p$ electronegativity, bond order [K3]

**CO5 :** construct MO diagrams, predict trends in periodic properties, assess the properties of elements, and explain hybridization in molecules, nature of H – bonding and organic reaction mechanisms. [K3]

**UNIT I**

**Atomic structure and Periodic trends**

History of atom (J.J.Thomson, Rutherford); Moseley's Experiment and Atomic number, Atomic Spectra; Black-Body Radiation and Planck's quantum theory - Bohr's model of atom;The Franck-Hertz Experiment; Interpretation of H- spectrum; Photoelectric effect, Compton effect; Dual nature of Matter- De- Broglie wavelength- Davisson and Germer experiment Heisenberg's Uncertainty Principle; Electronic Configuration of Atoms and ions- Hund's rule, Pauli'exclusion principle and Aufbau principle; Numerical problems involving the core concepts**.** **(12 Hour)**

**Unit II**

**Introduction to Quantum mechanics**

Classical mechanics, Wave mechanical model of atom, distinction between a Bohr orbit and orbital; Postulates of quantum mechanics; probability interpretation of wave functions, Formulation of Schrodinger wave equation - Probability and electron density-visualizing the orbitals -Probability density and significance of $\Psi$ and $\Psi^2$.

**Modern Periodic Table**

**Cause of periodicity**; Features of the periodic table; classification of elements - Periodic trends for atomic size- Atomic radii, Ionic, crystal and Covalent radii; ionization energy, electron affinity, electronegativity- electronegativity scales, applications of electronegativity.

(**15 Hours**)

**UNIT-III: Covalent and Ionic bonding**

a) Covalent bond - VB approach – types of overlapping – sigma and pi bonds- principles of hybridization- sp,$sp^2$,$sp^3$, $sp^3d$ and $sp^3d^2$hybridisation with an example. VSEPR theory –simple Inorganic molecules [ $BeCl_2$, $BF_3$, $CH_4$, $PCl_5$, $NH_3$, &$H_2O$ ]. MO Theory – Bonding and Antibonding Orbitals – Application of MO Theory to $H_2$, $He_2$, $N_2$, CO – Comparison of VB and MO Theories.

b) Ionic bond : Lattice energy of NaCl – Born Haber Cycle ( **15 Hours**)

**UNIT-IV: Metallic bonding & Metallurgy**

a) Metallic bond- nature -explanation of properties of metallic bond- conditions for the formation of the metallic bond – Hydrogen bond - types of hydrogen bond –effects of hydrogen bonding – van der Waals forces – types – factors affecting the strength of van der Waals forces –applications.

b) Metallurgy :

i) Occurrence of metals – concentration of ores – froth-floatation process, magnetic separation, calcination, roasting, smelting – flux - slag- purification of metals –Electrolytic refining- Zone refining –Van Arkel–de Boer process

ii) Important ores and extraction of the following metals – Ti, U and V

iii) Preparation and uses of some important compounds - titanium oxide, uranium hexafluoride and vanadium pentoxide. (**15 Hours**)

**UNIT-V:**

**Electronic effects , Reaction intermediates and aliphatic hydrocarbons**

**a)** Electron displacement effects: Inductive effect, mesomeric and electromeric effect, resonance – steric inhibition of resonance and hyper conjugative effect.

b) b) Cleavage of bonds : Homolytic and Heterolytic cleavage - reaction intermediates-carbocations, carbanions, free radicals – Formation, structure and their stability-Electrophilic and Nucleophilic reagents-types of organic reactions (elementary idea only).

c) Alkanes: Cracking and pyrolysis.

d) Alkenes: Preparation by dehydrohalogenation of alkyl bromides–

Electrophilic addition reactions– Markownikoff's rule–peroxide effect.

e) Alkynes: Acidity of acetylene. (**18 Hours**)

**Text Books**

1. Puri, B. R. and Sharma, L. R. *Principles of Physical Chemistry,* 38$^{th}$ed.;Vishal Publishing Company: Jalandhar, 2002.
2. Dash UN, Dharmarha OP, Soni P.L. Textbook of Physical Chemistry, Sultan Chand & Sons: New Delhi,2016
3. Madan, R. D. and Sathya Prakash, *Modern Inorganic Chemistry,* 2$^{nd}$ ed.; S.Chand and Company: New Delhi, 2003
4. Arun Bahl & Bahl, B.S.(2009). *Advanced Organic Chemistry* .19$^{th}$ edition.New Delhi: S.Chand & Company Ltd.
5. Tewari, K.S. & Vishnoi, N.K.(2006).*A Text book of Organic Chemistry.*2$^{nd}$ edition. New Delhi: Vikas Publishing House Pvt. Ltd.

**ReferenceBook**


1. Maron, S. H. and Prutton C. P. *Principles of Physical Chemistry*, 4thed.; The Macmillan Company: Newyork,1972.
2. Lee, J. D. *Concise Inorganic Chemistry,* 4th ed.; ELBS WilliamHeinemann: London,1991.
3. Gurudeep Raj, *Advanced Inorganic Chemistry,* 26thed.; Goel PublishingHouse: Meerut, 2001.
4. Atkins, P.W. & Paula, J. *Physical Chemistry*, 10th ed.; Oxford UniversityPress: New York, 2014.
5. Huheey, J. E. *Inorganic Chemistry: Principles of Structure and Reactivity*, 4th ed .; Addison, Wesley Publishing Company: India,1993.
6. Finar, I.L. Volume I.(2003).*Organic Chemistry.* 6thedition.Singapore: Pearson Education Pvt. Ltd.


| Course Code 23UCHC11 | PO1 | | PO2 | | PO3 | | PO4 | | PO5 | | PO6 | PO7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PSO 1.a | PSO 1. b | PSO 2.a | PSO 2.b | PSO 3a | PSO 3.b | PSO 4a | PSO 4b | PSO 5.a | PSO 5.b | PSO 6 | PSO 7 |
| CO1 | 1 | 1 | 3 | 3 | 1 | 1 | 1 | 2 | 1 | 1 | - | 1 |
| CO2 | 1 | 1 | 3 | 3 | 2 | 2 | 3 | 2 | 2 | 2 | - | 1 |
| CO3 | 2 | 2 | 3 | 2 | 2 | 3 | 3 | 2 | 2 | 3 | - | 1 |
| CO4 | 2 | 2 | 3 | 3 | 1 | 1 | 3 | | 2 | 3 | - | 1 |
| CO5 | 2 | 2 | 3 | 3 | 1 | 1 | 2 | 2 | 2 | 2 | - | 1 |

Dr.M.Dhanalakshmi
Head of the Department

Mrs.A.Prasanna
Course Designer

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**VIRUDHUNAGAR - 626 001**

**B.Sc. CHEMISTRY**

**(2023 -2024 onwards)**

| | | | |
|---|---|---|---|
| Semester I | **QUANTITATIVE INORGANIC ESTIMATION (TITRIMETRY) AND INORGANIC PREPARATIONS PRACTICAL** | Hours/Week: 3 | |
| Core Course-2 Practical I | | Credits: 2 | |
| CourseCode **23UCHC11P** | | Internal 40 | External 60 |

## COURSE OUTCOME

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

**CO1 :** explain the basic principles involved in titrimetric analysis and inorganic preparations.[K2]

**CO2 :** compare the methodologies of different titrimetric analysis.[K2]

**CO3 :** calculate the concentrations of unknown solutions in different ways and develop the skill to estimate the amount of a substance present in a given solution.[K3]

**CO4 :** determine the yield of different inorganic preparations and identify the end point of various titrations. [K3]

**CO5 :** apply the principle and procedure involved in titrimetric analysis to estimate the amount of unknown compound in the given solution. [K3]

## LIST OF EXPERIMENTS

### I. ACIDIMETRY AND ALKALIMETRY

1. Estimation of $Na_2CO_3$
2. Estimation of NaOH / KOH
3. Estimation of oxalic acid.

### II. REDOX TITRATIONS

**a) Permanganimetry**

1. Estimation of ferrous ion

2. Estimation of oxalic acid

**b)Dichrometry**

Estimation of ferrous ion using external indicator

## III. IODOMETRY AND IODIMETRY

1. Estimation of potassium dichromate
2. Estimation of potassium permanganate
3. Estimation of copper
4. Estimation of arsenious oxide.

## IV. Preparation of Inorganic compounds (Group Practicals)

Tetraammine copper (II) sulphate, Mohr's Salt

**Text Book**

1.Venkateswaran, V.; Veeraswamy, R.; Kulandivelu, A.R. Basic Principles of Practical Chemistry,2nd ed.; Sultan Chand &Sons: New Delhi, 1997.

2.Nad, A. K.; Mahapatra, B.; Ghoshal, A.; An advanced course in Practical

Chemistry, 3rd ed.; New Central Book Agency: Kolkata, 2007.

**ReferenceBooks**

1. Mendham, J.; Denney, R. C.; Barnes, J. D.; Thomas, M.; Sivasankar, B.; Vogel's Textbook of Quantitative Chemical Analysis, 6th ed.; Pearson Education Ltd: New Delhi, 2000.

| Course Code 23UCHC11P | PO1 | | PO2 | | PO 3 | | PO 4 | | PO5 | | PO 6 | PO 7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PSO 1. a | PSO 1. b | PSO 2.a | PSO 2.b | PSO 3. a | PSO 3. b | PSO 4 .a | PSO 4. b | PSO 5.a | PSO 5.b | PSO 6 | PSO 7 |
| CO1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 2 | 1 | 3 | 3 |
| CO2 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 |
| CO3 | 2 | 1 | 3 | 3 | 2 | 2 | 2 | 2 | 1 | 3 | 3 | 3 |
| CO4 | 3 | 2 | 3 | 3 | 2 | 2 | 3 | 2 | 1 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 1 | 3 | 2 | 2 | 2 | 1 | 2 | 3 | 3 |

Dr.M.Dhanalakshmi
Head of the Department

Mrs.A.Prasanna
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**VIRUDHUNAGAR - 626 001**

**B.Sc. CHEMISTRY**

**(2023-24 onwards)**

| | | | |
|---|---|---|---|
| Semester I | **ALLIED MATHEMATICS–I** | Hours/Week:6 | |
| Elective Course-I | | Credits:4 | |
| Course Code | | Internal | External |
| **23UMTA11** | | 25 | 75 |

**COURSE OUTCOMES**

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

CO1: retrieve the fundamental concepts, techniques in Calculus, Algebra and Numerical Methods. [K1]

CO2: explain curvature of a curve, method of solving algebraic, transcendental and simultaneous equations. [K2]

CO3: find the eigen values and eigen vectors of a given matrix and evaluate double and triple integrals. [K2]

CO4: apply the knowledge gained in Calculus and Algebra to other fields. [K3]

CO5: use appropriate method to solve algebraic, transcendental and simultaneous equations. [K3]

**UNIT I**

**The Solution of Numerical Algebraic and Transcendental Equations**

The Bisection method - Iteration method – Regula Falsi method – Newton Raphson method – Horner's method (without proof) (Simple problems only) (18 hours)

**UNIT II**

**Solution of Simultaneous Linear Algebraic Equations**

Introduction - Gauss Elimination method – Gauss Jordan method – Gauss Jacobi method - Gauss Seidel method of iteration – (Restricted to three variables only) (Simple problems only) (18 hours)

**UNIT III**

**Matrices**

Eigen Values and Eigen Vectors – Diagonalization of Matrices – Cayley – Hamilton Theorem – Inverse of a Matrix

(18 hours)

**UNIT IV**

**Differential Calculus**

$n^{th}$ derivatives – Leibnitz theorem (without proof) – Jacobian – Curvature and radius of curvature (18 hours)

**UNIT V**

**Ordinary Differential Equations**

Linear equations with Constant coefficients

**Partial Differential Equations**

Formation of Partial Differential Equations – Solution of a Partial Differential Equation – Standard Forms

(18 hours)

**TEXT BOOKS**

1. P.Kandasamy, K.Thilagavathy, K.Gunavathy, Numerical Methods (2016), S.Chand & Company Ltd., New Delhi-55.

2. P.Duraipandian and Dr.S.Udayabaskaran, Allied Mathematics Volume I (2014), S.Chand & Company Ltd., New Delhi-55.

3. P.Duraipandian and Dr.S.Udayabaskaran, Allied Mathematics Volume II (2014), S.Chand & Company Ltd., New Delhi-55.

| Unit | Chapter | Section |
|---|---|---|
| **Text Book 1** | | |
| I | 3 | 3.1.1, 3.2, 3.3, 3.4, 3.5 |
| II | 4 | 4.1, 4.2, 4.8, 4.9 |
| **Text Book 2** | | |
| III | 4 | 4.5, 4.5.1, 4.5.2, 4.5.3 |
| **Text Book 3** | | |
| IV | 1 | 1.1.1,1.1.2, 1.2, 1.4.3 |
| V | 5 | 5.2.1 |
| | 6 | 6,1,6.2,6.3 |

| Course Code 23UMTA11 | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 3 | 2 | 1 | 2 | - |
| CO2 | 3 | 2 | 3 | 2 | 1 | 2 | - |
| CO3 | 2 | 2 | 3 | 2 | 1 | 2 | - |
| CO4 | 3 | 3 | 3 | 3 | 1 | 2 | - |
| CO5 | 3 | 2 | 3 | 2 | 1 | 3 | - |

Dr.A.Uma Devi — Mrs. J.Ashwini

Head of the Department — Course Designer

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**VIRUDHUNAGAR - 626 001**

**B.Sc. CHEMISTRY**
**2023-2024 onwards**

| | | | |
|---|---|---|---|
| Semester I | **ALLIED BOTANY I** | Hours/Week: 4 | |
| Elective Course- I | | Credits: 4 | |
| Course Code **23UBYA11** | | Internal 25 | External 75 |

**Course Outcomes:**

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

CO1: Increase the awareness and appreciation of human friendly algae and their economic Importance. [ K1]

CO2: Develop an understanding of microbes and fungi and appreciate their adaptive Strategies [K2]

CO3: Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms. [K2]

CO4: Interpret the structure and function of cells and explain the development of cells.[ K3]

CO5: Implement the core concepts and fundamentals of plant biotechnology and genetic engineering. [ K3]

**UNIT I : Algae:** General characters of algae - Structure, reproduction and life cycle of *Sargassum* and economic importance of algae. (10 Hours)

**UNIT II: Fungi:** General characters of fungi, structure, reproduction and life cycle of *Agaricus* and economic importance of fungi. (10 Hours)

**UNIT III : Bryophytes, Pteridophytes and Gymnosperms:**

General characters of Bryophytes, Structure and life cycle of *Funaria*. General characters of Pteridophytes, Structure and life cycle of *Lycopodium*. General characters of Gymnosperms, Structure and life cycle of *Cycas*. (14 Hours)

**UNIT IV: Cell Biology:**

Prokaryotic and Eukaryotic cell- structure /organization. Cell organelles - ultra structure and function of chloroplast, mitochondria and nucleus. Cell division – mitosis. (12 Hours)

UNIT V :**Genetics and Plant Biotechnology:**

Mendelism - Law of dominance, Law of segregation, Incomplete dominance. Law of independent assortment. Monohybrid and dihybrid cross - Test cross - Back cross. Plant tissue culture - *In vitro* culture methods and its application in biotechnology. (14 Hours)

**TEXT BOOKS**

1. Singh, V., Pande, P.C and Jain, D.K. 2021. A Text Book of Botany. Rastogi Publications,Meerut.
2. Bhatnagar, S.P and Alok Moitra. 2020. Gymnosperms, New Age International (P) Ltd., Publishers, Bengaluru.
3. Sharma, O.P. 2017. Bryophyta, MacMillan India Ltd. Delhi.
4. Lee, R.E. 2008. Phycology, IV Edition, Cambridge University Press, New Delhi.
5. Rao, K., Krishnamurthy, K.V and Rao, G.S. 1979. Ancillary Botany,S. Viswanathan Pvt. Ltd., Madras.

**REFERENCE BOOKS**

1. Parihar, N.S. 2012. An introduction to Embryophyta –Pteridophytes - Surjeet Publications, Delhi.
2. Alexopoulos, C.J. 2013. Introduction to Mycology. Willey Eastern Pvt. Ltd.
3. Vashishta, P.C. 2014. Botany for Degree Students Gymnosperms. Chand & Company Ltd, Delhi.
4. Coulter, M. Jhon, 2014. Morphology of Gymnosperms. Surjeet Publications, Delhi.
5. Vashishta, P.C. 2014. Botany for Degree Students Algae. 2014. Chand & Company Ltd, Delhi.
6. Parihar, N.S. 2013. An introduction to Embryophyta –Bryophytes -, Surjeet Publications, Delhi.
7. Pandey B.P. 1986, Text Book of Botany (College Botany) Vol I &II, S.Chand and Co. New Delhi.

| Course code **23UBYA11** | PO1 | PO2 | PO 3 | PO4 | PO 5 | PO 6 | PO 7 |
|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 2 | 2 | 2 |
| CO2 | 3 | 3 | 3 | 3 | 2 | 2 | 2 |
| CO3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 |
| CO4 | 3 | 3 | 3 | 3 | 2 | 2 | 2 |
| CO5 | 3 | 3 | 3 | 3 | 2 | 2 | 2 |

**Strong (3) Medium (2) Low (1)**

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Dr. B. Karunai Selvi
Head of the Department

Dr. B. Karunai Selvi
Course Designer

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**B.Sc. CHEMISTRY**

**(2023 -2024 onwards)**

| | | | |
|---|---|---|---|
| Semester I | **FOOD CHEMISTRY** | Hours/Week: 2 | |
| NME-1 | | Credits: 2 | |
| CourseCode<br><br>**23UCHN11** | | Internal<br><br>25 | External<br><br>75 |

**COURSE OUTCOME**

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

**CO1 :** get an awareness about food adulteration and food poisons [K1].

**CO2 :** outline about various food additives, beverages and edible oils [K1]

**CO3 :** understand the food adulteration methods and the types of food poisons[K2]

**CO4 :** get an exposure on food additives, artificial sweeteners, types of beverages and quality parameters of edible oils.[K2]

**CO5 :** apply their knowledge to identify food adulterants, food poisons, analyse the advantage and disadvantage of food additives, prevent liver and social problems due to beverages and to determine iodine value,RM value,saponification values in edible oils. [K3]

**UNIT I**

**Food Adulteration**

Sources of food, types, advantages and disadvantages. Food adulteration - contamination of wheat, rice, milk, butter etc. with clay stones, water and toxic chemicals -Common adulterants, Ghee adulterants and their detection.Detection of adulterated foods by simple analytical techniques **(6 Hours)**

**UNIT-II**

**Food Poison**

Food poisons - natural poisons (alkaloids - nephrotoxin) - pesticides, (DDT, BHC, Malathion) -Chemical poisons - First aid for poison consumed victims

**(6 Hours)**

**UNIT-III**

**Food Additives**

Food additives -artificial sweeteners – Saccharin - Cyclomate a n d AspartateFood flavours -esters, aldehydes and heterocyclic compounds – Food colours– Emulsifying agents – preservatives -leavening agents. Baking powder – yeast – taste makers – MSG - vinegar. (**6 Hours)**

**UNIT-IV**

**Beverages**

Beverages-soft drinks-soda-fruit juices-alcoholic beverages-examples. Carbonation-addiction to alcohol– diseases of liver and social problems.

**(6 Hours)**

**UNIT-V**

**Edible Oils**

Fats and oils - Sources of oils - production of refined vegetable oils - preservation. Saturated and unsaturated fats - iodine value - role of MUFA and PUFA in preventing heart diseases-determination of iodine value, RM value, saponification values and their significance. **(6 Hours)**

**Text Books**

1. Food chemistry, H. K. Chopra, P. S. Panesar, Narosa publishing house,2010.

2. Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, S. ChandCo. Publishers, second edition, 2006.

3. Food chemistry, H. K. Chopra, P. S. Panesar, Narosa publishning house,2010.

4. Food Chemistry, Dr. L. Rakesh Sharma, Evincepub publishing, 2022.

5. Food processing and preservation, G. Subbulakshmi, Shobha A Udipi, Padmini S Ghugre, New age international publishers, second edition, 2021.

**ReferenceBooks**

1. H.-D. Belitz, Werner Grosch, Food Chemistry Springer Science & Business Media, 4th Edition, 2009.

2. M.Swaminathan, Food Science and Experimental Foods, Ganesh and Company,1979.

3. Hasenhuettl, Gerard. L.; Hartel, Richard. W. Food Emulsifiers and theirapplications Springer New York 2nd ed. 2008.

4. Food Chemistry, H.-D. Belitz, W. Grosch, P. Schieberle, Springer, fourthrevised and extended edition, 2009.

5. Principles of food chemistry, John M. deMan, John W. Finley, W. Jefferey Hurst, Chang Yong Lee, Springer, Fourth edition, 2018.

| Course Code<br><br>23UCHN11 | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 1 | 2 | 1 | 2 | 2 |
| CO2 | 2 | 1 | 1 | 2 | 2 | 1 | 2 |
| CO3 | 1 | 2 | 2 | 1 | 2 | 1 | 1 |
| CO4 | 1 | 1 | 1 | - | 1 | 1 | 1 |
| CO5 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Dr.M.Dhanalakshmi — Heads of the Department

Dr.M.Amutha — Course Designer

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**B.Sc. CHEMISTRY**
**(2023 -2024 onwards)**

| | | | |
|---|---|---|---|
| Semester I | **Fundamental Concepts and Laboratory Practices in Chemistry** | Hours/Week: 2 | |
| SEC- 1 Foundation Course | | Credits: 2 | |
| CourseCode **23UCHF11** | | Internal 25 | External 75 |

**COURSE OUTCOME**

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

**CO1 :** know about fundamental concepts [K1]

**CO2 :** recall the first aid techniques [K1]

**CO3 :** explain the determination of empirical formula and molecular formula [K2]

**CO4 :** classify chemicals [K2]

**CO5 :** Understand appropriate purification techniques [K2]

**UNIT I:**

i) Fundamental concepts- Symbol, Formula, Valency, equation-Laws of Chemical combination-kinds of chemical changes with examples. Equivalent weights of elements

ii) Oxidation – reduction: Concepts of oxidation – reduction in terms of oxidation number – calculation of oxidation number – Balancing of redox equations by ion electron method (half reaction) – Reactions involving $Cr_2O_7^{2-}$ / $Fe^{2+}$ , $MnO_4^-$ / $Fe^{2+}$ ( in acid medium) , $CrO_4^{2-}$ / $SO_3^{2-}$ ( in alkaline medium) **(6 Hours)**

**UNIT II :**

i) Detection of elements-nitrogen, sulphur and halogens- Determination of molecular weight-Silver salt method, Platinichloride method – Determination of empirical formula and molecular formula.

ii) Structural isomerism – Chain isomerism, position isomerism, functional isomerism and metamerism **(6 Hours)**

**UNIT – III**

Purification techniques of organic compounds – Crystallization- Sublimation – Distillation – Fractional Distillation – Distillation under reduced pressure- Steam distillation. Solvent Extraction **(6 Hours)**

**UNIT-IV**

1. Laboratory chemicals and reagents- different grades- commercial, LR, GR, AR, Chromatographic pure and spectral pure.
2. Units of concentration of solution- Normality, molarity, molality, mole fraction, mass percentage and volume percentage- simple problems dealing with the preparation of reagents.

**(6 Hours)**

**UNIT - V**

General precautions for avoiding accidents - First –Aid techniques-Hazards in Laboratory-Poisoning- Treatment for specific poisons- Universal antidote- Laboratory safety measures.

**(6 Hours)**

**Text Books**

1. Satyaprakash, G.D.Tuli, Basu, Madan, Advanced Inorganic Chemistry, S.Chand Company Ltd, 1st Edition, 2011.
2. P.L.Soni & H.M.Chawla, Text Book of Organic Chemistry, Sultan Chand & Sons, 29th edition, 2007.
3. R.Gopalan,Elements of Analytical Chemistry, Sultan Chand & Sons, 3rd edition, 2003.
4. S.Balasubramanian and D.J.Sathianathan,Elements of Chemistry

**Reference Books**

1. Puri, Sharma, Kalia, Principles of Inorganic Chemistry, Milestone Publishers, 2008. Addison-Wesley, Chemistry.
2. Raymond Chang, Chemistry, Tata McGraw.Mill Publishing Company Ltd,2008

| Course Code 23UCHF11 | PO1 | | PO2 | | PO3 | | PO4 | | PO5 | | PO6 | PO7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PSO 1.a | PSO 1. b | PSO 2a | PSO 2b | PSO 3a | PSO 3.b | PSO 4a | PSO 4b | PSO 5a | PSO 5b | PSO 6 | PSO 7 |
| CO1 | 1 | 1 | 3 | 2 | 1 | 2 | L | M | 1 | 1 | - | 1 |
| CO2 | 1 | 1 | 3 | 2 | 2 | 2 | 3 | 2 | 2 | 1 | - | 1 |
| CO3 | 2 | 2 | 3 | 2 | 2 | 3 | 3 | 2 | 2 | 1 | - | 1 |
| CO4 | 2 | 2 | 3 | 2 | 1 | 1 | 3 | 3 | 2 | 1 | - | 1 |
| CO5 | 2 | 2 | 3 | 2 | 1 | 1 | 2 | 2 | 2 | 1 | - | 1 |

Dr.M.Dhanalakshmi
Head of the Department

Mrs.R.Nagasathya
Course Designer

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**VIRUDHUNAGAR - 626 001**

**B.Sc. CHEMISTRY**
**(2023 -2024 Onwards)**

| | | | |
|---|---|---|---|
| Semester II | **GENERAL CHEMISTRY-II** | Hours/Week: 5 | |
| Core Course -3 | | Credits: 5 | |
| Course Code<br><br>**23UCHC21** | | Internal<br><br>25 | External<br><br>75 |

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

**CO1 :** explain the concept of acids, bases and ionic equilibria; periodic properties of s and p block elements, preparation and properties of aliphatic and aromatic hydrocarbons. [K1]

**CO2 :** discuss the periodic properties of sand p- block elements, reactions of aliphatic andaromatic hydrocarbons and strength of acids. [K2]

**CO3 :** classify hydrocarbons, types of reactions, acids and bases, examine the properties s and p-block elements, reaction mechanisms of aliphatic and aromatic hydrocarbons. [K2]

**CO4 :** illustrate theories of acids, bases and indicators, buffer action and important compoundsof s-block elements. [K3]

**CO5 :** assess the application of hard and soft acids indicators, buffers, compounds of s and p- block elements and hydrocarbons. [K3]

**UNIT-I**

**Acids, bases and Ionic equilibria**

Concepts of Acids and Bases - Arrhenius concept, Bronsted-Lowry concept, Lewis concept; Relative strengths of acids, bases and dissociation constant;dissociation of poly basic acids, ionic product of water, pH scale, pH of solutions; Degree of dissociation, common ion effect, factors affecting degreeof dissociation; acid base indicators, theory of acid base indicators – action of phenolphthalein and methyl orange, titration curves - use of acid base indicators;

Buffer solutions – types, mechanism of buffer action in acid and basic buffer, Henderson-

Hasselbalch equation; Salt hydrolysis - salts of weak acids and strong bases, weak bases and strong acids, weak acids and weak bases - hydrolysis constant, degree of hydrolysis and relation between hydrolysis constant and degree of hydrolysis; Solubility product - determination and applications; numerical problems involving the core concepts**.** **(15 Hours)**

**Unit-II**

**Chemistry of s - block Elements**

Hydrogen: Position of hydrogen in the periodic table. Alkali metals: Comparative study of the elements with respect to oxides, hydroxides, halides, carbonates and bicarbonates. Diagonal relationship of Li with Mg. Preparation, properties and uses of NaOH, $Na_2CO_3$, KBr, $KClO_3$ alkaline earth metals. Anomalous behaviour of Be.

**Chemistry of p- block Elements (Group 13 & 14)**

preparation and structure of diborane and borazine. Chemistry of borax. Extraction of Al and its uses. Alloys of Al.

comparison of carbon with silicon. Carbon-di-sulphide – Preparation, properties, structure and uses. Percarbonates, per monocarbonates and per dicarbonates. **(15 Hours)**

**UNIT-III**

**Chemistry of p- block Elements (Group 15-18)**

General characteristics of elements of Group 15; chemistry of $H_2N\text{-}NH_2$, $NH_2OH$, $HN_3$ and $HNO_3$. Chemistry of $PH_3$, $PCl_3$, $PCl_5$, $POCl_3$, $P_2O_5$ and oxy acids of phosphorous ($H_3PO_3$ and $H_3PO_4$).

General properties of elements of group16 - Structure and allotropy of elements - chemistry of ozone - Classification and properties of oxides - oxides of sulphur and selenium – Oxy acids of sulphur (Caro's and Marshall's acids).

Chemistry of Halogens: General characteristics of halogen with reference to electro-negativity, electron affinity, oxidation states and oxidizing power. Peculiarities of fluorine. Halogen acids (HF, HCl, HBr and HI), oxides and oxy acids ($HClO_4$). Inter-halogen compounds (ICl, $ClF_3$, $BrF_5$ and $IF_7$), pseudo halogens [$(CN)_2$ and $(SCN)_2$] and basic nature of Iodine.

Noble gases:Position in the periodic table. Preparation, properties and structure of $XeF_2$, $XeF_4$, $XeF_6$ and $XeOF_4$; uses of noble gases – clathrate compounds. **(15 Hours)**

**UNIT-IV**

**Hydrocarbon Chemistry-I**

**Petroproducts:** Fractional distillation of petroleum; isomerisation,alkylation, reforming and uses

**Alkadienes**

Nomenclature - classification – isolated, conjugated and cumulated dienes; stability of conjugated dienes; mechanism of electrophilic addition to conjugated dienes - 1, 2 and 1, 4 additions; free radical addition to conjugated dienes– Diels–Alder reactions – polymerisation – polybutadiene, polyisoprene (natural rubber), vulcanisation, polychloroprene.

**Alkynes**

Nomenclature; general methods of preparation, properties and reactions; polymerisation and isomerisation.

**Cycloalkanes:** Nomenclature, Relative stability of cycloalkanes, Bayer'sstrain theory and its limitations. Conformational analysis of cyclohexane, mono and di substituted cyclohexanes. Geometrical isomerism in cyclohexanes. **(15 Hours)**

**UNIT-V**

**Hydrocarbon Chemistry – II**

**Benzene:** Source, structure of benzene, stability of benzene ring, molecularorbital picture of benzene, aromaticity, Huckel's (4n+2) rule and its applications. Electrophilic substitution reactions - General mechanism of aromatic electrophilic substitution - nitration, sulphonation, halogenation,Friedel-Craft's alkylation and acylation. Mono substituted and disubstituted benzene - Effect of substituent – orientation and reactivity.

**Polynuclear Aromatic hydrocarbons**: Naphthalene – nomenclature, Haworth synthesis; physical properties, reactions – electrophilic substitution reaction, nitration, sulphonation, halogenation, Friedel – Crafts acylation & alkylation, preferential substitution at α/β - position – reduction, oxidation – uses.

Anthracene – synthesis by Elbs reaction, Diels – Alder reaction and Haworth synthesis; physical properties; reactions - Diels-Alder reaction, preferential substitution at C-9 and C-10; uses. **(15 Hours)**

**RecommendedText**

1. Madan R D, Sathya Prakash, (2003), Modern Inorganic Chemistry, 2nded,

S.Chand and Company, New Delhi.

2. Sathya Prakash, Tuli G D,Basu S K and Madan R D, (2003), Advanced Inorganic Chemistry, 17th ed., S.Chand and Company, New Delhi.
3. Bahl B S, Arul Bhal, (2003), Advanced Organic Chemistry, 3rd ed., S.Chand and Company, New Delhi.
4. Tewari K S, Mehrothra S N and Vishnoi N K, (1998), Text book of Organic Chemistry, 2nd ed., Vikas Publishing House, New Delhi.
5. Puri B R, Sharma L R, (2002), Principles of Physical Chemistry, 38th ed., Vishal Publishing Company, Jalandhar.

**ReferenceBooks**

1. Maron S H and Prutton C P, (1972), Principles of Physical Chemistry, 4th ed., The Macmillan Company, Newyork.
2. Barrow G M, (1992), Physical Chemistry, 5th ed., Tata McGraw Hill, NewDelhi.
3. Lee J D, (1991), Concise Inorganic Chemistry, 4th ed., ELBS WilliamHeinemann, London.
4. Huheey J E, (1993), Inorganic Chemistry: Principles of Structure andReactivity, 4th ed., Addison Wesley Publishing Company, India.
5. Gurudeep Raj, (2001), Advanced Inorganic Chemistry Vol – I, 26th ed., Goel Publishing House, Meerut.
6. Agarwal O P, (1995), Reactions and Reagents in Organic Chemistry,8thed., Goel Publishing House,Meerut

| Course Code 23UCHC21 | PO1 | | PO2 | | PO3 | | PO4 | | PO5 | | PO6 | PO7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PSO 1 a | PSO 1 b | PSO 2 a. | PSO 2b. | PSO 3 a | PSO 3 b | PSO 4 a | PSO 4 b | PSO 5.a | PSO 5.b. | PSO 6 | PSO 7 |
| CO 1 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 2 | 2 | 2 | 3 | 3 |
| CO 2 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 2 | 2 | 2 | 3 | 3 |
| CO 3 | 3 | 3 | 1 | 1 | 1 | 3 | 3 | 3 | 3 | 2 | 3 | 3 |
| CO 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 |
| CO 5 | 3 | 3 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 2 | 3 | 3 |

Dr.M.Dhanalakshmi
Head of the Department

Dr.M.Amutha
Course Designer

**V.V.VANNIAPERUMAL COLLEGE FOR WOMEN**
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**VIRUDHUNAGAR - 626 001**

**B.Sc. CHEMISTRY**
**(2023 -2024 Onwards)**

| | | | |
|---|---|---|---|
| Semester II | **QUALITATIVE ORGANIC ANALYSIS AND PREPARATION OF ORGANIC COMPOUNDS PRACTICAL** | Hours/Week: 3 | |
| Core Course-4<br><br>Practical II | | Credits: 2 | |
| Course Code<br><br>**23UCHC21P** | | Internal<br>40 | External<br>60 |

**COURSE OUTCOME**

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

**CO1 :** observe the physical state, odour, colour and solubility of the given organic compound. [K2]

**CO2 :** Classify the unknown organic compound by functional groups [K2]

**CO3 :** identify the presence of special elements and functional group in an unknown organic compound performing a systematic analysis. [K3]

**CO4 :** exhibit a solid derivative with respect to the identified functional group. [K3]

**CO5 :** apply the techniques of the separation and isolation of organic compounds in their project and research work. [K3]

**Qualitative Organic Analysis:** Preliminary examination, detection of special elements - nitrogen, sulphur andhalogens.

Aromatic and aliphatic nature, Test for saturation and unsaturation,identification of functional groups using solubility tests.

Confirmation of functional groups

- monocarboxylic acid, dicarboxylic acid
- monohydric phenol, polyhydric phenol
- aldehyde, ester

- carbohydrate (reducing sugars)
- primary, secondary, tertiary amine
- monoamide, diamide

Preparation of derivatives for functional groups **(20 Hours)**

**Preparation of Organic Compounds (15 Hours)**

i. Nitration : picric acid from Phenol

ii. Halogenation : p-bromo acetanilide from acetanilide

iii. Oxidation : benzoic acid from Benzaldehyde

iv. Hydrolysis: benzamide to Benzoic Acid / Methyl benzoate to Benzoic acid

v. Benzoylation: aniline to benzanilide / phenol to phenyl benzoate

**Separation and Purification Techniques (Not for Examination) (10 Hours)**

1. Purification of organic compounds by crystallization (from water /alcohol) and distillation
2. Determination of melting and boiling points of organic compounds.
3. Steam distillation - Extraction of essential oil from citrus fruits/eucalyptus leaves.
4. Chromatography (any one) (Group experiment)

(i) Separation of amino acids

(ii) Separation of $KMnO_4$ & $K_2Cr_2O_7$

(iii) Separation of lipids

(iv) Separation of carbohydrates

**Recommended Text**

1. Venkateswaran, V.; Veeraswamy, R.; Kulandaivelu, A.R. Basic Principles of Practical Chemistry, 2nd ed.; Sultan Chand: New Delhi, 2012.
2. Manna, A.K. Practical Organic Chemistry, Books and Allied: India, 2018.
3. Gurtu, J. N; Kapoor, R. Advanced Experimental Chemistry (Organic), Sultan Chand: New Delhi, 1987.

4. Furniss,B. S.; Hannaford, A. J.; Smith, P. W. G.; Tatchell, A.R. Vogel's Textbook of Practical Organic Chemistry, 5th ed.; Pearson: India,1989.

| Course Code 23UCHC21P | PO1 | | PO2 | | PO3 | | PO4 | | PO5 | | PO6 | PO 7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PSO 1.a | PSO 1. b | PSO 2.a | PSO 2.b | PSO 3a | PSO 3.b | PSO 4a | PSO 4b | PSO 5.a | PSO 5.b | PSO 6 | PSO 7 |
| CO1 | 1 | 1 | 3 | 3 | 1 | 2 | 1 | 2 | 1 | 1 | - | 3 |
| CO2 | 1 | 1 | 3 | 3 | 2 | 2 | 3 | 2 | 2 | 2 | - | 3 |
| CO3 | 2 | 1 | 3 | 2 | 2 | 3 | 3 | 2 | 2 | 2 | - | 3 |
| CO4 | 2 | 2 | 3 | 3 | 1 | 1 | 3 | 3 | 2 | 3 | - | 3 |
| CO5 | 2 | 2 | 3 | 3 | 1 | 1 | 2 | 2 | 2 | 3 | - | 3 |

**Strong (3) Medium (2) Low (1)**

Dr.M.Dhanalakshmi
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Mrs.A.Prasanna
Course Designer

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**VIRUDHUNAGAR - 626 001**

**B.Sc. CHEMISTRY**
**(2023-24 onwards)**

| | | | |
|---|---|---|---|
| Semester II | **MATHEMATICAL FOUNDATIONS** | Hours/Week:3 | |
| Elective Course-I | | Credits:2 | |
| Course Code<br>**23UMTA21** | | Internal<br>25 | External<br>75 |

**COURSE OUTCOMES**

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

CO1: retrieve the basic concepts in differentiation, integration, algebraic equations and trigonometric functions. [K1]

CO2: explain the concepts in Algebra, Vector Calculus and Trigonometry. [K2]

CO3: find approximate solutions, establish the relation between roots and coefficients of an equation. [K2]

CO4: apply the concepts in Algebra and trigonometry in various fields. [K3]

CO5: apply the knowledge gained in Vector Calculus to solve problems in real life situations. [K3]

**UNIT I**

**Vector Differentiation**

Differentiation of Vectors – Gradient – Velocity and Acceleration –Divergence and Curl (Simple Theorems only) - Problems. (9 hours)

**UNIT II**

**Vector Integration**

Line integrals – Surface integrals – Theorems of Green, Gauss and Stoke's (Statements only) – Problems. (9 hours)

**UNIT III**

**Algebra**

Formation of Equations – Relation between roots and coefficients. (9 hours)

**UNIT IV**

**Algebra Continued**

Transformation of Equations – Approximate solutions of numerical equations. (9 hours)

**UNIT V**

**Trigonometry**

Expansion of sinθ, cosθ, tanθ in powers of θ–Hyperbolic Functions. (9 hours)

**TEXTBOOKS**

1. Arumugam.S. and Thangapandi Isaac.A. (2004). *Ancillary Mathematics Paper II (Revised)*, New Gamma Publishing House.

2.Arumugam.S. and Thangapandi Isaac.A.(2014).*Allied Mathematics Paper I*, New Gamma Publishing House.

| Unit | Chapter | Section |
|---|---|---|
| | **Text Book1** | |
| I | 1 | 1.2–1.5 |
| II | 2 | 2.1,2.2,2.3 |
| | **Text Book2** | |
| III | Part1-Chapter1 | 1.1,1.2 |
| IV | Part1-Chapter1 | 1.4,1.5 |
| V | Part3- Chapter1<br>Chapter2 | <br>1.3<br>2.1 |

| Course Code 23UMTA21 | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** |
|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 3 | 2 | 2 | - | - |
| CO2 | 3 | 1 | 3 | 2 | 2 | 1 | - |
| CO3 | 3 | 2 | 3 | 2 | 2 | 1 | - |
| CO4 | 2 | 2 | 1 | 2 | 2 | - | - |
| CO5 | 3 | 1 | 1 | 2 | 2 | 1 | - |

Dr. A.Uma Devi
**Head of the Department**

Dr. A.Uma Devi
**Course Designer**

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**VIRUDHUNAGAR - 626 001**

**B.Sc. CHEMISTRY**

**(2023-24 onwards)**

| | | | |
|---|---|---|---|
| Semester II | **STATISTICS AND OPERATIONS RESEARCH** | Hours/Week:3 | |
| Elective Course -I | | Credits:2 | |
| Course Code **23UMTA22** | | Internal 25 | External 75 |

**COURSEOUTCOMES**

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

CO1: retrieve the basic concepts in Statistics and Operations Research. [K1]

CO2: explain the techniques used to solve the problems in Statistics and operations Research [K2]

CO3: find solutions to solve the problems in the society. [K2]

CO4: calculate some statistical constants to get statistical inference and use O.R techniques to solve real life problems. [K3]

CO5: apply Correlation and Regression to draw conclusion for a given data. [K3]

**UNIT I**

**Statistics**

**Correlation**

Correlation-Problems-Rank correlation

(9 hours)

**UNIT II Regression**

Regression –Properties of Regression coefficients–Problems.

(9 hours)

**UNIT III**

**Operations Research**

Formulation of Linear Programming Problem – Mathematical formulation of a Linear Programming Problem- Graphical method.

(9 hours)

**UNIT IV**

**Operations Research Continued:**

Mathematical formulation of Transportation Problems – Initial Basic Feasible Solutions (Method 1, Method 2, Method 3, Method 4). (9 hours)

**UNIT V**

**Operations Research Continued:**

Introduction- Mathematical formulation of an Assignment Problem – Solution to Assignment Problem – Hungarian Algorithm (balanced minimization problems only).

(9 hours)

**TEXTBOOKS**

1. Arumugam.S and Thangapandi Isaac. A. (2011). *Statistics*, New Gamma Publishing House.
2. Arumugam.S and Thangapandi Isaac. A.(2015). *Topics in Operations Research Linear Programming*,

New Gamma Publishing house.

| Unit | Chapter | Section |
|---|---|---|
| **Text Book 1** | | |
| I | 6 | 6.0, 6.1, 6.2 |
| II | 6 | 6.3 |
| **Text Book 2** | | |
| III | 3 | 3.1, 3.2, 3.4 |
| IV | 4 | 4.1 |
| V | 5 | 5.0, 5.1, 5.2 |

| Course Code 23UMTA22 | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** |
|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 3 | 3 | 3 | 3 | - |
| CO2 | 3 | 2 | 3 | 3 | 3 | 2 | - |
| CO3 | 3 | 3 | 3 | 3 | 3 | 3 | - |
| CO4 | 3 | 2 | 3 | 3 | 3 | 3 | - |
| CO5 | 3 | 2 | 3 | 3 | 3 | 3 | - |

Dr.A.Uma Devi

**Head of the Department**

Mrs.P.Getchial Pon Packiavathi

**Course Designer**

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**VIRUDHUNAGAR - 626 001**

**B.Sc. CHEMISTRY**
**(2023-2024 onwards)**

| | | | |
|---|---|---|---|
| Semester II | **ALLIED BOTANY II** | Hours/Week: 4 | |
| Elective Course - I | | Credits: 3 | |
| Allied Code **23UBYA21** | | Internal 25 | External 75 |

Course Outcomes:

CO1: Understand the fundamental concepts of plant anatomy and embryology. [ K1]

CO2: Recognize the different organs of plants and secondary growth. [ K2]

CO3: Explain the water relation of plants with respect to various physiological processes. [K2]

CO4: Demonstration of an aerobic and anaerobic respiration [K3]

CO5: Interpret the plant systematics and recognize the importance of herbarium and virtual herbarium. [ K3]

**UNIT I :**

MORPHOLOGY OF FLOWERING PLANTS: Plant and its parts. Structure and function of root and stem. Leaf and its parts. Leaf types- simple and compound. Phyllotaxy and types. Inflorescence - Racemose, Cymose and Special types. Terminology with reference to flower description. (12 Hours)

**UNIT II:**

TAXONOMY: Study of the range of characters and plants of economic importance in the following families: Rutaceae, Caesalpiniaceae, Asclepiadaceae, Euphorbiaceae and Cannaceae (12 Hours)

**UNIT III**

ANATOMY: Tissue and tissue systems: Simple and complex tissues. Anatomy of monocot and dicot roots - anatomy of monocot and dicot stems - anatomy of dicot and monocot leaves. (12 Hours)

**UNIT IV:**

EMBRYOLOGY: Structure of mature anther and ovule - Types of ovules, structure of embryo sac, pollination -double fertilization, structure of dicotyledonous and monocotyledonous seeds. (12 Hours)

**UNIT V**:

PLANT PHYSIOLOGY: Absorption of water, photosynthesis - light reaction - Calvin cycle; respiration - Glycolysis - Krebs cycle - electron transport system. Growth hormones - auxins and cytokinins and their applications. (12 Hours)

**TEXT BOOKS**

1. Sharma, O.P. 2017. Plant Taxonomy. (II Edition).The McGraw Hill Companies.

2. Bhojwani, S.S. Bhatnagar, S.P and Dantu, P.K. 2015. The Embryology of Angiosperms (6th revised and enlarged edition). Vikas Publishing House, New Delhi.

3. Maheshwari, P. 1963. Recent Advances in Embryology of Angiosperms. Intl. Soc. Plant Morphologists, New Delhi.

4. Salisbury, F. B.C.W. Ross.1991. Plant Physiology. Wassworth Pub. Co. Belmont.

5. Ting, I.P. 1982. Plant Physiology. Addison Wesley Pb. Philippines.

REFERENCE BOOKS

1. Lawrence.G.H.M. 1985. An Introduction to Plant Taxonomy, Central Book Depot, Allahabad.

2. Bhojwani, S.S and Bhatnagar, S.P. 2000. The Embryology of Angiosperms (4th revised and enlarged edition). Vikas Publishing House, New Delhi.

3. Pandey, B.P. 2012. Plant Anatomy. S Chand Publishing.

4. Jain, VK. 2006. Fundamentals of Plant Physiology, S. Chand and Company Ltd.

5. Rajni Gupta. 2012. Plant Taxonomy: Past, Present and Future. Vedams (P) Ltd. New Delhi.

6. Jain, V.K. 2006. Fundamentals of Plant Physiology, S.Chand and Company Ltd., New Delhi.

7. Verma, S.K. 2006. A Textbook of Plant Physiology, S.K.Chand & Co., New Delhi.

| Course code 23UBYA21 | PO1 | PO2 | PO 3 | PO4 | PO 5 | PO 6 | PO 7 |
|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 2 | 2 | 2 |
| CO2 | 3 | 3 | 3 | 3 | 2 | 2 | 2 |
| CO3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 |
| CO4 | 3 | 3 | 3 | 3 | 2 | 2 | 2 |
| CO5 | 3 | 3 | 3 | 3 | 2 | 2 | 2 |

**Strong (3) Medium (2) Low (1)**

Dr.B.Karunai Selvi
**Head of the Department**

Dr. R. Murugalakshmi Kumari
**Course Designer**

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**B.Sc. CHEMISTRY**
**(2023-2024 onwards)**

| | | | |
|---|---|---|---|
| Semester II | **ALLIED BOTANY PRACTICAL I** | Hours/Week: 2 | |
| Elective Course – I Practical I | | Credits: 1 | |
| Course Code **23UBYA21P** | | Internal 40 | External 60 |

Course Outcomes:

CO1: Explain the internal organization of algae and fungi. [K2]

CO2: Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms. [K2]

CO3: Solve the classical taxonomy with reference to different parameters. [K3]

CO4: Sketch the fundamental concepts of plant anatomy and embryology. [K3]

CO5: Demonstrate the effect of various physical factors on photosynthesis. [K3]

**EXPERIMENTS**

1. Make suitable micro preparation of the types prescribed in Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms.
2. Micro photographs of the cell organelles ultra structure.
3. Simple genetic problems.
4. To describe in technical terms, plants belonging to any of the family prescribes and to identify the family.
5. To dissect a flower, construct floral diagram and write floral formula.

6. Demonstration experiments
    1. Ganong's Light screen

2. Ganong's respiroscope

7. To make suitable micro preparations of anatomy materials prescribed in the syllabus.
8. Spotters - Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms and Angiosperm anatomy, Embryology, Cell biology and Biotechnology.

**TEXT BOOKS**

1. Sharma, O.P. 2017. Bryophyta, MacMillan India Ltd, New Delhi.
2. Sharma, O.P. 2012. Pteridophyta, Tata McGraw-Hills Ltd, New Delhi.
3. Subramaniam, N.S. 1996. Laboratory Manual of Plant Taxonomy. Vikas Publishing House Pvt. Ltd., New Delhi.
4. Benjamin, A. Pierce. 2012. Genetics- A conceptual Approach. W.H. Freeman and Company, New York, England.
5. Noggle G.R and G.J. Fritz. 2002. Introductory Plant Physiology. Prentice Hall of India, New Delhi.

**REFERENCE BOOKS**

1. Strickberger, M.W. 2005. Genetics (III Ed). Prentice Hall, New Delhi, India.
2. Nancy Serediak and M. Huynh. 2011. Algae identification lab Guide. Accompanying manual to algae identification field guide, Ottawa Agriculture and Agri food Canada publisher.
3. Mohammed Gufran Khan, Shite Gatew and Bedilu Bekele. 2012. Practical manual for Bryophytes and Pteridophytes. Lambert Academic Publishing.
4. Aler Gingauz. 2001. Medicinal Chemistry. Oxford University Press & Wiley Publications.
5. Steward, F.C. 2012. Plant Physiology Academic Press, US

| Course code **23UBYA21P** | PO1 | PO2 | PO 3 | PO4 | PO 5 | PO 6 | PO 7 |
|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 2 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 2 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 2 | 3 | 3 |

**Strong (3) Medium (2) Low (1)**

Dr.B.Karunai Selvi
**Head of the Department**

Dr.B.Karunai Selvi
**Course Designer**

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**VIRUDHUNAGAR - 626 001**

**B.Sc. CHEMISTRY**
**(2023 -24 onwards)**

| | | | |
|---|---|---|---|
| Semester II | **DRUGS AND NATURAL PRODUCTS** | Hours/Week: 2 | |
| NME -2 | | Credits: 2 | |
| Course Code **23UCHN21** | | Internal 25 | External 75 |

**COURSE OUTCOMES**

On completion of the course, the students shall be able to

CO1: define the various drug terminologies, antibiotics, chemotherapy agents, vitamins, hormones and natural products. [K1]

CO2: know the drugs studies, antibiotics, chemotherapeutic agents, vitamins, hormones and natural products. [K1]

CO3: understand the pharmaceutical terminologies, antibiotics drug action and effects, types of therapeutic agents, effects and uses of vitamins, hormones and natural products. [K2]

CO4: discuss the pharmaceutical terms, activity and effects of bacterial inflectional drugs, action of different therapeutic agents, biological importance and dificency of vitamins and hormones, medicinal significance of terpenoids and alkaloids. [K2]

CO5: predict the drug terminologies, drug activity and effects of antibiotics nature and types of therapeutic agents, effects and importance of vitamins and steroids, medicinal uses of natural products. [K3]

**UNIT I**

Importance of Drugs –terminologies – Pharmacy – Pharmacology – Pharmacodynamics – Pharmacokinetics – Molecular Pharmacology – Pharmacophore – antimetabolites – actinomycetes - Bacteria, Virus, fungi –mutation. (6 Hours)

**UNIT II**

Antibiotics – Definition-classification-uses of Ampicillin, streptomycin, Erythromycin, tetracycline, rifomycin (structure not necessary) – drug action and side effects.

(6 Hours)

**UNIT III**

Chemotherapy-introduction-classification-Definition and examples of Antipyretics-Analgesics - Anti-inflammatory agents - Sulpha drugs-Antimalarials-Antiseptics(structure not necessary) (6 Hours)

**UNIT IV**

Vitamin – Classification – Sources and deficiency of various vitamins.(structure not necessary)

Steroids – Classification- biological importance of Male sex hormone, Female sex hormone. (structure not necessary) (6Hours)

**UNIT V**

Terpenoids: Definition – classification – occurrence – uses of citral, geraniol, limonene, menthol and zingiberene.(structure not necessary)

Alkaloids: Definition – classification - occurrence – medicinal uses of quinine, atropine, morphine,nicotine and papavarine.(structure not necessary) (6 Hours)

**TEXT BOOKS**

1. Jayashree Ghosh, (2012). *A Text Book of Pharmaceutical Chemistry*, 1st Edition. New Delhi: S.Chand & Company Ltd.

2. Jain, M.K. & Sharma, S.C. (2016). *Modern Organic Chemistry*, 1st Edition.New Delhi: Vishal Publishing Co.

| Course Code 23UCHN21 | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6 | PSO 7 |
|---|---|---|---|---|---|---|---|
| CO 1 | 2 | 2 | 1 | 1 | 2 | 2 | 1 |
| CO 2 | 1 | 1 | 2 | 2 | 1 | 1 | 2 |
| CO 3 | 2 | 2 | 1 | 1 | 1 | 2 | 1 |
| CO 4 | 2 | 1 | 1 | 1 | - | 1 | 1 |
| CO 5 | 1 | 1 | 1 | - | 1 | 1 | 2 |

Dr.M.Dhanalakshmi
**Head of the Department**

Dr. C. Vidya Rani
**Course Designer**

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**VIRUDHUNAGAR - 626 001**

**B.Sc. CHEMISTRY**
**(2023 -24 onwards)**

| | | | |
|---|---|---|---|
| Semester II | **POLYMER CHEMISTRY** | Hours/Week: 2 | |
| SEC-2 | | Credits: 2 | |
| Course Code | | Internal | External |
| **23UCHS21** | | 25 | 75 |

**COURSE OUTCOMES**

On successful completion of the course, the learners shall be able to

CO1: remember the classification of polymers[K1]

CO2: know the chemistry of polymer formation [K1]

CO3: explain the mode of preparation of vulcanized rubber, resins, plastics and biomedical polymers [K2]

CO4: understand the techniques of polymer preparation into a novel polymeric compound [K2]

CO5: apply the utility of different polymers [K3]

**UNIT I :**

Polymers - Introduction - definition - Classification of polymers- Types of polymerization reactions - Addition, condensation polymerization – examples-Polymerization techniques. **(**6 Hours)

**UNIT II :**

Plastic - definition - Types - Thermosetting and thermoplastics – differences- examples – advantages and disadvantages of plastics - preparation and uses of cellulose acetate, celluloid, PVC, polyethylene,teflon, polycarbonates and polystyrene. (**6** Hours)

**UNIT III :**

Resins-Definition - Types – Examples - Phenolic resin, amino resin and polyurethanes – preparation and uses.

Fibres – Nylon-6,6, Nylon-6 and polyester - preparation and uses. (**6** Hours)

**UNIT IV :**

Inorganic polymers - Silicones - preparation and uses- Glass transition and melting temperatures – importance - conducting polymers - Different types - uses. Polymer alloy - biomedical polymers - examples and uses. **(6** Hours)

**UNIT V:**

Rubber - Natural rubber - Vulcanization of rubber-synthetic rubber – Buna - S, Buna-N, Thiokol and Neoprene rubber- preparation and uses. (**6** Hours)

**TEXT BOOKS**

1.Jain& Jain. (2013).*Engineering Chemistry*, 16th Edition. DhanpatRai Publishing Company (P) Ltd.

2.JayashreeGhosh.(2013).*Fundamental concepts of Applied Chemistry*, S.Chand& Company Ltd.

**REFERENCE BOOKS**

1.K.BagavathiSundari.(2006). *Applied Chemistry*, MJP Publishers.

2.B.K.Sharma.(2008).*Industrial Chemistry*, 13th Edition. GOEL Publishing House.

| Course Code 23UCHS21 | PO1 | | PO2 | | PO3 | | PO4 | | PO5 | | PO6 | PO7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PSO 1 a | PSO 1 b | PSO 2a . | PSO 2a | PSO 3 a | PSO 3 b | PSO 4 a | PSO 4 b | PSO 5a | PSO 5.b | PSO 6 | PSO 7 |
| CO 1 | 3 | 2 | 3 | | 3 | 1 | 1 | 2 | 2 | 2 | 1 | 2 |
| CO 2 | 3 | 3 | 3 | | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 2 |
| CO 3 | 3 | 3 | 3 | | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 |
| CO 4 | 3 | 3 | 2 | | 2 | 3 | 1 | 2 | 2 | 2 | 2 | 3 |
| CO 5 | 3 | 3 | 3 | | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 |

Dr.M.Dhanalakshmi
Head of the Department

Mrs.R.Nagasathya
Course Designer

**V.V.VANNIAPERUMAL COLLEGE FOR WOMEN**
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**VIRUDHUNAGAR**
**Quality Education with Wisdom and Values**

**B.Sc. CHEMISTRY**
**(for those who joined in 2023 -2024)**

| | | | |
|---|---|---|---|
| Semester III | **GENERAL CHEMISTRY-III** | Hours/Week: 5 | |
| Core Course -5 | | Credits: 5 | |
| Course Code | | Internal | External |
| **23UCHC31** | | 25 | 75 |

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

**CO1 :** explain the basic concepts in gaseous,liquid and solid states, nuclear chemistry and haloorganic compounds and alcohols [K1]

**CO2 :** discuss the properties and laws governing the different forms of matter and radioactivity, nomenclature of halo compounds and alcohols [K2]

**CO3 :** describe the physical properties of gases, liquids and solids by using mathematical concepts, nuclear energy and it's production, preparation of halo compounds and alcohols [K2]

**CO4 :** identify various types of crystalswith respect to its packing, the nuclear waste management, properties of halogen organic compounds and alcohols [K3]

**CO5 :** apply the XRD method for crystal structure determinations, illustrate the deviations from ideal gas behavior, propose the mechanisms of haloorganic compounds and alcohols. [K3]

**UNIT-I**

**Gaseous state**

**Kinetic molecular model of a gas:** postulates of kinetic theory of gases and derivation of gas laws from the kinetic gas equation; The Maxwell –Boltzmann distribution of speed of molecules- average, root mean square and most probable velocity and average kinetic energy, law of equipartition of energy, degrees of freedom and molecular basis of heat capacities. Collision frequency; collision diameter; mean free path and viscosity of gases.

**Real gases:** Deviations from ideal gas behaviour, (Andrew's and Amagat's plots); compressibility factor, Z, and its variation with pressure for different gases. equations of states for real gases-van

der Waal's equation; Virial equation; Boyle temperature; Numerical problems based on equations of statesfor real gases, isotherms of real gases – critical phenomena – isotherms of $CO_2$- continuity of state–Van der waal's equation and the critical state; law of corresponding states-liquefaction of gases; numerical problems involving the core concepts**.**

**(15 Hours)**

**Unit-II**

**Liquid and Solid State**

Properties of Liquids- Surface tension, viscosity and their applications. Crystalline and amorphous – differences - geometry, isotropy and anisotropy,melting point; isomorphism, polymorphism.

Crystals –size and shape; laws of crystallography; symmetry elements – plane, centre and axis; Miller indices, unit cells and space lattices; classification ofcrystal systems; Bravais lattices; X–ray diffraction – Bragg's equation

Packing in atomic solids – simple cubic, body centered cubic, face centeredand hexagonal close packing; Co-ordination number in typical structures - NaCl, CsCl, ZnS, $TiO_2$; comparison of structure and properties of diamond and graphite;.numerical problems involving core concepts

Defects in solids - stoichiometric and nonstoichiometric defects.

**Liquid crystals** – classification and applications. **(15 Hours)**

**UNIT-III**

**Nuclear Chemistry**

Natural radioactivity - α, β and ϒ rays; half-life period; Fajan–Soddy group displacement law; Geiger–Nattal rule; isotopes, isobars, isotones, mirror nuclei, iso diaphers; nuclear isomerism; radioactive decay series; magic numbers; units – Curie, Rutherford, Roentgen; nuclear stability - neutron- proton ratio; binding energy; packing fraction; mass defect. Simple calculations involving mass defect and B.E., decay constant and $t_{1/2}$ and radioactive series.

Nuclear energy; nuclear fission and fusion – major nuclear reactors in India;radiation hazards, disposal of radioactive waste and safety measures. **(15 Hours)**

**UNIT-IV**

**Halogen derivatives Aliphatic halogen derivatives**

Nomenclature and classes of alkyl halides – isomerism, physical properties, Chemical reactions. Nucleophilic substitution reactions – $S_N1$, $S_N2$ and $S_Ni$mechanisms with stereochemical aspects and effect of solvent.

**Di, Tri & Tetra Halogen derivatives:**

Nomenclature, classification,preparation, properties and applications.

**Aromatic halogen compounds**

Nomenclature, preparation, properties and uses. Mechanism of nucleophilic aromatic substitution – benzyne intermediate.

**Aryl alkyl halides**

Nomenclature, benzyl chloride – preparation – preparation properties and uses

**Alcohols:** Nomenclature, classification, preparation, properties, use; conversions – ascent and descent of series; test for hydroxyl groups. Oxidation of diols by periodic acid and lead tetraacetate.

**(15 Hours)**

**UNIT-V**

**Phenols**

Nomenclature; classification, Preparation from diazonium salts, cumene, Dow's process, Raching process; properties – acidic character and effect of substitution on acidity. Reactions – Fries, Claisen rearrangement, Electrophilic substitution reactions, Reimer - Teimen, Kolbe, Schmidt, Gatermann synthesis, Libermann, nitro reaction, phthalein reaction. Resorcinol, quinol, picric acid – preparation, properties and uses.

**Aromatic alcohols**

Nomenclature, benzyl alcohol – methods of preparation – hydrolysis, reduction of benzaldehyde, Cannizzaro reaction, Grignard synthesis, physical properties, reactions – reaction with sodium, phosphorus pentachloride, thionyl chloride, acetic anhydride, hydrogen iodide, oxidation – substitution on the benzene nucleus, uses.

**Thiols:** Nomenclature, structure, preparation and properties. **(15 Hours)**

**RecommendedText**


1. B.R. Puri, L.R. Sharma, M.S. Pathania;( 2020) *Principles of Physical Chemistry*,46th edition, Vishal Publishing,
2. B.R. Puri, L.R. Sharma and K.C. Kalia,(2009), *Principles of Inorganic Chemistry*,Milestone Publishers and Distributors, New Delhi, thirtieth edition,
3. 4. P.L. Soni and Mohan Katyal, (2006), *Textbook of Inorganic Chemistry,* SultanChand & amp; Sons, twentieth edition.
4. M. K. Jain, S. C. Sharma, (2003), *Modern Organic Chemistry,* Vishal Publishing,fourth reprint.
5. S.M. Mukherji, and S.P. Singh, (1994), *Reaction Mechanism in Organic Chemistry*, Macmillan India Ltd., third edition.

6. Tewari K S, Mehrothra S N and Vishnoi N K, (1998), Text book of Organic Chemistry, 2nd ed., Vikas Publishing House, New Delhi.
7. Arun Bahl, Bahl, B.S &.Tuli G.D, (2017) *Essentials of Physical chemistry.* NewDelhi: S.Chand & Company Ltd.
8. Madan.R.D, *Modern Inorganic Chemistry*, S.Chand& Company Ltd.
9. Arun Bahl & Bahl, B.S.(2009). *Advanced Organic Chemistry .19th edition.* NewDelhi: S.Chand & Company Ltd.

**ReferenceBooks**

1. T. W. Graham Solomons, (1992), *Organic Chemistry*, John Wiley & Sons,fifth edition.
2. A. Carey Francis, (2009), *Organic Chemistry*, Tata McGraw-Hill Education Pvt.,Ltd.,New Delhi, seventh edition.
3. I. L. Finar, (1996), *Organic Chemistry*, Wesley Longman Ltd, England, sixth edition.
4. P. L. Soni, and H. M.Chawla, (2007), *Text Book of Organic Chemistry*, New Delhi,Sultan Chand & Sons, twenty ninth edition.
5. J.D. Lee, (2005), *Concise Inorganic Chemistry*, Blackwell Science, fifth edition.

| Course Code 23UCHC31 | PO1 | | PO2 | | PO3 | | PO4 | | PO5 | | PO6 | PO7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PSO 1 a | PSO 1 b | PSO 2 a | PSO 2b | PSO 3 a | PSO 3 b | PSO 4 a | PSO 4 b | PSO 5.a | PSO 5.b | PSO 6 | PSO 7 |
| CO 1 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 2 | 2 | 2 | 3 | 3 |
| CO 2 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 2 | 2 | 2 | 3 | 3 |
| CO 3 | 3 | 3 | 1 | 1 | 1 | 3 | 3 | 3 | 3 | 2 | 3 | 3 |
| CO 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 |
| CO 5 | 3 | 3 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 2 | 3 | 3 |

**Strong (3) Medium (2) Low (1)**

Dr.M.Dhanalakshmi
**Head of the Department**

Dr.A.Prasanna
**Course Designer**

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**Quality Education with Wisdom and Values**

**B.Sc. CHEMISTRY**
**(For those who joined in 2023 -2024)**

| | | | |
|---|---|---|---|
| Semester III | **QUALITATIVE INORGANIC ANALYSIS** | Hours/Week: 3 | |
| Core Course-6 | | Credits: 2 | |
| CourseCode<br>**23UCHC31P** | | Internal<br>40 | External<br>60 |

**COURSE OUTCOME**

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

**CO1 :** acquire knowledge on the systematic analysis of mixture of salts. [K2]

**CO2 :** observe the physical state and carryout the preliminary reactions of the given mixture [K2]

**CO3 :** apply systematic procedure and find out the non-interfering and interfering anions present in the given mixture. [K3].

**CO4 :** identify the cations present in the given mixture [K3]

**CO5 :** assess the role of common ion effect and solubility product [K3]

**Inorganic Semi micro Qualitative Analysis**

1. Analysis of simple acid radicals: Carbonate, sulphide, sulphate, thiosulphite, chloride, bromide, iodide, nitrate
2. Analysis of interfering acid radicals: Fluoride, oxalate, borate, phosphate,arsenate, arsenite.
3. Elimination of interfering acid radicals and Identifying the group of basic radicals
4. Analysis of basic radicals (group wise): Lead, copper, bismuth, cadmium, tin, antimony, iron, aluminium, arsenic, zinc,manganese, nickel, cobalt, calcium, strontium, barium, magnesium, ammonium

Analysis of a mixture - I to VIII containing two cations and two anions (of which one is interfering type).

**Recommended Text**

1. Venkateswaran, V.; Veeraswamy, R.; Kulandaivelu, A.R. (2012), Basic Principles of Practical Chemistry, 2nd ed.; Sultan Chand: New Delhi.

| Course Code 23UCHC31P | PO1 | | PO2 | | PO3 | | PO4 | | PO5 | | PO6 | PO7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PSO 1.a | PSO 1. b | PSO 2.a | PSO 2.b | PSO 3a | PSO 3.b | PSO 4a | PSO 4b | PSO 5.a | PSO 5.b | PSO 6 | PSO 7 |
| CO1 | 1 | 1 | 3 | 3 | 1 | 2 | 1 | 2 | 1 | 1 | - | 2 |
| CO2 | 1 | 1 | 3 | 3 | 2 | 2 | 3 | 2 | 2 | 2 | - | 2 |
| CO3 | 2 | 1 | 3 | 2 | 2 | 3 | 3 | 2 | 2 | 2 | - | 2 |
| CO4 | 2 | 2 | 3 | 3 | 1 | 1 | 3 | 3 | 2 | 3 | - | 2 |
| CO5 | 2 | 2 | 3 | 3 | 1 | 1 | 2 | 2 | 2 | 3 | - | 2 |

**Strong (3) Medium (2) Low (1)**

Dr.M.Dhanalakshmi
**Head of the Department**

Dr.A.Prasanna
**Course Designer**

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**B.Sc. CHEMISTRY**

**(For those who joined in 2023 -2024)**

| | | | |
|---|---|---|---|
| Semester I | **GENERAL PHYSICS** | Hours/Week: 4 | |
| Elective Course I | | Credits: 3 | |
| Course Code **23UPHA31** | | Internal 25 | External 75 |

**COURSE OUTCOMES**

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

CO1: identify basic laws and principles of wave motion, thermodynamics, gravitation, electrostatistics, electromagnetism and elastic constants. [K1]

CO2: describe experimental methods involved in SHM, ultrasonics, gravitation, liquefaction of gases and also derive the physical parameters under properties of matter. [K2]

CO3: deduce the physical parameters in heat engines, gravitation, electrostatistics, electromagnetism and also explain the experimental methods behind properties of matter. [K2]

CO4: demonstrate the applications of SHM, ultrasonics, low temperature physics and solve simple problems in properties of matter. [K3]

CO5: illustrate the applications and solve problems in thermodynamics, gravitation, electrostatics and electricity & magnetism. [K3]

**UNIT I**

**WAVES, OSCILLATIONS AND ULTRASONICS:** simple harmonic motion (SHM) – composition of two SHMs at right angles (periods in the ratio 1:1) – Lissajous figures – uses – laws of transverse vibrations of strings – determination of AC frequency using sonometer (steel and brass wires) – ultrasound – production – piezoelectric method – application of ultrasonics: medical field – lithotripsy, ultrasonography – ultrasonic imaging- ultrasonics in dentistry, opthalmology – ultrasonics in green chemistry. (12 hours)

**UNIT II**

**PROPERTIES OF MATTER:** *Elasticity*: elastic constants – bending of beam – theory of non-uniform bending – determination of Young's modulus by non-uniform bending – energy stored in a stretched wire – torsion of a wire – determination of rigidity modulus by torsional pendulum.

*Viscosity*: streamline and turbulent motion – critical velocity – coefficient of viscosity – Poiseuille's formula – comparison of viscosities – burette method.

*Surface tension*: definition – molecular theory - Droplets formation–shape, size and lifetime – COVID transmission through droplets, saliva – drop weight method – interfacial surface tension.

(12 hours)

**UNIT III**

**HEAT AND THERMODYNAMICS:** Joule-Kelvin effect – Joule-Thomson porous plug experiment – theory – temperature of inversion – liquefaction of Oxygen– Linde's process of liquefaction of air–- thermodynamic system – thermodynamic equilibrium – laws of thermodynamics – heat engine – Carnot's cycle – efficiency – entropy – change of entropy in reversible and irreversible process. (12 hours)

**UNIT IV**

**GRAVITATION:**

Gravitation - Kepler's Law of planetary motion - Newton's law of gravitation - mass & density of earth - Determination of 'G' by Boy's method - Variation of 'g' with latitude, altitude and depth.

**ELECTROSTATISTICS:**

Electrostatics - Coulomb's law - Gauss law - Application of Gauss law at a point outside the charged sphere - Capacitor - principle of a capacitor -capacitance of parallel plate capacitor - Energy stored in a charged capacitor - Loss of energy on sharing of charges between two capacitors. (12 hours)

**UNIT V**

**ELECTRICITY AND MAGNETISM:** potentiometer – principle – measurement of thermo emf using potentiometer –magnetic field due to a current carrying conductor – Biot-Savart's law – field along the axis of the coil carrying current – peak, average and RMS values of ac current and voltage – power factor and current values in an AC circuit. (12 hours)

**ASSIGNMENT/ SEMINAR (NOT INCLUDED IN EXAM)**

1. Droplets formation–shape, size and lifetime – COVID transmission through droplets, saliva

**TEXT BOOKS**

1. Murugesan, R., (2018) *Allied Physics*, S. Chand & Co, New Delhi.
2. Brijlal and N. Subramanyam., (1994) *Waves and Oscillations*, Vikas Publishing House, New Delhi.
3. Brijlal and N. Subramaniam., (1994) *Properties of Matter*, S.Chand & Co., New Delhi.

**REFERENCE BOOKS**

1. Resnick Halliday and Walker., (2018) *Fundamentals of Physics,* (11th Edition), John Willey and Sons. Asia Pvt. Ltd., Singapore.
2. Khannaan, V.R., Bedi, R.S., (1998) *Textbook of Sound,* 1st Edition. Kedharnath Publish & Co, Meerut.
3. Khare, N.S., and Srivastava, S.S., (1983) *Electricity and Magnetism*, 10th Edition., Atma Ram & Sons, New Delhi.

**WEB LINKS**

1. https://youtu.be/M_5KYncYNyc
2. https://youtu.be/ljJLJgIvaHY
3. https://youtu.be/7mGqd9HQ_AU
4. https://youtu.be/h5jOAw57OXM
5. https://learningtechnologyofficial.com/category/fluid-mechanics-lab/
6. http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.htmlhttps://www.youtube.com/watch?v=gT8Nth9NWPMhttps://www.youtube.com/watch?v=9mXOMzUruMQ&t=1shttps://www.youtube.com/watch?v=m4u-SuaSu1s&t=3shttps://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work

| PO/CO Course Code 23UPHA31 | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| **CO 1** | 3 | 2 | - | - | 2 | - | 2 |
| **CO 2** | 3 | 3 | 2 | 2 | - | - | 2 |
| **CO 3** | 3 | 2 | 2 | 2 | - | - | - |
| **CO 4** | 3 | 3 | 3 | 2 | - | - | - |
| **CO 5** | 3 | 3 | 3 | 2 | - | - | - |

**Strong (3) Medium (2) Low (1)**

Dr.A.Azhagu Parvathi — **Head of the Department**

Dr.R. Hemalatha — **Course Designer**

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**B.Sc. CHEMISTRY**

**(For those who joined in 2023 -2024)**

| | | | |
|---|---|---|---|
| Semester I | **GENERAL PHYSICS PRACTICAL –I** | Hours/Week: 2 | |
| Elective Course II – Practical I | | Credits: 1 | |
| Course Code **23UPHA31P** | | Internal 40 | External 60 |

COURSE OUTCOMES

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

CO1: understand the theoretical concepts in Mechanics and Properties of matter, Heat and Electricity related experiment and formulate the experimental procedure. [K2]

CO2: draw the circuit diagram /experimental set up with tabular column/model graph and write the formula to calculate the required physical parameters. [K2]

CO3: execute the technical skills in handling the equipment and observe the required measurements related to the experiment. [K3]

CO4: calculate the necessary parameters using the formula/graph and complete the record work [K3]

CO5: assess the accuracy of the results obtained and compare it with the theoretical value. [K3]

**Minimum of Seven Experiments from the list:**

1. Young's modulus by non-uniform bending using pin and microscope
2. Young's modulus by non-uniform bending using optic lever,scale and telescope
3. Rigidity modulus by static torsion method.
4. Rigidity modulus by torsional oscillations without mass
5. Surface tension and interfacial Surface tension – drop weight method
6. Comparison of viscosities of two liquids – burette method
7. Specific heat capacity of a liquid – half time correction

8. Verification of laws of transverse vibrations using sonometer
9. Calibration of low range voltmeter using potentiometer
10. Determination of thermo emf using potentiometer
11. Determination of 'g' using compound pendulum.
12. Calibration of ammeter using potentiometer.
13. Determination of capacitance using Desauty's bridge.

| **PO/CO Course Code 23UPHA31P** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** |
|---|---|---|---|---|---|---|---|
| **CO 1** | 3 | 3 | 2 | - | 2 | - | 2 |
| **CO 2** | 3 | 3 | 3 | - | - | - | 1 |
| **CO 3** | 3 | 3 | 3 | 2 | - | 3 | 3 |
| **CO 4** | 3 | 3 | 3 | 2 | 2 | 2 | 3 |
| **CO 5** | 3 | 2 | 2 | 2 | 2 | 2 | 3 |

**Strong (3) Medium (2) Low (1)**

Dr.A.Azhagu Parvathi
**Head of the Department**

Dr. R. Hemalatha
**Course Designer**

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| | | |
|---|---|---|
| Semester III | **ENTREPRENEURIAL SKILLS IN CHEMISTRY** | Hours/Week: 1 |
| Skill Enhancement Course-2 | | Credits: 1 |
| CourseCode **23UCHS31** | | Internal 100 |

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

**CO1 :** identify adulterated food items by doing simple chemical tests. [K1]

**CO2 :** prepare cleaning products and become entrepreneurs. [K1]

**CO3 :** educate others about adulteration and motivate them to become entrepreneurs. [K2]

**CO4 :** distinguish natural and synthetic dyes. [K2]

**CO5 :** analyse the quality of water by performing simple tests**.** [K3]

**UNIT–I**

**Food Chemistry**

Food adulteration-contamination of food items with clay stones, water and toxic chemicals – Common adulterants.

Food additives, Natural and synthetic anti-oxidants, glazing agents (hazardous effect), food colourants, Preservatives, leavening agents, Baking powder and baking soda, yeast, MSG, vinegar. (3 hours)

**UNIT–II**

**Dyes**

Classification–Natural, synthetic dyes and their characteristics – basic methods and principles of dyeing (3 Hours)

**UNIT - III**

**Hands on Experience (Students can choose any four)**

Detection of adulterants in food items like coffee, tea, pepper, chilli powder, turmeric powder, butter, ghee, milk, honey etc., by simple techniques. (3 Hours)

**UNIT - IV**

Preparation of Jam, squash and Jelly, Gulkand, cottage cheese.

Preparation of products like candles, soap, detergents, cleaning powder, shampoos, painbalm, toothpaste/powder and disinfectants in small scale.

(3 Hours)

**UNIT - V**

Extractionofoilsfromspicesandflowers.Testingofwatersamplesusingtestingkit.

Dyeing–cotton fabrics with natural and synthetic dyes Printing–tie and dye, batik. (3 Hours)

**Text Books**

1. George S &Muralidharan V, (2007) Fibre to Finished Fabric – A Simple Approach, Publication Division, University of Madras, Chennai.
2. Appaswamy G P, A Handbook on Printing and Dyeing of Textiles.

**Reference Book**

1. Shyam Jha, (2015), Rapid detection of food adulterants and contaminants (Theory and Practice),Elsevier, e Book ISBN 9087128004289, 1st Edition.

| Course Code **23UCHS31** | PO1 | | PO2 | | PO3 | | PO4 | | PO5 | | PO6 | PO7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PSO 1 a | PSO 1 b | PSO 2 a | PSO 2b | PSO 3 a | PSO 3 b | PSO 4 a | PSO 4 b | PSO 5.a | PSO 5.b | PSO 6 | PSO 7 |
| CO 1 | 3 | 2 | 3 | 1 | 2 | 1 | 2 | 1 | - | - | - | 1 |
| CO 2 | 3 | 2 | 3 | 1 | 3 | 1 | 1 | 1 | - | - | - | 1 |
| CO 3 | 2 | 3 | 3 | 1 | 3 | 3 | 1 | 1 | - | - | - | 1 |
| CO 4 | 2 | 3 | 3 | 2 | 3 | 3 | 1 | 2 | - | - | - | 1 |
| CO 5 | 1 | 2 | 2 | 1 | 3 | 2 | 1 | 1 | - | - | - | 1 |

**Strong (3) Medium (2) Low (1)**

Dr.M.Dhanalakshmi
**Head of the Department**

Dr.J.Kavitha
**Course Designer**

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| | | | |
|---|---|---|---|
| Semester III | **PESTICIDE CHEMISTRY** | Hours/Week: 2 | |
| Skill Enhancement Course-3 | | Credits: 2 | |
| CourseCode **23UCHS32** | | Internal 25 | External 75 |

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

**Unit I**

**CO1 :** know about the pesticides and their toxicity with respect to structure and category [K1]

**CO2 :** understand the preparation and property of pesticides [K1]

**CO3 :** identify the pesticide residues, prevention and care. [K2]

**CO4 :** explain the extraction and analytical methods of pesticide residues. [K2]

**CO5 :** interpret the bio-pesticides. [K3]

**Unit I**

**Introduction**: History of pesticides. Chemistry of Pesticides: Brief introduction to classes of pesticides (Chemical class, targets), structures, chemical names, physical and chemical properties.

**Toxicity of pesticides**: Acute and chronic toxicity in mammals, birds, aquatic species etc. Methods of analysis of pesticides. **(6 Hours)**

**Unit II**

**Insecticides:** Classification and study of following insecticides with respect to structure, chemical name, physical properties, chemical properties, synthesis, degradation, metabolism, formulations, Mode of action, uses, toxicity.

Organophosphates and Phosphothionates: Acephate, Chlorpyriphos, Monocrotophos, and parathion-methyl. Organochlorine – Endosulfan, heptachlor; Carbamate: Cartap hydrochloride, Methomyl, Propoxur. **(6 Hours)**

**Unit III**

**Pesticides residues:** Introduction- application of agrochemicals, dissemination pathways of pesticides, causes of pesticide residues,remedies. Pesticides residues in atmosphere- entry into atmosphere, action of pesticides, effects on environments. Pesticides residues in water - entry into water systems, action and effect in aquatic environment. Pesticides residues in soil. entry into soil, absorption, retention and transport in soil, effects on microorganism, soil condition and fertility, decomposition and degradation by climatic factors and microorganism. **(6 Hours)**

**Unit IV**

**Pesticide Residues effect and analysis:** Effects of pesticides residue on human life, birds and animals- routes for exposure to pesticides, action of pesticides on living system. Analysis of pesticides residues- sample preparation, extraction of pesticides residues (soil, water and vegetables/fruits) simple methods and schemes of analysis, multi-residue analysis. **(6 Hours)**

**Unit V**

**Biopesticides:** Pheromones, attractants, repellents – Introduction, types and application (8-Dodecen-1-ol, 10-cis-12-hexadecadienoic, Trimedlure, Cue-lure, methyl eugenol, N,N- Diethyl-m-toluamide, Dimethyl phthalate, Icaridin). Baits- Metaldehyde, Iron (II) phosphate, Indoxacarb, Zinc Phosphide, Bromadiolone. **(6 Hours)**

**RecommendedText**

1. Handa SK.(2012), Principles of pesticide chemistry. Agrobios (India).
2. Matolcsy G, Nádasy M, Andriska V, (1989), Pesticide chemistry. Elsevier.
3. J. Miyamoto and P. C. Kearney, (1985), Pesticide Chemistry Human Welfare and the Environment vol. IV Pesticide Residue and Formulation Chemistry, Pergamon press.
4. R. Cremlyn: Pesticides, John Wiley.
5. Sharma, B.K.(2008). *Industrial Chemistry.* 1st Edition. Meerut: GOEL PublishingHouse.
6. BagavathiSundari. K,(2006). *Applied Chemistry.* 1st Edition. Chennai: MJP Publishers.
7. Jaya Shree Ghosh, (2013). *Fundamental Concepts of Applied Chemistry*. 1stEdition.New Delhi: S.Chand& Company Ltd.

**Reference Books**

1. Roy N. K., (2010), Chemistry of Pesticides. CBS Publisher & Distributors PLtd; 1st Ed.
2. Nollet L.M., Rathore H.S.,(2016), Handbook of pesticides: methods ofpesticide residues analysis. CRC press.

3. Ellerbrock R.H., (2005), Pesticide Residues: Significance, Management andAnalysis.
4. Thankamma Jacob, (1979). *A Text Book of Applied Chemistry for Home ScienceandAllied Sciences.* 1st Edition.New Delhi: The Macmillan Company of India Ltd.
5. Jain, P.C. & Monika Jain. (2013). *Engineering Chemistry.*1st Edition.New Delhi: Dhanpat Rai Publishing CompanyPvt.Ltd.

| Course Code **23UCHS32** | PO1 | | PO2 | | PO3 | | PO4 | | PO5 | | PO6 | PO7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PSO 1 a | PSO 1 b | PSO 2 a. | PSO 2b. | PSO 3 a | PSO 3 b | PSO 4 a | PSO 4 b | PSO 5.a | PSO 5.b. | PSO 6 | PSO 7 |
| CO 1 | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 3 | 3 |
| CO 2 | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 3 | 3 |
| CO 3 | 2 | 3 | 3 | 1 | 1 | 3 | 2 | 3 | 3 | 2 | 3 | 3 |
| CO 4 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 |
| CO 5 | 2 | 3 | 2 | 1 | 2 | 2 | 2 | 3 | 3 | 2 | 3 | 3 |

**Strong (3) Medium (2) Low (1)**

Dr.M.Dhanalakshmi
**Head of the Department**

Mrs.R.Nagasathya
**Course Designer**

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**Quality Education with Wisdom and Values**

**B.Sc. CHEMISTRY**

**(For those who joined in 2023 -2024)**

| | | | |
|---|---|---|---|
| Semester IV | **GENERAL CHEMISTRY-IV** | Hours/Week: 4 | |
| Core Course 7 | | Credits: 4 | |
| Course Code<br><br>**23UCHC41** | | Internal<br><br>25 | External<br><br>75 |

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

**CO1 :** know the thermodynamic concepts on chemical processes, characteristics of d-block elements and the properties of ethers, carbonyl compounds and carboxylic acids. [K1]

**CO2 :** understand the thermochemical calculations and recognize the need for free energy functions. [K2]

**CO3 :** interpret the transition elements with reference to periodic properties and explain the structure and reactivity of aliphatic and aromatic aldehydes and ketones. [K2]

**CO4 :** illustrate the applications of thermodynamic concepts. [K3]

**CO5 :** relate transition and non-transition elements and summarize the synthetic applications of active methylene compounds. [K3]

**UNIT I**

**Thermodynamics I**

Terminology – Intensive, extensive variables, state, path functions; isolated, closed and open systems; isothermal, adiabatic, isobaric, isochoric, cyclic, reversible and irreversible processes; First law of thermodynamics – Concept and significance of heat (q), work (w), internal energy (E), enthalpy (H); calculations of q, w, E and H for reversible, irreversible expansion of ideal and real gases under isothermal and adiabatic conditions; relation between heat capacities (Cp & Cv); Joule Thomson effect- inversion temperature.

Thermochemistry - heats of reactions, standard states; types of heats of reactions and their applications; effect of temperature (Kirchhoff's equations) and pressure on enthalpy of reactions; Hess's law and its applications; determination of bond energy; Measurement of heat of reaction – determination of calorific value of food and fuels

Zeroth law of thermodynamics-Absolute Temperature scale. **(12 Hours)**

**Unit II**

**Thermodynamics II**

Second Law of thermodynamics - Limitations of first law, spontaneity and randomness; Carnot's cycle; Concept of entropy, entropy change for reversible and irreversible processes, entropy of mixing, calculation of entropy changes of an ideal gas and a van der Waals gas with changes in temperature, volume and pressure, entropy and disorder.

Free energy and work functions - Need for free energy functions, Gibbs free energy, Helmholtz free energy - their variation with temperature, pressure and volume, criteria for spontaneity; Gibbs-Helmholtz equation – derivations and applications; Maxwell relationships, thermodynamic equations of state; Thermodynamics of mixing of ideal gases, Ellingham Diagram-application.

Third law of thermodynamics - Nernst heat theorem; Applications of thirdlaw - evaluation of absolute entropies from heat capacity measurements, exceptions to third law.Thermodynamics of mixing of ideal gases, Ellingham Diagram-application. **(12 Hours)**

**Unit III**

**General Characteristics of d-block elements**

**Transition Elements**- Electronic configuration - General periodic trend variable valency, oxidation states, stability of oxidation states, colour, magnetic properties, catalytic properties and tendency to form complexes. Comparative study of transition elements and non transition elements – comparison of II and III transition series with I transition series. Group study of Titanium, Vanadium, Chromium, Manganese, Iron, Cobalt, Nickeland Zinc groups. **(12 Hours)**

**Unit IV**

**Ethers, Thio ethers and Epoxides**

Nomenclature, isomerism, general methods of preparations, reactions involving cleavage of C-O linkages, alkyl group and ethereal oxygen. Zeisel's method of estimation of methoxy group.

Reactions of epoxides with alcohols, ammonia derivatives and $LiAH_4$ Thioethers - nomenclature,

structure, preparation, properties and uses.

**Aldehydes and Ketones**

Nomenclatue, structure and reactivity of aliphatic and aromatic aldehydes and ketones; general methods of preparation and physical properties. Nucleophilic addition reactions, base catalysed reactions with mechanism- Aldol, Cannizzaro's reaction, Perkin reaction, Benzoin condensation, Haloform reaction, Knoevenagel reaction. Oxidation of aldehydes. Baeyer - Villiger oxidation of ketones. Reduction: Clemmensen reduction, Wolf -Kishner reduction, Meerwein – Pondorf Verley reduction, reduction with $LiAlH_4$ and $NaBH_4$.

Addition reactions of unsaturated carbonyl compounds: Michael addition **(12 Hours)**

**Unit V**

**Carboxylic Acids**: Nomenclature, structure, preparation and reactions of aliphatic and aromatic monocarboxylic acids. Physical properties, acidic nature, effect of substituent on acidic strength. HVZ reaction, Claisen ester condensation, Bouveault Blanc reduction, decarboxylation, Hunsdieckerreaction.Formic acid-reducing property. Reactions of dicarboxylic acids, hydroxy acids and unsaturated acids

**Carboxylic acid Derivatives:** Preparations of aliphatic and aromatic acid chlorides, esters, amides and anhydrides. Nucleophilic substitution reaction at the acyl carbon of acyl halide, anhydride, ester, amide. Schottan- Baumann reaction. Claisen condensation, Dieckmann and Reformatsky reactions, Hofmann bromamide degradation and Curtius rearrangement.

**Active methylene compounds:** Keto – enol tautomerism. Preparation andsynthetic applications of diethyl malonate and ethyl acetoacetate

**Halogen substituted acids** – nomenclature; preparation by directhalogenation, iodination from unsaturated acids, alkyl malonic acids

**Hydroxy acids** – nomenclature; preparation from halo, amino, aldehydicand ketonic acids, ethylene glycol, aldol acetaldehyde; reactions – action of heat on $\alpha$, $\beta$ and $\gamma$–hydroxy acids.

**(12 Hours)**

**Recommended Text**

1. B.R. Puri and L.R. Sharma,(1992), *Principles of Physical Chemistry*, ShobanLal Nagin Chand and Co., thirty three edition.
2. Arun Bahl & Bahl, B.S.(2009). *Advanced Organic Chemistry .19th edition.* NewDelhi: S.Chand & Company Ltd.
3. P.L. Soni and Mohan Katyal, (2006), *Textbook of Inorganic Chemistry*, SultanChand & Sons,

twentieth edition.

4. M. K. Jain, S. C. Sharma, (2003), *Modern Organic Chemistry*, VishalPublishing, fourth reprint.
5. Arun Bahl, Bahl, B.S &.Tuli G.D, (2017) *Essentials of Physical chemistry*. NewDelhi: S.Chand & Company Ltd.
6. Madan.R.D, *Modern Inorganic Chemistry*, S.Chand & Company Ltd.
7. S.M. Mukherji, and S.P. Singh, (1994), *Reaction Mechanism in Organic Chemistry*, Macmillan India Ltd., third edition.
8. K. L. Kapoor,( 2 0 0 9 ) , *A Textbook of Physical chemistry*, (volume-2 and 3), Macmillan, India Ltd, thirdedition.

**ReferenceBooks**

1. Negi, A.S. & Anand, S.C.(2008). *A text book of Physical Chemistry*.2nd Edition. New Delhi: A New Age International Publishers.
2. Lee, J. D.(1991), *Concise Inorganic Chemistry*, 4th ed.; ELBS WilliamHeinemann: London.
3. Gurudeep Raj,(2001), *Advanced Inorganic Chemistry*, 26thed.; GoelPublishing House: Meerut.
4. Atkins, P.W. & Paula, J, (2014), *Physical Chemistry*, 10th ed.; OxfordUniversity Press:New York.
5. Huheey, J. E. (1994), *Inorganic Chemistry: Principles of Structure and Reactivity*, 4th ed; Addison Wesley Publishing Company: India.
6. Puri, Sharma, Kalia,(2008)*Principles of Inorganic Chemistry*, Milestone Publishers.
7. Tewari, K.S &.Vishnoi, N.K. (2006).*A Text book of Organic Chemistry*.3rd edition.New Delhi: Vikas. Publishing House Pvt. Ltd.
8. Maron, S. H. and Prutton C. P. (1972), *Principles of Physical Chemistry*,4thed.; The Macmillan Company: Newyork.

| Course Code **23UCHC41** | PO1 | | PO2 | | PO3 | | PO4 | | PO5 | | PO6 | PO7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PSO 1 a | PSO 1 b | PSO 2 a. | PSO 2b. | PSO 3 a | PSO 3 b | PSO 4 a | PSO 4 b | PSO 5.a | PSO 5.b. | PSO 6 | PSO 7 |
| CO 1 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 2 | 2 | 2 | 3 | 3 |
| CO 2 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 2 | 2 | 2 | 3 | 3 |
| CO 3 | 3 | 3 | 1 | 1 | 1 | 3 | 3 | 3 | 3 | 2 | 3 | 3 |
| CO 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 |
| CO 5 | 3 | 3 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 2 | 3 | 3 |

**Strong (3) Medium (2) Low (1)**

Dr.M.Dhanalakshmi — **Head of the Department**

Dr.M.Amutha — **Course Designer**

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**B.Sc. CHEMISTRY**
**(For those who joined in 2023 -2024)**

| | | | |
|---|---|---|---|
| Semester IV | **PHYSICAL CHEMISTRY PRACTICAL – I** | Hours/Week: 3 | |
| Core Course-8 | | Credits: 2 | |
| Course Code **23UCHC41P** | | Internal 40 | External 60 |

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

**CO1** **:** describe the principles and methodology for the practical work [K2]

**CO2** **:** explain the procedure, data and methodology for the practical work. [K2]

**CO3** **:** apply the principles of electrochemistry, kinetics for carrying out the practical work. [K3]

**CO4** **:** demonstrate laboratory skills for safe handling of the equipment and chemicals. [K3]

**CO5** **:** Interpret the colligative properties and adsorption isotherm. [K3]

**UNIT-I**

**Chemical kinetics**

1. Determination of rate constant of acid catalysed hydrolysis of an ester (methyl acetate).

2. Determination of order of reaction between iodide and persulphate(initial rate method).

3. Polarimetry: Determination of rate constant of acid catalysedinversion of cane sugar.

**Thermochemistry**

4. Determination of heat of neutralisation of a strong acid by a strongbase.

5. Determination of heat of hydration of copper sulphate. **(15 Hours)**

**UNIT II**

**Electrochemistry – Conductance measurements**

6. Determination of cell constant.

7. Determination of molar conductance of strong electrolyte.

8. Determination of dissociation constant of acetic acid.

**Colorimetry**

9. Determination of concentration of copper sulphate solution. **(15 Hours)**

**UNIT III**

**Colligative property**

10. Determination of molecular weight of an organic compound by Rastmethod using naphthalene or diphenyl as solvent.

**Adsorption**

11. Construction of Freundlich isotherm for the adsorption of aceticacid on activated charcoal.

**(15 Hours)**

**Reference Books**


1. Sindhu, (2005), P.S.*Practicals in Physical Chemistry*, Macmillan India :New Delhi.
2. Khosla, B. D.Garg,V. C.; Gulati, A.;(2011), *Senior Practical PhysicalChemistry*, R.Chand : New Delhi.
3. Gupta, Renu, (2017), *Practical Physical Chemistry*, 1st Ed.; New AgeInternational: New Delhi.


| Course Code | PO1 | | PO2 | | PO3 | | PO4 | | PO5 | | PO6 | PO7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 23UCHC41P | PSO 1 a | PSO 1 b | PSO 2 a. | PSO 2b. | PSO 3 a | PSO 3 b | PSO 4 a | PSO 4 b | PSO 5.a | PSO 5.b. | PSO 6 | PSO 7 |
| CO 1 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 1 | 1 | 2 | 3 | 2 |
| CO 2 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 1 | 1 | 2 | 3 | 2 |
| CO 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 1 | 1 | 2 | 3 | 2 |
| CO 4 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 1 | 1 | 2 | 3 | 2 |
| CO 5 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 1 | 1 | 2 | 3 | 2 |

**Strong (3) Medium (2) Low (1)**

Dr.M.Dhanalakshmi Dr.J.Kavitha

**Head of the Department** **Course Designer**

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**(For those who joined in 2023 -2024)**

| | | | |
|---|---|---|---|
| Semester II | **OPTICS AND MODERN PHYSICS** | Hours/Week: 4 | |
| Elective Course II | | Credits: 3 | |
| Course Code<br>**23UPHA41** | | Internal<br>25 | External<br>75 |

**COURSE OUTCOMES**

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

On successful completion of the course, the learners should be able to

CO1: state basic concepts of physical optics, atom models, nuclear energy, relativity and semiconductor physics. [K1]

CO2: derive physical parameters related to physical optics, nuclear energy and relativity [K2]

CO3: describe experimental methods involved in physical optics, atom models and semiconductor diodes [K2]

CO4: illustrate the applications and solve problems in optics, nuclear energy and atomic physics. [K3]

CO5: demonstrate the applications involved in semiconductor physics and solve problems in relativity. [K3]

**UNIT I**

**OPTICS: i**nterference – interference in thin films –colors of thin films – air wedge – determination of diameter of a thin wire by air wedge - Newton's rings – diffraction – diffraction of light vs sound – normal incidence – experimental determination of wavelength using diffraction grating (no theory) – polarization – polarization by double reflection – Brewster's law – optical activity – Laurent's Half shade polarimeter. (12hours)

**UNIT II**

**ATOMIC PHYSICS:** atom models – Bohr atom model – mass number – atomic number – nucleons – vector atom model – various quantum numbers – Pauli's exclusion principle – electronic configuration – periodic classification of elements – Bohr magneton – Stark effect –Zeeman effect (elementary ideas only) – photo electric effect – Einstein's photoelectric equation - Applications of

photoelectric effect: solar cells, solar panels, optoelectric devices.

(12 hours)

**UNIT III**

**NUCLEAR PHYSICS:** nuclear models – liquid drop model – magic numbers – shell model – nuclear energy – mass defect – binding energy – radioactivity – uses – half life – mean life - radio isotopes and uses –controlled and uncontrolled chain reaction – nuclear fission – energy released in fission – chain reaction – critical reaction – critical size- atom bomb – nuclear reactor – breeder reactor. (12 hours)

**UNIT IV**

**INTRODUCTION TO RELATIVITY**: frame of reference – postulates of special theory of relativity – Galilean transformation equations – Lorentz transformation equations – derivation – length contraction – time dilation – twin paradox – mass-energy equivalence. (12 hours)

**UNIT V**

**SEMICONDUCTOR PHYSICS:** p-n junction diode – forward and reverse biasing – characteristic of diode – zener diode – characteristic of zener diode – voltage regulator – full wave bridge rectifier – construction and working – advantages (no mathematical treatment) –

(12 hours)

**SELF STUDY**

1. Applications of photoelectric effect: solar cells, solar panels, optoelectric devices.

**TEXT BOOK**

1. Murugesan, R., (2017) *Allied Physics*, S. Chand & Co, New Delhi
2. Thangarajan, K., and Jayaraman, D., (2004) *Allied Physics*, Popular Book Depot, Chennai
3. Brijlal and N.Subramanyam, (2002) *Textbook of Optics* S. Chand & Co, NewDelhi
4. Murugesan,R., (2005) *Modern Physics,* S.Chand &Co, NewDelhi
5. Subramaniyam, A., (2001) *Applied Electronics*, 2nd Edn., National Publishing Co.,Chennai.

**REFERENCE BOOKS**

1. Resnick Halliday and Walker., (2018) *Fundamentals of Physics*, 11thEdn. John Willey and Sons, Asia Pvt. Ltd., Singapore.
2. Khanna, D.R., and Gulati, H.R., (1979) *Optics*, S. Chand & Co. Ltd., New Delhi.

3. Arthur Beiser., (1997) *Concepts of Modern Physics,* Tata McGraw Hill Publication, New Delhi.

4. Thomas L. Floyd., (2017) *Digital Fundamentals*, 11th Edition, Universal Book Stall, NewDelhi.

5. Metha, V.K., (2004) *Principles of electronics,* 6th Edition. S. Chand and Company, New Delhi.

| PO/CO Course Code 23UPHA41 | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| **CO 1** | 3 | 2 | - | - | 2 | - | 2 |
| **CO 2** | 3 | 3 | 2 | 2 | - | - | 2 |
| **CO 3** | 3 | 2 | 2 | 2 | - | - | - |
| **CO 4** | 3 | 3 | 3 | 2 | 2 | - | - |
| **CO 5** | 3 | 3 | 3 | 2 | 2 | - | - |

**Strong (3) Medium (2) Low (1)**

Dr.A.Azhagu Parvathi
**Head of the Department**

Dr.G.Shanmuga Priya
**Course Designer**

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| | | | |
|---|---|---|---|
| Semester II | **GENERAL PHYSICS PRACTICAL- II** | Hours/Week: 2 | |
| Elective Course II – Practical II | | Credits: 1 | |
| Course Code **23UPHA41P** | | Internal 40 | External 60 |

**COURSE OUTCOMES**

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

CO1: understand the theoretical concepts in Magnetism, Optics, Electronics and formulate the experimental procedure [K2]

CO2: draw the circuit diagram /experimental set up with tabular column/model graph and write the formula to calculate the required physical parameters. [K2]

CO3: execute the technical skills in handling the equipment and observe the required measurements related to the experiment. [K3]

CO4: calculate the necessary parameters using the formula/graph and complete the record work [K3]

CO5: assess the results obtained and compare it with the theoretical value [K3]

**Minimum of seven Experiments from the list:**

1. Radius of curvature of lens by forming Newton's rings
2. Thickness of a wire using air wedge
3. Determination of AC frequency using sonometer
4. Thermal conductivity of poor conductor using Lee's disc
5. LCR – Series Resonance – Determination of L.
6. Characterization of PN Junction diode.
7. Characterization of Zener diode
8. Study of output voltages of Bridge Rectifier.

9. Determination of refractive index of prism using spectrometer.

| **PO/CO Course Code 23UPHA41P** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** |
|---|---|---|---|---|---|---|---|
| **CO 1** | 3 | 3 | 2 | - | 2 | - | 2 |
| **CO 2** | 3 | 3 | 3 | - | - | - | 1 |
| **CO 3** | 3 | 3 | 3 | 2 | - | 3 | 3 |
| **CO 4** | 3 | 3 | 3 | 2 | 2 | 2 | 3 |
| **CO 5** | 3 | 2 | 2 | 2 | 2 | 2 | 3 |

**Strong (3) Medium (2) Low (1)**

Dr.A.Azhagu Parvathi
**Head of the Department**

Dr.G.Shanmuga Priya
**Course Designer**

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| | | | |
|---|---|---|---|
| Semester IV | **INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS** | Hours/Week: 2 | |
| Skill Enhancement Course-4 | | Credits: 2 | |
| CourseCode **23UCHS41** | | Internal 25 | External 75 |

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

**CO1 :** define the basics aspects of Qualitative and Quantitative of Analysis. [K1]

**CO2 :** know the basic principles of various analytical, spectroscopic and separation methods. [K1]

**CO3 :** explain the basic concepts of analytical, spectroscopic and separation techniques. [K2]

**CO4 :** understand the instrumentation and working of different analytical, spectroscopic and separation methods. [K2]

**CO5 :** apply the fundamentals of analytical and spectroscopic techniques for the estimation and characterization of chemical compounds. [K3]

**UNIT-I**

**Qualitative and Quantitative Aspects of Analysis**

S.I Units, Distinction between Mass and Weight. Moles, Millimoles, Milli equivalence, Molality, Molarity, Normality, Percentage by Weight and Volume, ppm, ppb. Density and Specific Gravity of Liquids. Stoichiometry Calculations

Sampling, evaluation of analytical data, Errors – Types of Errors, Accuracy, Precision, Minimization of Errors. Significant Figures. Methods of Expressing Precision: Mean, Median, Average Deviation, Standard Deviation, Coefficient of Variation, Confidence Limits, Q- test, F-test, T-test. The Least Square Method for Deriving Calibration plots. **(6 Hours)**

**UNIT II**

**Atomic Absorption Spectroscopy**: Basic principles of instrumentation (choice of source, monochromator, detector, choice of flame and Burner designs. Techniques of atomization and sample introduction; Method of background correction, sources of chemical interferences and their method of removal. Techniques for the quantitative estimation of trace level of metal ions from water samples.

**(6 Hours)**

**UNIT III**

**UV-Visible and IR Spectroscopy**

Origin of spectra, interaction of radiation with matter, fundamental lawsof spetroscopy and selection rules, validity of Beer-Lambert's law.

**UV-Visible Spectrometry:** Basic principles, instrumentation (choice ofsource, monochromator and detector) for single and double beaminstrument; Basic principles of quantitative analysis: estimation of metal ions from aqueous solution, geometrical isomers, keto-enol tautomers. **Infrared Spectroscopy:** Basic principles of instrumentation (choice ofsource, monochromator& detector) for single and double beaminstrument; sampling techniques. **(6 Hours)**

**UNIT IV**

**Thermal and Electro-analytical Methods of Analysis**

TGA and DTA- Principle, Instrumentation, methods of obtainingThermograms, factors affecting TGA/DTA, Thermal analysis of silver nitrate, calcium oxalate and calcium acetate

DSC- Principle, Instrumentation and applications.

Electroanalytical methods: polarography - principle, instrumentation and applications. Derivative polarography- Cyclic Voltammetry - principle. **(6 Hours)**

**UNIT V**

**Separation and purification techniques**

Classification, principle, Factors affecting - Solvent Extraction – Liquid - Liquid Extraction, Chromatography: Column, TLC, Paper, Gas, HPLC and Electrophoresis, Principle, Classification, Choice of Adsorbents, Solvents, Preparation of Column, Elution Mechanism of separation: adsorption, partition & ion exchange. Development of chromatograms and $R_f$ value.

**(6 Hours)**

**RecommendedText**


1. Vogel, Arthur I: A Test book of Quantitative Inorganic Analysis (Rev. by G.H. Jeffery and others) 5th Ed., The English Language Book Society of Longman.
2. R. Gopalan, P. S. Subramanian and K. Rengarajan,(2007), Elements of Analytical Chemistry, Sultan Chand, New Delhi
3. Skoog, Holler and Crouch, (2017), Principles of Instrumental Analysis, Cengage Learning, 6th Indian Reprint .
4. R. Speyer, (1993), Thermal Analysis of Materials, CRC Press.
5. R.A. Day and A.L.(1993), Underwood, Quantitative Analysis, 6thedn., Prentice Hall of India Private Ltd., New Delhi.


**Reference Books**


1. D. A. Skoog, D. M. West and F. J. Holler, (1998), Analytical Chemistry: An Introduction, 5thedn., Saunders college publishing, Philadelphia.
2. Dash U N, (2011), Analytical Chemistry; Theory and Practice, Sultan Chand and sons Educational Publishers, New Delhi.
3. Christian, Gary D; (2004), Analytical Chemistry, 6th Ed., John Wiley & Sons, New York.
4. Mikes, O. & Chalmes, R.A. Laboratory Handbook of Chromatographic & Allied Methods, Elles Harwood Ltd. London
5. G.H. Jeffery, J. Bassett, J. Mendham and R.C. Denney, (2000), Vogel's Textbook of Quantitative Chemical Analysis, sixth edition PearsonEducation.


| Course Code 23UCHS41 | PO1 | | PO2 | | PO3 | | PO4 | | PO5 | | PO6 | PO7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PSO 1 a | PSO 1 b | PSO 2 a. | PSO 2b. | PSO 3 a | PSO 3 b | PSO 4 a | PSO 4 b | PSO 5.a | PSO 5.b. | PSO 6 | PSO 7 |
| CO 1 | 3 | 2 | 3 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 1 |
| CO 2 | 3 | 2 | 3 | 3 | 1 | 3 | 1 | 1 | 1 | 2 | 1 | 1 |
| CO 3 | 2 | 3 | 3 | 3 | 1 | 3 | 3 | 1 | 2 | 2 | 2 | 1 |
| CO 4 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 1 | 1 | 2 | 1 | 1 |
| CO 5 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 2 | 1 | 1 |

**Strong (3) Medium (2) Low (1)**

Dr.M.Dhanalakshmi — **Head of the Department**

Dr.A.Anitha — **Course Designer**

**V.V.VANNIAPERUMAL COLLEGE FOR WOMEN**
(Belonging to Virudhunagar Hindu Nadars)
An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
*Reaccredited with 'A++' Grade (4th Cycle) by NAAC*
**VIRUDHUNAGAR**
**Quality Education with Wisdom and Values**

**B.Sc. CHEMISTRY**
**(For those who joined in 2023 -2024)**

| | | | |
|---|---|---|---|
| Semester IV | **FORENSIC SCIENCE** | Hours/Week: 2 | |
| Skill Enhancement Course-5 | | Credits: 2 | |
| CourseCode **23UCHS42** | | Internal 25 | External 75 |

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

**CO1 :** learn about the crimes occurred due to poisons, explosives, forgery and counterfeiting [K1]

**CO2 :** know how to track and trace of incidents through various techniques [K1]

**CO3 :** aware of the sample collection and characterization methods [K2]

**CO4 :** understand the basic concepts of various detection techniques [K2]

**CO5 :** apply the fundamental analytical methods to analyze biological and hazardous substances, to detect the forgery documents [K3]

**UNIT I**

**Poisons**

Poisons - types and classification - diagnosis of poisons in the living andthe dead -clinical symptoms - postmortem appearances. Heavy metal contamination (Hg, Pb, Cd) of sea foods - use of neutron activation analysisin detecting arsenic in human hair. Treatment in cases of poisoning – use of antidotes for common poisons. **(6 Hours)**

**UNIT-II**

**Crime Detection**

Accidental explosion during manufacture of matches and fireworks (Case Study) - possible explosives (gelatin sticks and RDX) - metal detector devices andother security measures for VVIP-composition of bullets and detecting powder burns. **(6 Hours)**

**UNIT-III**

**Forgery and Counterfeiting**

Documents - different types of forged signatures - simulated and traced forgeries -inherent signs of forgery methods - writing deliberately modified- uses of ultraviolet rays -comparison of type written letters – checking silver line water mark in currency notes – alloy analysis using AAS todetect counterfeit coins – detection of gold purity in 22 carat ornaments – detecting gold plated jewels - authenticity of diamond. **(6 Hours)**

**UNIT-IV**

**Tracks and Traces**

Tracks and traces - small tracks and police dogs - foot prints - costing of foot prints -residue prints, walking pattern or tyre marks – miscellaneous traces and tracks – glass fracture - tool marks- paints - fibres - Analysis of biological substances - blood, semen, saliva, urine and hair - Cranial analysis (head and teeth) DNA Finger printing for tissue identification in dismembered bodies - detecting steroid consumption in athletes and racehorses. **(6 Hours)**

**UNIT-V**

**Medical Aspects**

Aids - causes and prevention - misuse of scheduled drugs - burns and their treatment by plastic surgery. Metabolite analysis using mass spectrum - Gas chromatography-Arson -natural fires and arson - burning characteristics and chemistry of combustible materials -nature of combustion. Ballistics - classification - internal and terminal ballistics - small arms -laboratory examination of barrel washing and detection of powder residue by chemical tests. **(6 Hours)**

**Text Books**

1. SA Iqbal, M Liviu, (2011), Textbook of forensic chemistry, Discoverypublishing house private limited.
2. Kelly M. Elkins, (2019), Introduction to Forensic Chemistry, CRC Press,Taylor & Francis Group,.
3. Javed I. Khan, Thomas J. Kennedy, Donnell R. Christian, Jr., (2012). Basicprinciples of Forensic chemistry, Humana Press, first edition.
4. Bapuly AK, (2006) Forensic Science – Its application in crimeinvestigation, Paras Medical Publisher, Hyderabad.

5. Sharma B.R., (2006) Scientific Criminal Investigation, Universal Law Publishing Co. Pvt. Ltd, New Delhi.

**ReferenceBooks**

1. Richard Saferst in and Criminalistics (2003), An Introduction to Forensic Science (College Version), Sopfestein, Printice hall, eighth edition.
2. Suzanne Bell, (2014), Forensic Chemistry, Pearson, second international edition.
3. Jay Siegel, (2015), Forensic chemistry: Fundamentals and applications, Wiley-Blackwell, first edition.
4. Max M. Houck & Jay A. Segal, (2006) Fundamentals of ForensicScience, Elsevier Academic press.
5. Henry C. Lee, Timothy Palmbach, Marilyn T. Miller, (2006) HenryLee's Crime Scene Book Elsevier Academic press.

| Course Code 23UCHS42 | PO1 | | PO2 | | PO3 | | PO4 | | PO5 | | PO6 | PO7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PSO 1 a | PSO 1 b | PSO 2a. | PSO 2b. | PSO 3 a | PSO 3 b | PSO 4 a | PSO 4 b | PSO 5a. | PSO 5b. | PSO 6 | PSO 7 |
| CO 1 | 3 | 2 | 3 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 1 |
| CO 2 | 3 | 2 | 3 | 3 | 1 | 3 | 1 | 1 | 1 | 2 | 1 | 1 |
| CO 3 | 2 | 3 | 3 | 3 | 1 | 3 | 3 | 1 | 2 | 2 | 2 | 1 |
| CO 4 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 1 | 1 | 2 | 1 | 1 |
| CO 5 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 2 | 1 | 1 |

**Strong (3) Medium (2) Low (1)**

Dr.M.Dhanalakshmi
**Head of the Department**

Dr.M.Amutha
**Course Designer**