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 2025 - 2026)

V.V.Vanniaperumal College for Women, Virudhunagar, established in 1962, offers 13 UG Programmes (Aided), 13 UG Programmes (SF), 13 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, Biochemistry, Home Science - Nutrition and Dietetics, Biotechnology, Computer 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)
(2024-2025 onwards)

UG PROGRAMMES

Name of the Course	Course Code	Semester	Department
Introduction to Tourism	24UHIN11	I	History (E.M)
Indian Constitution	24UHIN21	II	
சுற்றுலா ஓர் அறிமுகம்	24UHIN11	I	History (T.M)
இந்திய அரசியலமைப்பு	24UHIN21	II	
Popular Literature and Culture	24UENN11	I	English
Philosophy for Literature	24UENN21	II	
அடிப்படைத் தமிழ் இலக்கணம் – I எழுத்தறிதல்/ பேச்சுக்கலைத்திறன்	24UBTN11/ 24UTAN11	I	Tamil
அடிப்படைத்தமிழ் – மொழித் திறனறிதல் / பயன்முறைத் தமிழ்	24UBTN21/ 24UTAN21	II	
Basic Hindi - I	24UBHN11	I	Hindi
Basic Hindi - II	24UBHN21	II	

Everyday Banking/ Practical Banking	24UCON11N/ 24UCON11	I	Commerce (Aided)
Basic Accounting Principles	24UCON21	II	
Everyday Banking	24UCON11N	I	Commerce (Self)
Emotional Intelligence	24UCON21N	II	
Everyday Banking/Self- Employment and Startup Business	24UCON11N/ 24UCCN11	I	Commerce C.A.(Self)
Fundamentals of Marketing	24UCCN21	II	
Everyday Banking/ Practical Banking	24UCPN11N/ 24UCPN12N	I	Commerce Professional Accounting
Basic Accounting Principles	24UCPN21N	II	
Basics of Event Management	24UBAN11	I	Business Administration
Managerial Skill Development	24UBAN21	II	
Quantitative Aptitude -I	24UMTN11	I	Mathematics
Quantitative Aptitude - II	24UMTN21	II	
Physics for EveryDay Life	24UPHN11	I	Physics
Astrophysics	24UPHN21	II	
Food Chemistry	24UCHN11	I	Chemistry
Dairy Chemistry	24UCHN21	II	
Ornamental fish farming and Management	24UZYN11	I	Zoology
Biocomposting for Entrepreneurship	24UZYN21	II	
Foundations of Baking and Confectionery	24UHSN11	I	Home Science – Nutrition and Dietetics
Women's Health and Wellness	24UHSN21	II	
Nutrition and Health	24UBCN11	I	Biochemistry
Life Style Diseases	24UBCN21	II	
Social and Preventive Medicine	24UMBN11	I	Microbiology
Nutrition and Health Hygiene	24UMBN21	II	
Herbal Medicine	24UBON11	I	Biotechnology
Organic Farming and Health Management	24UBON21	II	
Basics of Fashion	24UCFN11	I	Costume Design And Fashion
Interior Designing	24UCFN21	II	
Introduction to HTML	24UCSN11N	I	Computer Science
Office Automation	24UCSN21N	II	
Basics of Internet	24UITN11N	I	Information Technology
Data Analysis using Spreadsheet	24UITN21N	II	
Fundamentals of Information Technology	24UDSN11	I	Data Science
Computer Fundamentals	24UDSN21	II	
Web Designing	24UCAN11N	I	B.C.A.

Fundamentals of Computers	24UCAN21N	II	
Organic Farming	24UBYN11	I	Botany
Nursery and Landscaping	24UBYN12	I	
Mushroom Cultivation	24UBYN21	II	Botany
Medicinal Botany	24UBYN22	II	
Library and Information Science - I	24ULSN11	I	Library Science
Library and Information Science - II	24ULSN21	II	
Cadet Corps for Career Development I	24UNCN11	I	National Cadet Corps
Cadet Corps for Career Development II	24UNCN21	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 that each 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.

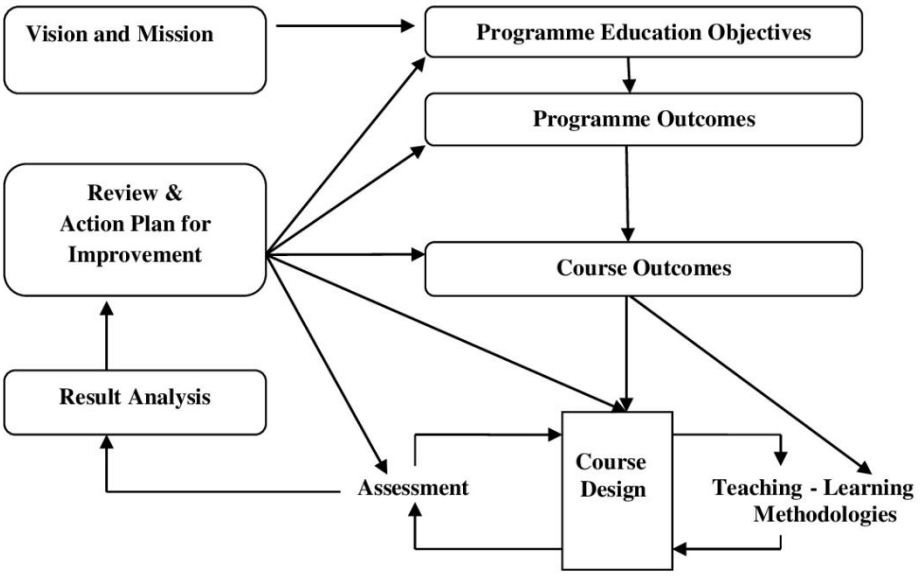
PO-PEO Mapping Matrix

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	-	-	✓

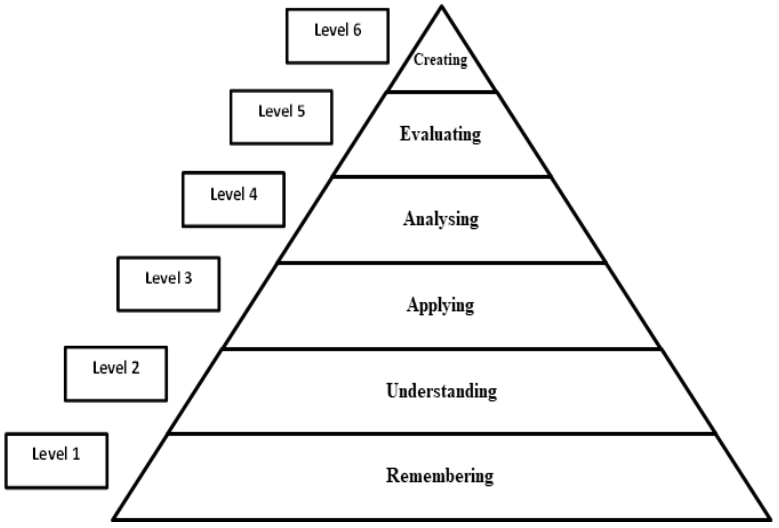
B.1.4 Course Outcomes (COs)

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 • Generic Elective Courses • Discipline Specific Elective Courses
		Self-Study Course - online
Part IV	:	Skill Enhancement Courses (SEC)
		Elective Course (NMEC)
		Environmental Studies 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

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**

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
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 (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 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**

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

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 Q. No.(1-5)	Internal Choice – Either Or Type	5	5	6	30
B 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 (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.2.4 PART IV- ENVIRONMENTAL STUDIES / VALUE EDUCATION

INTERNAL ASSESSMENT ONLY

Evaluation Pattern

Mode of Evaluation		Marks
Periodic Test	:	15
Assignment - K3 Level	:	10
Online Quiz (Multiple Choice Questions - K2 Level)	:	25
Poster Presentation - K3 Level		10
Report - 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 / Industrial Training

Internship / Industrial Training is mandatory for all the Students

- **Internship:** Students have to involve in a designated activity, working in an organization under the guidance of an identified mentor for a period of 15 days.
- **Industrial Training:** Student has to undertake in-plant training in industries individually or in group for a period of 15 days.
- Internship / Industrial Training must be done during the fourth semester holidays
- **Internal Assessment only.**

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

B.2.5 SELF STUDY COURSE

B.2.5.1 PART III – Discipline Specific 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.2.5.2 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.2.6. 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.2.7 Transfer of credits earned through MOOC (UGC recognized Courses)

- Students can opt for minimum of
    - 12 weeks Courses for Core Courses
    - 8 weeks Courses for Elective Courses
    - 4 weeks Courses for Skill Enhancement Course
- The Online Courses opted by the students will be verified and approved by the Head of the Department and forwarded to the Controller of Examinations through the Principal.
- Students are required to register for the equivalent Online Courses through the Institution's SWAYAM-NPTEL Local Chapter after submitting a Permission letter to the Head of the Department.
- The Course should be completed before the beginning of that particular Semester in which the selected Course is offered.
- The student should submit the Course Completion Certificate immediately after receiving it, to the Department.
- The Head of the Department has to send the list of the students and their Course Completion Certificates to the Controller of Examinations through the Principal.

- The students who have submitted the Completion Certificate are exempted from appearing the Periodic Tests and Summative Examinations of the respective course but without any exemption for class attendance.
- Credits allotted for the particular Course in the Curriculum will be transferred after the completion of the Online Course
- Students can earn up to 10 credits within the mandatory credits requirements of the Degree Programme by completing UGC recognised Online Courses.

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 (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 Q.No.(1-5)	Internal Choice- Either or Type	5	5	7	35
B 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 marks for all Courses.
  - Pass minimum for External Practical Examination is 21 marks out of 60 marks.

Attendance

- The students who have attended the classes for 76 days (85%) and above are permitted to appear for the Summative Examinations without any condition.
- 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.
- The students who have attended the classes for 59 days and less - up to 45 days (50%- 65%) can appear for the Summative Examinations only after getting special permission from the Principal.
- 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.
- For Part V in UG Programmes, the students require 75 % of attendance to get a credit.
- 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
	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	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	**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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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 2024-2025

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 and Self-Study Course							
Core Course	5 (5)	5 (5)	5 (5)	4 (4)	6 (6)	6 (5)	31 (30)
Core Course	-	-	-	-	6 (6)	6 (5)	12 (11)
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 (1)	-	1 (1)
Elective Course (DSEC)	-	-	-	-	5(4)	5 (5)	10 (9)
Elective Course (DSEC)	-	-	-	-	4(2)	3(2)	7(4)
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 and Internship/ Industrial Training							
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 (2)	-	-	-	-	4 (4)
Value Education	-	-	-	-	2(2)	-	2 (2)
Environmental Studies	-	-	1	1 (2)	-	-	2 (2)
Self-Study Course	-	-	-	-	0 (1)	-	0 (1)
Internship/ Industrial Training	-	-	-	-	0 (1)	-	0 (1)
Part V : Extension Activities	-	-	-		-	0(1)	0 (1)
Total	**30 (21/21)**	**30 (21/21)**	**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 (2024-2025 onwards)
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	24UTAG31/ 24UHDG31	6	3	3	25	75	100
2.	**Part II**		English	24UENG31	6	3	3	25	75	100
3.	**Part III**	Core Course -5	General Chemistry–III	24UCHC31	5	5	3	25	75	100
4.		Core Course -6	Qualitative Inorganic Analysis	24UCHC31P	3	2	3	40	60	100
5.		Elective Course -II	General Physics	24UPHA31	4	3	3	25	75	100
6.		Elective Course –II Practical –II	General Physics Practical-I	24UPHA31P	2	1	3	40	60	100
7	**Part IV**	SEC – 2	Entrepreneurial skills in Chemistry	24UCHS31	1	1	2	100	-	100
8		SEC- 3	Pesticide Chemistry	24UCHS32	2	2	2	25	75	100
9			Environmental Studies	24UGES41	1	-	-	-	-	-
				Total	**30**	**20**				**800**

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B. Sc. CHEMISTRY (2024-2025 onwards)
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	24UTAG41/ 24UHDG41	6	3	3	25	75	100
2.	**Part II**		English	24UENG41	6	3	3	25	75	100
3.	**Part III**	Core Course -7	General Chemistry–IV	24UCHC41	4	4	3	25	75	100
4.		Core Course -8	Physical Chemistry Practical- I	24UCHC41P	3	2	5	40	60	100
5.		Elective Course -II	Optics and Modern Physics	24UPHA41	4	3	3	25	75	100
6.		Elective Course –II Practical –II	General Physics Practical-II	24UPHA41P	2	1	3	40	60	100
7	**Part IV**	SEC – 4	Instrumental methods of Chemical Analysis	24UCHS41	2	2	2	25	75	100
8		SEC- 5	Forensic Science	24UCHS42	2	2	2	25	75	100
9			Environmental Studies	24UGES41	1	2	2	100	-	100
				Total	**30**	**22**				**900**

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B. Sc. CHEMISTRY (2024-2025 onwards)
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	24UCHC51	6	6	3	25	75	100
2.		Core Course -10	Inorganic Chemistry-I	24UCHC52	6	6	3	25	75	100
3.		Core Course -11	Physical Chemistry-I	24UCHC53	6	5	3	25	75	100
4.		Elective Course – I (DSEC)	Biochemistry/ Textile Chemistry	24UCHE51/ 24UCHE52	5	4	3	25	75	100
5.		Elective Course – II (DSEC)	Industrial Chemistry/ Soil Chemistry	24UCHE53/ 24UCHE54	4	2	3	25	75	100
6.		Core Course -12	Project	24UCHC54PR	1	1	-	100	-	100
7.	**Part IV**		Value Education	24UGVE51	2	2	3	100	-	100
8.		Self-Study course	Practice for competitive examinations- online	24UGCE51	-	1	-	100	-	100
9.		Internship / Industrial Training	Internship	24UCHI51	-	1	-	100	-	100
				Total	**30**	**28**				**900**
	Extra Credit Course (Self-Study course)		Laboratory Practices and Safety Measures	24UCHO51	-	2	3	-	100	100

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B. Sc. CHEMISTRY (2024-2025 onwards)
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	24UCHC61	6	5	3	25	75	100
2.		Core Course -14	Inorganic Chemistry-II	24UCHC62	6	5	3	25	75	100
3.		Core Course -15	Physical Chemistry-II	24UCHC63	5	5	3	25	75	100
4.		Core Course -16	Physical Chemistry Practical II	24UCHC61P	3	2	5	25	75	100
5.		Elective Course – III (DSEC)	Fundamentals of Spectroscopy/ Green Chemistry	24UCHE61/ 24UCHE62	5	5	3	25	75	100
6.		Elective Course – IV (DSEC)	Nanoscience/ Pharmaceutical Chemistry	24UCHE63/ 24UCHE64	3	2	3	25	75	100
7.		Self-Study Course	Core courses Quiz-online	24UCHQ61	-	1	-	100	-	100
8.	**Part IV**	SEC-7	Quantitative Analysis of Organic and Inorganic Compounds Practical	24UCHS61P	2	2	2	40	60	100
9.		Extension Activity	Extension Activity		-	1	-	100	-	100
				Total	**30**	**28**				**900**

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Semester III	**GENERAL CHEMISTRY-III**	Hours/Week: 5	
Core Course -5		Credits: 5	
Course Code **24UCHC31**		Internal 25	External 75

COURSE OUTCOMES

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 halo organic 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 crystals with 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 halo organic 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)

TEXT BOOKS

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.

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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 24UCHC31	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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(2024 -2025 onwards)

Semester III	**QUALITATIVE INORGANIC ANALYSIS**	Hours/Week: 3	
Core Course-6		Credits: 2	
Course Code **24UCHC31P**		Internal 40	External 60

COURSE OUTCOMES

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).

TEXT BOOK

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

Course Code 24UCHC31P	**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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VIRUDHUNAGAR
Quality Education with Wisdom and Values

B.Sc. CHEMISTRY
(2024 -2025 onwards)

Semester III	**GENERAL PHYSICS**	**Hours/Week: 4**	
Elective Course I		**Credits: 3**	
Course Code 24UPHA31		**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., (2018) *Waves and Oscillations*, Vikas Publishing House Pvt Ltd, New Delhi.

REFERENCE BOOKS

1. Resnick Halliday and Walker., (2018) *Fundamentals of Physics*, (11th Edition), John Willey and Sons. Asia Pvt. Ltd., Singapore.
2. Murugeshan, R., (2017) *Electricity and Magnetism*, 10th Edition, S.Chand Publications Pvt Ltd.

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/

Course Code 24UPHA31	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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Quality Education with Wisdom and Values

B.Sc. CHEMISTRY
(2024-2025 onwards)

Semester III	**GENERAL PHYSICS PRACTICAL –I**	Hours/Week: 2	
Elective Course II – Practical I		Credits: 1	
Course Code **24UPHA31P**		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: check/verify the accuracy of the result against standard value and to test whether the principles of the experiment are understood. [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.

Course Code 24UPHA31P	**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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B.Sc. CHEMISTRY
(2024 -2025 onwards)

Semester III	**ENTREPRENEURIAL SKILLS IN CHEMISTRY**	Hours/Week: 1
Skill Enhancement Course-2		Credits: 1
Course Code **24UCHS31**		Internal 100

COURSE OUTCOMES
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

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

Course Code 24UCHS31	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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B.Sc. CHEMISTRY
(2024 -2025 onwards)

Semester III	**PESTICIDE CHEMISTRY**	Hours/Week: 2	
Skill Enhancement Course-3		Credits: 2	
Course Code **24UCHS32**		Internal 25	External 75

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

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)

TEXT BOOKS

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 P Ltd; 1st Ed.
2. Nollet L.M., Rathore H.S.,(2016), Handbook of pesticides: methods of pesticide residues analysis. CRC press.
3. Ellerbrock R.H., (2005), Pesticide Residues: Significance, Management and Analysis.

4. Thankamma Jacob, (1979). *A Text Book of Applied Chemistry for Home Science and Allied 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 Company Pvt .Ltd.

Course Code 24UCHS32	**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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B.Sc. CHEMISTRY
(2024 -2025 onwards)

Semester IV	**GENERAL CHEMISTRY-IV**	Hours/Week: 4	
Core Course 7		Credits: 4	
Course Code **24UCHC41**		Internal 25	External 75

COURSE OUTCOMES

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 ofaliphatic 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 α, β and γ–hydroxy acids. (12 Hours)

TEXT BOOKS

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.

REFERENCE BOOKS

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 24UCHC41	**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
(2024 -2025 onwards)

Semester IV	**PHYSICAL CHEMISTRY PRACTICAL – I**	Hours/Week: 3	
Core Course-8		Credits: 2	
Course Code **24UCHC41P**		Internal 40	External 60

COURSE OUTCOMES

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
24UCHC41P	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
Head of the Department

Dr.J.Kavitha
Course Designer

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

B.Sc. CHEMISTRY
(2024-2025 onwards)

Semester IV	**OPTICS AND MODERN PHYSICS**	Hours/Week: 4	
Elective Course II		Credits: 3	
Course Code		Internal	External
24UPHA41		25	75

COURSE OUTCOMES

On completion of the course, the students will 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: interference – 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. (12 hours)

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 – nuclear fusion – carbon-nitrogen cycle – proto-proton cycle - 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: semiconductor materials – intrinsic and extrinsic type - 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., (2018) *Allied Physics*, S. Chand & Co, New Delhi.
2. Thangarajan, K., and Jayaraman, D., (2004) *Allied Physics*, Popular Book Depot, Chennai
3. Murugesan,R., (2016) *Modern Physics*, S.Chand &Co, NewDelhi

REFERENCE BOOKS

1. Resnick Halliday and Walker., (2018) *Fundamentals of Physics*, 11thEdn. John Willey and Sons, Asia Pvt. Ltd., Singapore.
2. Thomas L. Floyd., (2017) *Digital Fundamentals*, 11th Edition, Universal Book Stall, NewDelhi.
3. Metha, V.K., (2022) *Principles of electronics*, 12th Edition. S. Chand and Company, New Delhi.

Course Code 24UPHA41	**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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B.Sc. CHEMISTRY
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Semester IV	**GENERAL PHYSICS PRACTICAL- II**	Hours/Week: 2	
Elective Course II – Practical II		Credits: 1	
Course Code **24UPHA41P**		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: check/verify the accuracy of the result against standard value and to test whether the principles of the experiment are understood. [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.

Course Code 24UPHA41P	**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

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B.Sc. CHEMISTRY
(2024 -2025 onwards)

Semester IV	**INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS**	Hours/Week: 2	
Skill Enhancement Course-4		Credits: 2	
Course Code **24UCHS41**		Internal 25	External 75

COURSE OUTCOMES

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 beam instrument; 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 beam instrument; 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)

TEXT BOOKS

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	**PO1**		**PO2**		**PO3**		**PO4**		**PO5**		**PO6**	**PO7**
24UCHS41	**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	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**

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B.Sc. CHEMISTRY
(2024 -2025 onwards)

Semester IV	**FORENSIC SCIENCE**	Hours/Week: 2	
Skill Enhancement Course-5		Credits: 2	
Course Code **24UCHS42**		Internal 25	External 75

COURSE OUTCOMES

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 and the dead -clinical symptoms - postmortem appearances. Heavy metal contamination (Hg, Pb, Cd) of sea foods - use of neutron activation analysis in 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 and other 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.

REFERENCE BOOKS

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	**PO1**		**PO2**		**PO3**		**PO4**		**PO5**		**PO6**	**PO7**
24UCHS42	**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

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B.Sc. CHEMISTRY
(2024-2025 onwards)

Semester V	**ORGANIC CHEMISTRY - I**	Hours/Week: 6	
Core Course-9		Credits: 6	
Course Code **24UCHC51**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : know the basic concepts of stereochemistry, chemistry of nitrogen compounds, dyes and heterocyclics. [K1]

CO2 : distinguish the stereoisomers, outline the preparation of aliphatic, aromatic nitrogen compounds, dyes and heterocyclics [K2]

CO3 : comprehend the molecules with and with no asymmetric carbon atoms, the properties and uses of aliphatic, aromatic nitrogen compounds and heterocyclics and the theory of colour and constitution. [K2]

CO4 : sketch several projection formulae and conformers, relate various nitrogen compounds and establish their basic character and their synthetic applications [K3]

CO5 : write notations for stereoisomers, select appropriate methods for racemization, and resolution of racemic mixtures and interpret the aromatic character and reactivity of heterocyclics. [K3]

UNIT I

Stereochemistry

Fischer Projection, Newmann and Sawhorse Projection formulae and their interconversions;

Geometrical isomerism: cis–trans, syn-anti isomerism, E/Z notations.

Optical Isomerism: Optical activity, specific rotation, asymmetry, enantiomers, distereoisomers, meso structures - molecules with one and two chiral centres, racemisation- methods of racemisation; resolution- methods of resolution. C.I.P rules. R and S notations for one and two chirality (stereogenic) centres. Molecules with no asymmetric carbon atoms – allenes and biphenyls. Conformational analysis of ethane and butane. (18 hours)

UNIT II

Chemistry of Nitrogen Compounds – I

Nitroalkanes

Nomenclature, isomerism, preparation from alkyl halides, halo acids, alkanes; physical properties; reactions – reduction, halogenations, Grignard reagent, Pseudo acid character. Nitro - aci nitro tautomerism.

Aromatic nitro compounds

Nomenclature, preparation – nitration, from diazonium salts, physical properties; reactions - reduction of nitrobenzene in different medium, Electrophilic substitution reactions, TNT.

Amines: Aliphatic amines: Nomenclature, isomerism, preparation – Hofmanns' degradation reaction, Gabriel's phthalimide synthesis, Curtius Schmidt rearrangement.

Physical properties, reactions – alkylation, acylation, carbylamine reaction, Mannich reaction, oxidation, basicity of amines. (18 hours)

UNIT III

Chemistry of Nitrogen Compounds – II

Aromatic amines – Nomenclature, preparation – from nitro compounds, Hofmann's method; Schmidt reaction, properties - basic nature, ortho effect; reactions – alkylation, acylation, carbylamine reaction, reaction with nitrous acid, aldehydes, oxidation, Electrophilic substitution reactions, diazotization and coupling reactions; sulphanilic acid - zwitter ion formation.

Distinction between primary, secondary and tertiary amines - aliphatic and aromatic

Diazonium compounds

Diazomethane, Benzene diazonium chloride - preparations and synthetic applications

Dyes

Theory of colour and constitution; classification based on structure and application; preparation – Martius yellow, aniline yellow, methyl orange, alizarin, indigo, malachite green.

Industry oriented content

Dyes Industry, Food colour and additives (18 hours)

UNIT IV

Heterocyclic compounds

Nomenclature and classification. General characteristics - aromatic character and reactivity.

Five-membered heterocyclic compounds

Pyrrole – preparation - from succinimide, Paal Knorr synthesis; reactions – reduction, basic character,

acidic character, electrophilic substitution reactions, ring opening.

Furan – preparation from mucic acid and pentosan; reactions – hydrogenation, reaction with oxygen, Diels Alder reactions, formation of thiophene and pyrrole; Electrophilic substitution reaction.

Thiophene synthesis - from acetylene; reactions –reduction; oxidation; electrophilic substitution reactions (18 hours)

UNIT V

Six-membered heterocyclic compounds

Pyridine – synthesis - from acetylene, Physical properties; reactions - basic character, oxidation, reduction, electrophilic substitution reactions; nucleophilic substitution- uses

Condensed ring systems

Quinoline – preparation - Skraup synthesis and Friedlander's synthesis; reactions – basic nature, reduction, oxidation; electrophilic substitutions; nucleophilic substitutions – Chichibabin reaction

Isoquinoline – preparation by the Bischler – Napieralski reaction, reduction, oxidation; electrophilic substitution. (18 hours)

TEXT BOOKS

1.M.K. Jain, S.C.Sharma, Modern Organic Chemistry, VishalPublishing, fourth reprint, 2009.

2. S.M. Mukherji, and S.P. Singh, Reaction Mechanism in OrganicChemistry, Macmillan India Ltd., third edition, 2009.

3. ArunBahl and B.S. Bahl, Advanced organic chemistry, New Delhi,S.Chand& CompanyPvt. Ltd., Multicolour edition, 2012.

4. P. L.Soni and H. M. Chawla, Text Book of Organic Chemistry,Sultan Chand & Sons, New Delhi, twenty ninth edition, 2007.

5. C.N.Pillai, Text Book of Organic Chemistry, Universities Press(India) Private Ltd., 2009.

REFERENCE BOOKS

1. R. T. Morrison and R. N. Boyd, Organic Chemistry, PearsonEducation, Asia, sixth edition, 2012.

2. T.W.Graham Solomons, Organic Chemistry, John Wiley & Sons,

3. A. Carey Francis, Organic Chemistry, Tata McGraw-Hill Education Pvt. Ltd., New Delhi, seventh edition,2009.

4. I. L. Finar, Organic Chemistry, Vol. (1& 2), England, Wesley Longman Ltd, sixth edition, 2006.

5. J. A. Joule, and G. F. Smith, Heterocyclic Chemistry, Wiley, Fifth Edition, 2010.

Course Code 24UCHC51	**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
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Dr.A.Prasanna
Course Designer

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B.Sc. CHEMISTRY
(2024-2025 onwards)

Semester V	**INORGANIC CHEMISTRY - I**	Hours/Week: 6	
Core Course-10		Credits: 6	
Course Code **24UCHC52**		Internal 25	External 75

COURSE OUTCOME

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

CO1 : know the concepts of coordination compounds, organometallic. inner transitio and Polymers. [K1]

CO2 : understand the classification and applications of coordination compounds, organom inorganic polymers in industrial level. [K2]

CO3 : describe the Crystal field theory, properties of metal carbonyls, inner transition elen silicones.[K2]

CO4 : identify the types of ligands, structure of metal carbonyls, properties transition elements and inorganic polymers. [K3]

CO5 : apply the calculation of CFSE in octahedral and tetrahedral complexes, EAN rule, ex inner transition elements and inorganic polymers. . [K3]

UNIT I

Co-ordination Chemistry - I

IUPAC Nomenclature of coordination compounds, Isomerism in coordination compounds. Werner's coordination theory – effective atomic number –interpretation of geometry and magnetic properties by Pauling's theory – geometry of co-ordination compounds with co-ordination number 4 &6. Chelates – types of ligands forming chelates – stability of chelates, applications of chelates in qualitative and quantitative analysis– application of DMG and oxine in gravimetric analysis – estimation of hardness of water using EDTA, metal ion indicators.Role of metal chelates in living systems – haemoglobin and chlorophyll (18 Hours)

UNIT II

Co-ordination Chemistry - II

Crystal field theory –Crystal field splitting of energy levels in octahedral and tetrahedral complexes, Crystal field stabilization energy (CFSE), spectrochemical series - calculation of CFSE in octahedral and tetrahedral complexes - factors influencing the magnitude of crystal field splitting, crystal field effect on ionic radii, lattice energies, heats of ligation with water as a ligand (heat of hydration), interpretation of magnetic properties, spectra of $[Ti(H_2O)_6]^{3+}$ - Jahn – Teller effect. Stability of complexes in aqueous solution, stability constants- factors affecting the stability of a complex ion, thermodynamic and kinetic stability (elementary idea). Comparison of VBT and CFT. (18 Hours)

UNIT III

Organometallic compounds

Metal Carbonyls

Mono and polynuclear carbonyls, General methods of preparation of carbonyls – general properties of binary carbonyls – bonding in carbonyls – structure and bonding in carbonyls of Ni, Fe, Cr, Co, Mn, Ru and Os. EAN rule as applied to metal carbonyls. Ferrocene-Methods of preparation, physical and chemical properties (18 Hours)

UNIT IV

Inner transition elements (Lanthanoids and Actinoids)

General characteristics of f-block elements - Comparative account of lanthanoids and actinoids - Occurrence, Oxidation states, Magnetic properties, Colour and spectra - Lanthanoids and Actinoids, Separation by ion-Exchange and Solvent extraction methods - Lanthanoids contraction- Chemistry of thorium and Uranium-Occurrence, Ores, Extraction, properties and uses - Preparation, Properties and uses of ceric ammonium sulphate, thorium dioxide and uranyl acetate. **(18 Hours)**

UNIT V

Inorganic polymers

General properties – classification of inorganic polymers based on element in the backbone (Si, S, B and P) - preparation and properties of silicones (polydimethylsiloxane and polymethylhydrosiloxane) phosphorous based polymer (polyphosphazines and polyphophonitrilic chloride), sulphur based polymer (polysulfide and polymeric sulphur nitride), boron based polymers (borazine polymers) – industrial applications of inorganic polymers. **(18 Hours)**

TEXT BOOKS

1. Puri B R, Sharma L R, Kalia K C (2011), Principles of InorganicChemistry, 31thEdition, Milestone Publishers & Distributors, Delhi.

2. Satya Prakash, Tuli G. D., Basu S. K., Madan R. D. (2009), Advanced Inorganic Chemistry, 18th Edition, S. Chand & Co., New Delhi
3. Lee J D, (1991), Concise Inorganic Chemistry, 4th Edition, ELBSWilliam Heinemann, London.
4. W V Malik, G D Tuli, R D Madan, (2000), Selected Topics inInorganic Chemistry, S. Chand and Company Ltd.
5. A. K. De, Text book of Inorganic Chemistry, Wiley East Ltd,seventh edition, 1992.

REFERENCE BOOKS

1. Madan R D, Sathya Prakash, (2003), Modern Inorganic Chemistry,2nd ed ., S.Chand and Company, New Delhi.
2. Gopalan R, (2009) Inorganic Chemistry for Undergraduates, IstEdition, University Press (India) Private Limited,Hyderabad
3. Sivasankar B, (2013) Inorganic Chemistry.Ist Edition, Pearson,Chennai
4. Alan G. Sharp (1992), Inorganic Chemistry, 3rd Edition, Addition-Wesley, England
5. Peter Atkins, Tina Overton, Jonathan Rourke and Mark Weller, Inorganic Chemistry, Oxford University Press, sixth edition, 2014.

Course Code 24UCHC52D	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.Dhanalakshmi — **Course Designer**

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Quality Education with Wisdom and Values

B.Sc. CHEMISTRY
(2024-2025 onwards)

Semester V	**PHYSICAL CHEMISTRY-I**	**Hours/week:6**	
Core Course-11		**Credits:5**	
Course Code: 24UCHC53		**Internal**	**External**
		25	**75**

COURSE OUTCOMES

On completion of the course, students will be able to

CO1: understand the basic principles of thermodynamics, chemical kinetics, adsorption, catalysis, surface and photochemistry [K1]

CO2:explain the concepts of Gibbs free energy, Helmholtz free energy, Ellingham's diagram and partial molar properties, chemical kinetics and different types of chemical reactions, adsorption, homogeneous and heterogeneous catalysis, colloids and macromolecules, photochemistry, fluorescence and phosphorescence [K2]

CO3: apply the concepts of chemical potential, chemical kinetics to predict the rate of the reaction and order of the reaction, kinetics of enzyme catalyzed reaction , types and characteristics of colloids and Kinetics of H_2-Cl_2, H_2-Br_2 and H_2-I_2reactions. [K2]

CO4: evaluate variation of chemical potential with temperature and pressure, chemical potential of a system of ideal gases, Collision theory, Kinetics of Acid – base and enzyme catalysis, Heterogenous catalysis, Molecular weight of Macromolecules and Chemistry of Vision. [K3]

CO5:predict Maxwell relationships, thermodynamic equations of state , Lindemann's theory of unimolecular reaction and Theory of absolute reaction rates, Adsorption isotherms and their limitations, Optical properties, Electrical properties of colloids and Laws of photochemistry. [K3]

UNIT I

Thermodynamics-III

Partial molar properties –chemical potential, Gibbs Duhem equation, variation of chemical potential with temperature and pressure, chemical potential of a system of ideal gases, Gibbs-

Duhem-Margules equation – van't Hoff reaction isotherm – van't Hoff isochore – Clapeyron equation and Clausius-Clapeyron equation – applications Introduction of real system – fugacity, activity and activity coefficient

Liquid system – partially miscible liquid system (phenol-water system) – completely miscible system (alcohol-water system) – completely immiscible system (benzene –water system) – Theory of fractional distillation - steam distillation.

Nernst distribution law – mathematical formulation – deviation from distribution law – solvent extraction – principle. (18 hours)

UNIT II

Chemical Kinetics

Rate of reaction - Average and instantaneous rates, factors influencing rate of reaction - molecularity of a reaction - rate equation - order of reaction. order and molecularity of simple and complex reactions, Rate laws- Rate constants – derivation of rate constants and characteristics for zero, first order, second and third order (equal initial concentration) Derivation of time for half change with examples. Methods of determination of order of Volumetry, manometry and polarimetry.

Effect of temperature on reaction rate–temperature coefficient-concept of activation energy - Arrhenius equation. Theories of reactionrates–Collisiontheory–derivation of rate constant of bimoleculargaseous reaction – Failure of collision theory. Lindemann's theory of unimolecular reaction. Theory of absolute reaction rates – Derivation of rate constant for a bimolecular reaction –significance of entropy and free energy of activation. Comparison of collision theory and ARRT.

Complex reactions – reversible and parallel reactions (no derivation and only examples)

Kinetics of consecutive reactions–steady state approximation. (18 hours)

UNITIII

Adsorption–Chemicalandphysicaladsorptionandtheirgeneralcharacteristics- distinction between them Different types of isotherms –Freundlich and Langmuir. Adsorption isotherms and their limitations –BET theory, kinetics of enzyme catalysed reaction –Michaelis- Mentenand Briggs-Haldene equation – Lineweaver- Burk plot – inhibition –reversible–competitive, non-competitive and uncompetitive (no derivation of rate equations)

Catalysis – general characteristics of catalytic reactions, auto catalysis, promoters, negative catalysis, poisoning of acatalyst–theories of homogenous and heterogeneous catalysis – Kinetics of Acid – base and enzyme catalysis. Heterogenous catalysis. (18 hours)

UNIT IV

Colloids and Surface Chemistry

Colloids: Types of Colloids, Characteristics Colloids (Lyophilic and Lyophobic sols),

Preparation of Sols-Dispersion methods, aggregation methods, Properties of Sols- Optical properties, Electrical properties – Electrical double layer, Electro Kinetic properties-Electro-osmosis, Electrophoresis,

Coagulation or precipitation, Stability of sols, associated colloids, Emulsions, Gels-preparation of Gels, Applications of colloids.

Macromolecules: Molecular weight of Macromolecules-Number average molecular weight-average molecular weight, Determination of Molecular weight of molecules. (18 hours)

UNIT V

Photochemistry

Laws of photochemistry–Lambert–Beer, Grotthus –Draper and Stark–Einstein. Quantum efficiency. Photo chemical reactions–ratelaw–Kinetics of H_2-Cl_2, H_2-Br_2 and H_2-I_2 reactions, comparison between thermal and photochemical reactions.

Fluorescence–applications including fluorimetry–sensitised fluorescence, phosphorescence – applications - chemiluminescence and photosensitisation– examples Chemistry of Vision–11 cis-retinal–vitamin A as a precursor-colour perception of vision. (18 hours)

TEXT BOOKS

1. B.R.Puri and L.R.Sharma, (2021) Principles of Physical Chemistry, Shoban Lal Nagin Chand and Co., forty eighth edition.
2. Peter Atkins ,and Juliode Paula, James Keeler, (2018), Physical Chemistry, Oxford University press, International eleventh edition.
3. Arun Bahl, B.S.Bahl, G.D.Tuli Essentials of physical chemistry, 28th edition, (2019), S, Chand & Co.
4. S.K.Dogra and S.Dogra, (1996), Physical Chemistry through Problems: New Age International, fourth edition.
5. J.Rajaram and J.C. Kuriacose, (1986), Thermodynamics ,Shoban Lal Nagin Chand and CO.

REFERENCE BOOKS

1. J.Rajaram and J.C. Kuriacose, (2013), Chemical Thermodynamics, Pearson, 1st edition.
2. Keith J. Laidler, Chemical kinetics, (2003), third edition, Pearson.
3. P.W. Atkins ,and Juliode Paula, ,Physical Chemistry, (2002), Oxford University press, seventh edition.

4. K.L. Kapoor, A Text book of Physical Chemistry, Macmillan India Ltd, (2009), third edition,.
5. B.R.Puri, L.R.Sharma and M.S.Pathania, Principles of Physical Chemistry, (2001), Shobanlal Nagin Chand and Co. Jalendhar, forty first, edition,.

Website and e-learning source

1. https://nptel.ac.in
2. https://swayam.gov.in
3. www.epgpathshala.nic.in

Course Code 24UCHC53	PO1		PO2		PO3		PO4		PO5		PO6	PO7
	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	3	3	3	2	3	3	3	2	3	3	3	2
CO2	3	3	3	2	1	2	2	2	2	2	2	2
CO3	3	3	3	2	1	3	3	3	3	3	3	2
CO4	3	3	3	2	3	1	3	3	3	3	3	2
CO5	3	3	3	2	3	3	3	3	3	3	3	2

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

Dr.M.Dhanalakshmi
Head of the Department

Dr.J. Kavitha
Course Designer

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B.Sc. CHEMISTRY
(2024-2025 onwards)

Semester V	**BIOCHEMISTRY**	**Hours/week:5**	
Elective Course-I		**Credits:4**	
Course code 24UCHE51		**Internal**	**External**
		25	**75**

COURSE OUTCOMES

On completion of the course, students will be able to

CO1: know molecular logic of living organisms and biochemical applications [K1]

CO2: understand synthesis and properties of amino acids, determination of structure of peptides and proteins [K2]

CO3 explain the factors influencing enzyme activity and vitamins as coenzymes [K2]

CO4: predict RNA and DNA structure and functions [K3]

CO5: illustrate the biological significance of simple and compound biomolecules [K3]

UNIT I

Logic of Living Organisms

Relationship of Biochemistry and Medicine Blood - Composition of Blood, Blood Coagulation – Mechanism. Hemophilia and Sickle Cell Anaemia Maintenance of pH of Blood – Bicarbonate Buffer, Acidosis, Alkalosis. (15 hours)

UNIT II

Peptides and Proteins

Amino acids – nomenclature, classification – essential and Non-essential; Synthesis - Gabriel Phthalimide, Strecker; properties – zwitter ion and isoelectric point, electrophoresis and reactions. Peptides – peptide bond – nomenclature – synthesis of simple peptides –solution and solid phase. Determination of structure of peptides, N- terminal analysis – Sanger's & Edmann method; C terminal analysis - Enzymic method.Proteins – classification based on composition, functions and structure;properties and reactions – colloidal nature, coagulation, hydrolysis,oxidation, denaturation, renaturation; colour tests for proteins; structureof proteins – primary, secondary, tertiary and quaternary.Metabolism of Amino acids – general aspects of metabolism (a briefoutline); urea cycle. (15 hours)

UNIT III

Enzymes and Vitamins

Nomenclature and classification, characteristics, factors influencing enzyme activity – mechanism of enzyme action – Lock and key hypothesis, Koshland's induced fit model. Proenzymes, antienzymes, coenzymes and isoenzymes; allosteric enzyme regulation.

Vitamins as coenzymes – functions of TPP, lipoic acid, NAD, NADP, FMN, FAD, pyridoxal phosphate, CoA, folic acid, biotin, cyanocobalamin. (15 hours)

UNIT IV

Amino acids

Components of nucleic acids - nitrogenous bases and pentose sugars, structure of nucleosides and nucleotides, DNA- structure & functions; RNA –types– structure - functions; biosynthesis of proteins HormonesAdrenalin and thyroxine — chemistry, structure and functions (No structure elucidation). (15 hours)

UNIT V

Lipids

Occurrence, biological significance of fats, classification of lipids. Simple lipids – Oils and fats, chemical composition, properties, reactions – hydrolysis, hydrogenation, trans-esterification, saponification, rancidity; analysis of oils and fats – saponification number, iodine number, acid value, R.M. value. Distinction between animal and vegetable fats. Compound lipids – Lipoproteins - VLDL, LDL, HDL, chylomicrons – biological significance. Cholesterol – occurrence, structure, test, physiological activity. Metabolism of lipids: β-oxidation of fatty acids. (15 hours)

TEXT BOOKS

1. Bahl, B. S.; Bhal, A. Advanced Organic Chemistry, 3rd ed.; S. Chand:New Delhi, 2003.
2. Jain, M.K.; Sharma, S.C. Modern Organic Chemistry, Vishal Publications: New Delhi, 2017.
3. Shanmugam, A. Fundamentals of Biochemistry for Medical Students,6th ed.; Published by the author, 1999.
4. Veerakumari, L. Biochemistry, 1st ed.; MJP Publications: Chennai,2004.
5. Jain, J. L.; Fundamentals of Biochemistry, 2nd ed.; S.Chand: NewDelhi, 1983.

REFERENCE BOOKS

1. Conn, E. E.; Stumpf, P. K. Outline of Biochemistry, 5th ed.; Wiley Eastern: New Delhi, 2002.

2. West, E. S.; Todd, W. R.; Mason, H. S.; Van Bruggen, J. T. Text Book of Biochemistry, 4th ed.; Macmillan: New York, 1970.

3. Lehninger, A. L. Principles of Biochemistry, 2nd ed.; CBS Publisher:NDelhi, 1993.

4. Rastogi, S. C. Biochemistry, 2nd ed.; Tata McGraw-Hill: New Delhi, 35 2003.

5. Chatterjea, M. N.; Shinde, R. Textbook of Medical Biochemistry, 5th ed.; Jaypee Brothers: New Delhi, 2002.

WEBSITE AND E-LEARNING SOURCE

1) http://library.med.utah.edu/NetBiochem/nucacids.html
2)http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/E/EnzymeKinetics.html
3) https://swayam.gov.in/courses/4384-biochemistry Biochemistry
4) https://onlinecourses.nptel.ac.in/noc19_cy07/preview
Experimental Biochemistry

Course Code 24UCHE51	PO1		PO2		PO3		PO4		PO5		PO6	PO7
	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	3	3	3	2	3	3	2	2	3	3	3	2
CO2	3	3	3	2	1	2	2	2	2	2	2	2
CO3	3	2	2	2	1	3	3	3	3	3	2	2
CO4	3	3	3	2	3	1	3	2	3	3	3	2
CO5	3	3	3	2	3	3	3	2	3	1	3	2

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
(2024-2025 onwards)

Semester V	**TEXTILE CHEMISTRY**	**Hours/Week: 5**	
Elective Course I (DSEC)		**Credits: 4**	
Course Code 24UCHE52		**Internal** 25	**External** 75

COURSE OUTCOMES

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

CO1 : understand the classification of physical and chemical properties of natural fibres, and Synthetic fibres. [K1]

CO2 : know about different synthetic fibres, their manufacture and properties. [K2]

CO3 : acquire knowledge about scouring and desizing processes. [K2]

CO4 : clear idea about manufacturing and bleaching technique. [K3]

CO5 : acquire knowledge about principles of purification, singeing, principles of wetting, dyeing, synthesis of dyestuffs and fastness properties.. [K3]

UNIT I

VEGETABLE FIBRES AND ANIMAL FIBRES

Definition – classification of textile fibres – essential and desirable properties of textile fibres – Cotton fibre – Physical and Chemical properties, Jute – Purification; physical and chemical properties of jute, silk and wool (15 Hours)

UNIT II

REGENERATED AND SYNTHETIC FIBRES

Rayon – different types of rayon and their sources - manufacturing of viscose rayon – physical and chemical properties – acetate rayon – manufacture – properties, cuprammonium rayon – manufacture and properties. Manufacture – properties and uses of polyamides - polyester – polypropylene and polyacrylonitrile. (15 Hours)

UNIT III

PREPARATORY PROCESS PRIOR TO DYEING

Scouring: Objectives of scouring – process of caustic scouring on open kier and closed kier machine with sine diagram, scouring with NaOH and Na_2CO_3 – Precautions to be taken before scouring. Desizingusing malt extract – merits and demerits of acid and enzyme desizing. Singeing – Impurities present in grey cotton and cotton fabric – objects of singeing – process of singeing on gas singeing machine – precautions to be taken during gas singeing.

(15 Hours)

UNIT IV

PRINCIPLES OF BLEACHING

Principles of wetting and mechanism of detergency – synthetic detergents – surface active agents – bleaching processes – bleaching agents – H_2O_2, NaOCI, bleaching powder and biobleaching and their properties – bleaching of cotton, rayon, wool and synthetic fibres.

(15 Hours)

UNIT V

PRINCIPLES OF DYEING

Colour and Chemical constitution – Chromophore and auxochromes – natural and synthetic dyes – dyes - classification, synthesis of dyeshift – congored, bismark brown and crystal violet, theories of dyeing – effect of temperature and salt on dyeing – dyeing of wool, silk and poly-esters – dyeing of cotton with reactive dyes – fastness properties – washing , light, rubbing and perspiration. (15 Hours)

TEXT BOOKS

1. Sharma, B.K.(2008). *Industrial Chemistry*. 1st Edition. Meerut: GOEL Publishing House.
2. BagavathiSundari. K,(2006). *Applied Chemistry.* 1st Edition. Chennai: MJP Publishers.
3. Rangnekar,D.W& Singh, P.P.(1980). *An Introduction to Synthetic Dyes* 1st Edition.Bombay: Himalaya Publishing House.

REFERENCE BOOKS

1. Jaya Shree Ghosh, (2013). *Fundamental Concepts of Applied Chemistry*. 1st Edition.New Delhi: S.Chand& Company Ltd.
2. Thankamma Jacob. (1979). *AText Book of Applied Chemistry for Home Science and Allied Sciences.* 1st Edition. New Delhi: The Macmillan Company of India Ltd.
3. Jain, P.C. & Monika Jain, (2013). *Engineering Chemistry.*1st Edition.New Delhi: Dhanpat Rai Publishing Company Pvt.Ltd.

Course Code 24UCHE52	**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
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B.Sc. CHEMISTRY
(2024-2025 onwards)

Semester V	**INDUSTRIAL CHEMISTRY**	**Hours/week:4**	
Elective Course –II (DSEC)		**Credits:2**	
24UCHE53		**Internal 25**	**External 75**

COURSE OUTCOMES

On completion of the course, students will be able to

CO1: know the availability of Indian Industries and mineral resources, cosmetic products, soaps, detergents, leather, paper, lubricant, cement, sugar, abrasives and Intellectual Property Rights [K1]

CO2: understand the manufacture of sugar, cement, paper, abrasives, lubricant, soaps and detergents. [K2]

CO3: explain the properties of mineral resources, cosmetics, food preservatives, leather, paper, lubricant cemet and Intellectual Property Rights [K2]

CO4: apply the properties of sugar, cement, paper, abrasives, lubricant, soaps and detergents in daily life [K3]

CO5: integrating the need of properties and manufacture of lubricants mineral resources, cosmetics, food preservatives, leather, paper, sugar, cement [K3]

UNIT I

Survey of Indian Industries and mineral resources in India

Fuels: Classification, characteristics of fuels. Solid fuels: coal - classification; analysis of coal- proximate analysis and ultimate analysis; calorific value-determination, carbonisation of coal. Liquid fuels: Petroleum - characteristics; Gasoline aviation petrol- knocking in internal combustion engines, antiknock agents; unleaded petrol-octane number, cetane number. Gaseous fuel: advantages over solid and liquid fuels; water gas, producer gas, carburetted water gas - preparations - uses. Natural gas: LPG-composition, advantages, application; gobar gas- production, composition, advantages, application. Propellants – rocket fuels (basic idea) (12 hours)

UNIT II

Cosmetics

Skin care: powders, ingredients; creams and lotion-cleansing, moisturising, all purpose shaving cream, sunscreen; make up preparations.

Dental care: tooth pastes – ingredients.

Hair care: shampoos-types, ingredients; conditioners-types, ingredients. Perfumes: natural-plant origin-parts of the plant used, chief constituents; animal origin-amber gries, civetone and musk; synthetic-classification- esters-amylsalicylate alcohols-citronellol; terpeneols-gereniol and nerol; ketones-muskone, coumarin; aldehydes-vanilin.

Soaps and Detergents

Soaps-properties, manufacture of soap-batch process; types-transparent soap, toilet soap, powder soap and liquid soap – ingredients.

Detergents-definition, properties-cleansing action; soap less detergents- anionic, cationic and non-ionic (general idea only); uses of detergents as surfactants. Biodegradability of soaps and detergents. (12 hours)

UNIT III

Sugar Industry

Manufacture from sugar cane; recovery of sugar from molasses; testing and estimation of sugar.

Food Preservation and processing

Food spoilage – causes; Food preservation - methods – high temperature, low temperature, drying, radiation; Processing Technology of the Basic food groups-Cereals and Pulses-Fruits and vegetables-Meat, poultry, fish and egg-Nuts and Oil seeds. Food standards – Agmark and Codex alimentarius. (12 hours)

UNIT IV

Abrasives

Definition, characteristics, types-natural and synthetic; natural abrasives – diamond, corundum, emery, garnet, quartz – composition, uses; synthetic abrasives – carborundum, aluminium carbide, boron carbide, boron nitride, synthetic graphite – composition and uses.

Leather Industry

Structure and composition of skin, hide; Manufacture of leather – pre- tanning process –

curing, liming, beating, pickling; methods of tanning- vegetable, chrome – one bath, two bath process; finishing.

Paper Industry

Manufacture of pulp - mechanical, chemical processes; sulphate pulp, rag pulp; manufacture of paper- beating, refining, filling, sizing, colouring, calendaring; cardboard. (12 hours)

UNIT V

Lubricants Definition, classification-liquid, semi-solid, solid and synthetic; properties-viscosity index, flash point, cloud point, pour point, aniline point and drop point; greases-properties, types; cutting fluids, selection of lubricants.

Cement Industry

Cement – types, raw materials; manufacture-wet process, constituent of cement, setting of cement; properties of cement-quality, setting time, soundness, strength; mortar, concrete, RCC; curing and decay of concrete.

Intellectual Property Rights

Introduction to Intellectual Property Rights – Patents - Factors for patentability - Novelty, Non obviousness, Industrial applications - Patent offices in India: Trademark - Types of trademarks- Certification marks, logos, brand names, signatures, symbols and service marks. (12 hours)

TEXT BOOKS

1. Sharma, B.K. *Industrial Chemistry*, 9th ed.(1998); Goel Publishing House:Meerut.
2. Wilkinson, J.B.E. Moore, R.J. *Harry's Cosmeticology*, 7th ed(1982).;Chemical Publishers : New York.
3. Alex V. Ramani, *Food Chemistry,(* 2009), MJP publishers: Chennai.
4. Jayashree Ghosh, *Applied Chemsitry*, (2006), S. Chand : New Delhi.

Srilakshmi, B. *Food Science*, 4th ed.(2005); New Age InternationalPublication.

REFERENCE BOOKS

1. Jain, P.C.; Jain, M. *Engineering Chemistry*, 16th ed.(1992) ; Dhanapet Rai: Delhi.

2. George Howard, *Principles and Practice of Perfumes and Cosmetics,* (1987), Stanley Therones, Cheltenham: UK.

3. Thankamma Jacob, *Foods, Drugs and Cosmetics - A ConsumerGuide*, (1997) Macmillan : London.
4. ShankuntalaManay, N.; Shadaksharaswamy, M. *Food Facts andPrinciples*, 3rd ed. (2008); New Age Publication.
5. Neeraj Pandey, Khushdeep Dharni, *Intellectual Property Rights*, (2014), PHILearning.

Website and e-learning source

1. http://www.sciencecases.org/irradiation/irradiation_notes.asp
2. http://discovery.kcpc.usyd.edu.au//9.5.5/
3. https://www.wipo.int/about-ip/en/
4. 4.www.nptel.ac.in
5. http:/swayam.gov.in

Course Code 24UCHE53	PO1		PO2		PO3		PO4		PO5		PO6	PO7
	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	3	3	3	2	3	3	3	2	2	3	3	3
CO2	3	3	3	2	3	3	3	3	2	3	3	3
CO3	3	3	3	2	3	3	3	3	2	3	3	3
CO4	3	3	3	2	3	3	3	3	2	3	3	3
CO5	3	3	3	2	3	3	3	3	2	3	3	3

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

Dr.M.Dhanalakshmi
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Dr.A. Anitha
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B.Sc. CHEMISTRY
(2024-2025 onwards)

Semester V	**SOIL CHEMISTRY**	**Hours/week:4**	
Elective Course –Ii (DSEC)		**Credits:2**	
24UCHE54		**Internal 25**	**External 75**

COURSE OUTCOMES

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

CO1: recognize the soil and its formation. [K1]

CO2: classify the properties and reactions of soil. [K2]

CO3: describe the bio fertilizers and soil reclamation. [K2]

CO4: summarize the ion exchange reactions the factors affecting on soil pH. [K3]

CO5 : illustrate the soil contents and bio conservation of agricultural waste. [K3]

UNIT I

ORIGIN OF SOIL

Introduction- Definition of soil – formation of soil – Classification of soil –Soil profile- Soil taxonomy – Properties of soil- Terminology used in soil water status- soil temperature- soil minerals. (12 Hours)

UNIT II

COLLOIDAL PROPERTIES OF SOIL

Classification of soil colloids- Inorganic colloids- cation exchange- cation exchange capacity (CEC)- method of determination of CEC- anion exchange capacity (AEC)- other important properties of soil colloids – Electrical properties-Dispersion-Coagulation-Tyndal phenomenon –Brownian movement-Dialysis. (12 Hours)

UNIT III

SOIL REACTIONS

Soil pH- Soil acidity – Sources of acidity- soil alkalinity – buffering of soils- amending the soil- Inherent Factors Affecting Soil PH- reclamation of acid soil- Liming agents-Reclamation of alkaline soil. (12 Hours)

UNIT IV

BIO FERTILIZER

The efficient use of Bio fertilizers – integrated nutrient management biofertilizers – rhizobium, azospirillium, azotobacter – Blue green algae and azolla production and quality control of bio-fertilizers. Microbial interrelationship in soil – microbes in pert and disease management – Bio-conversion of agricultural wastes. (12 Hours)

UNIT V

DETERMINATION OF SOIL CONTENTS

Soil testing – Concept, objectives and basis – soil sampling, tools, collection processing, dispatch of soil Determination of Saturation Moisture Percentage - Determination of Nitrogen - Alkaline Permanganate Method- Determination of Phosphorous – Olsen's Method- Determination of Potassium and Sodium on Flame Photometer- Determination of Calcium & Magnesium by EDTA Titrimetric Method. (12 Hours)

TEXT BOOKS

1. Sharma, B.K.(2008). *Industrial Chemistry.* 1st Edition.Meerut: GOEL Publishing. House.
2. BagavathiSundari. K,(2006). *Applied Chemistry.* 1st Edition. Chennai: MJP Publishers.
3. Jaya Shree Ghosh, (2013). *Fundamental Concepts of Applied Chemistry.* 1st Edition. New Delhi: S.Chand& Company Ltd.
4. Firman,E. (1964). *Chemistry of the Soil.* 2nd Edition. New Delhi: Oxford & IBH Publishing Co.
5. SreeRamulu,U.S. (1979). *Chemistry of Insecticides and Fungicides.*1st Edition. New Delhi: Oxford & IBH Publishing Co.

REFERENCE BOOKS

1. Small scale Industries manual from District Industrial centre. (DIC)
2. Thankamma Jacob. (1979). *A Text Book of Applied Chemistry for Home Science and Allied Sciences.* 1st Edition. New Delhi: The Macmillan Company of India Ltd.
3. Jain, P.C. & Monika Jain, (2013). *Engineering Chemistry.*1st Edition. New Delhi: Dhanpat Rai Publishing Company Pvt. Ltd.

Course Code 24UCHE54	PO1		PO2		PO3		PO4		PO5		PO6	PO7
	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	3	3	3	2	3	3	3	2	2	3	3	3
CO2	3	3	3	2	3	3	3	3	2	3	3	3
CO3	3	3	3	2	3	3	3	3	2	3	3	3
CO4	3	3	3	2	3	3	3	3	2	3	3	3
CO5	3	3	3	2	3	3	3	3	2	3	3	3

Dr..M.Dhanalakshmi
Head of the Department

Dr. A. Anitha
Course Designer

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

B.Sc. CHEMISTRY
(2024-2025 onwards)

Semester V	**PROJECT**	Hours/Week: 1
Core Course-12		Credits: 1
Course Code **24UCHC54PR**		Internal 100 Marks

COURSE OUTCOMES

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

CO1: relate the technical skills in handling the equipment, apparatus and exhibit written communication skill acquired in related projects [K2]

CO2: explain the theoretical knowledge to synthesis and character study on the chemical compounds. [K3]

CO3: apply the learned concepts to select projects in Organic, Inorganic and Physical chemistry. [K3]

CO4: make use of analytical data to elucidate the structure of compounds. [K3]

CO5: plan the project to meet the challenges to fulfill the global needs and satisfy the greener environment. [K4]

Students are expected to select a Project in Organic, Inorganic, Physical Chemistry and Interdisciplinary fields. Two students can do one Project. Minimum pages for Project report should be 20 pages. Two typed copies of the report on the completed project will be submitted to the Controller of Examination through the Head of the department in the month of November during V semester .Evaluation will be done internally

Project Work & Report	-	60 Marks
Presentation & Viva –voce	–	40 Marks

Course code 24UCHC54PR	**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	3	3	2	2	3	1	2	2	3	2
CO 2	3	3	3	3	2	2	3	1	2	2	3	2
CO 3	3	3	3	3	2	2	3	2	2	2	3	2
CO 4	3	3	3	3	2	2	3	2	1	2	3	2
CO 5	3	3	3	3	2	2	3	2	1	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
(2024-2025 onwards)

Semester V	**INTERNSHIP**	**Hours/Week: -**
Internship / Industrial Training		**Credit: 1**
Course Code 24UCHI51		**Internal** 100

COURSE OUTCOMES

On completion of the Internship/Field Project, students will be able to

CO1: relate their theoretical insights with hands-on experience. [K2]

CO2: develop technical skills to their respective field of study. [K3]

CO3: demonstrate the attributes such as observational skills, team spirit and inter personal skills built through site visits. [K3]

CO4: exhibit the written communication skills acquired through internship/field project. [K3]

CO5: analyze the observations and results and communicate their academic and technological knowledge appropriately oralmeans. [K4]

Guidelines/ Regulations

- Each student must go for Internship training in a reputed Industry / Company / Organization/ Educational Institution.
- Students should produce the completion certificate after the completion of Internship period.
- A report of 10-15 pages must be submitted by each student after the completion of the Internship period.
- Internal Viva-voce examination will be conducted.
- Students with diverse disabilities must complete a 10 day internship programme at their preferred places.

Course Code 24UCHI51	PO1		PO2		PO3		PO4		PO5		PO6	PO7
	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	3	3	3	2	3	3	3	2	3	3	3	2
CO2	3	3	3	2	1	2	2	2	2	2	2	2
CO3	3	3	3	2	1	3	3	3	3	3	3	2
CO4	3	3	3	2	3	1	3	3	3	3	3	2
CO5	3	3	3	2	3	3	3	3	3	3	3	2

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

Dr.M.Dhanalakshmi
Head of the Department

Dr.M.Dhanalakshmi
Course Designer

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B.Sc. CHEMISTRY
(2024-2025 onwards)

Semester V	**LABORATORY PRACTICES AND SAFETY MEASURES**	Hours/Week: -
Extra credit Course-1		Credits: 2
Course Code **24UCHO51**		External 100

COURSE OUTCOMES

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

CO1: recognize the fundamental concepts in chemicals and the skills to be handled

CO2: summarize the chemical laws and concentration terms of chemicals

CO3: relate the chemicals and skills to be applied in different stages of reactions

CO4: categorize the chemicals and the solutions

CO5: appraise the methods of equivalent weight, problems dealing with the preparation of reagents.

UNIT I

Fundamental concepts

Symbol, formula, Valency, equation- Laws of Chemical combination kinds of chemical changes with examples. Equivalent weight of elements- methods of finding equivalent weights.

UNIT II

Laboratory hygiene and safety

Storage and handling of chemicals – carcinogenic chemicals Toxic and poisonous chemicals- safe limits of vapor concentrations- waste disposal- Fume disposal.

UNIT III

General precautions for avoiding accidents

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

UNIT IV

Principles of volumetric analysis

Standard solutions- Primary and secondary standard- requirements of a primary standard- types of titrations- neutralization- redox, precipitation- choice of indicators in acid – base titrations. Equivalent weight of acid , base and salt.

UNIT V

Laboratory chemicals and reagents

Different grades- commercial, LR, GR, AR, Chromatographic pure and spectral pure.

Problems involving units of concentration of solutions

Normality, molarity, molality, mole fraction, mass percentage and volume percentage- simple problems dealing with the preparation of reagents

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. Sathyanathan, Elements of Chemistry

REFERENCE BOOKS

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

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

Dr.M.Amutha — **Course Designer**

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B.Sc. CHEMISTRY
(2024-2025 onwards)

Semester VI	**ORGANIC CHEMISTRY - II**	Hours/Week: 6	
Core Course-13		Credits: 5	
Course Code **24UCHC61**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : identify the natural products, carbohydrates, molecular rearrangements, special reagents in organic synthesis and understand the principles of green chemistry [K1]

CO2 : classify carbohydrates and natural products based on their structure, properties, and uses and discuss about green solvents, green reagents and catalysts. [K2]

CO3 : recognize the alkaloids and terpenoids in plants, importance of carbohydrates and choose special reagents and organometallics for synthesis. [K2]

CO4 : examine the structure of natural products and carbohydrates, mechanism of molecular rearrangements and greener tools like microwave and ultra-sound in chemical synthesis. [K3]

CO5 : ascertain the configuration of sugars, elucidate structures to meet up global needs and explore the benefit of the reagents and rearrangements in accomplishing a greener environment. [K3]

UNIT I

Alkaloids

Classification, isolation, general properties- Hofmann Exhaustive Methylation; Structure elucidation – Coniine, piperine, nicotine.

Terpenes: Classification, Isoprene rule, isolation and structural elucidation of Citral, alpha terpineol, Menthol, Geraniol and Camphor (18 hours)

UNIT II

Carbohydrates

Definition and Classification of Carbohydrates with examples. Relative configuration of sugars. Determination of configuration (Fischer's Proof). Definition of enantiomers, diastereomers, epimers and anomers with suitable examples.

Monosaccharides– configuration – D and L hexoses – aldohexoses and ketohexoses.

Glucose, Fructose – Occurrence, preparation, properties, reactions, structural elucidation, uses.

Interconversions of sugar series – ascending, descending, aldose to ketose and ketose to aldos

Disaccharides – sucrose, lactose, maltose - preparation, properties and uses (no structural elucidation).

Polysaccharides – Source, constituents and biological importance of homopolysaccharides- starch and cellulose, heteropolysaccharides – hyaluronic acid, heparin. (18 hours)

UNIT III

Molecular rearrangements:

Molecular Rearrangement: Type of rearrangements, Mechanism for Benzidine, Favorskii, Clasien, Fries, Hofmann, Curtius, Schmidt and Beckmann, Pinacol-pinacolone rearrangement (18 hours)

UNIT IV

Special reagents in organic synthesis

AIBN, 9BBN, BINAP/BINOL, BOC, DABCO, DCC, DIBAL, DMAP, NBS/NCS, NMP, PCC, TBHP, TEMPO

Organometallic compounds in Organic Synthesis

Preparation, Properties and applications:

Grignard Reagents, Organo Lithium Compounds, Ziegler – Natta, Wilkinson, Metal Carbonyl, Zeiss's Salt (18 hours)

UNIT V

Green Chemistry: Principles, chemistry behind each principle and applications in chemical synthesis. Green reaction media – green solvents, green reagents and catalysts; tools used like microwave and ultra-sound in chemical synthesis. (18 hours)

TEXT BOOKS

1.M.K.Jain, S. C.Sharma, Modern Organic Chemistry, Vishal Publishing, 4th reprint,2009.

2.S.M. Mukherji, and S.P. Singh, Reaction Mechanism in Organic Chemistry, Macmillan India Ltd., 3rd edition,2009

3.Arun Bahl and B.S. Bahl, Advanced organic chemistry, New Delhi, S.Chand& Company Pvt. Ltd., Multicolour edition,2012.

4. P. L.Soni and H. M. Chawla, Text Book of Organic Chemistry, Sultan Chand & Sons, New Delhi, 29th edition, 2007.

5. C Bandyopadhya; An Insight into Green Chemistry; Published on 2020

REFERENCE BOOKS

1. R. T. Morrison and R. N. Boyd, Organic Chemistry, PearsonEducation, Asia,6th edition, 2012.
2. T.W.Graham Solomons, Organic Chemistry, John Wiley &Sons,11th edition, 2012.
3. A. Carey Francis, Organic Chemistry, Tata McGraw-HillEducation Pvt. Ltd., New Delhi,7th edition,2009.
4. I. L. Finar, Organic Chemistry, Vol. (1& 2), England, WesleyLongman Ltd, 6th edition, 2006.
5. J. A. Joule, and G. F. Smith, Heterocyclic Chemistry, Wiley, 5th Edition, 2010.

Course Code 24UCHC61	**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
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R.Nagasathya
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B.Sc. CHEMISTRY
(2024-2025 onwards)

Semester VI	**INORGANIC CHEMISTRY - II**	Hours/Week: 6	
Core Course-14		Credits: 5	
Course Code **24UCHC62**		Internal 25	External 75

COURSE OUTCOME

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

CO1 **:** explain the concept of essential trace elements, metalion storage, and transport, metallo enzymes, silicate and explosives. [K1]

CO2 **:** discuss the biological role of metal ions, porphyrins, carboxy peptidase, properties of silicate and paints. [K2]

CO3 **:** describe the toxicity of meta lions, hemoglobin, oxygen transport, Vitamin B12, Pyrosilicates and constituents of paints. [K2]

CO4 **:** illustrate Bohr effect, Zinc metallo enzymes, ring silicates and enamels. [K3]

CO5 **:** assess the effect of trace elements, sodium and potassium pump, biological functions of nitrogenase enzyme, zeolites and synthesis of nanocomposite Hydrogels. [K3]

UNIT I

Bioinorganic Chemistry

Essential and trace elements: Role of Na^+, K^+, Mg^{2+}, Ca^{2+}, Fe^{3+}, Cu^{2+} and Zn^{2+} in biological systems. Effect of excess intake (Toxicity) of Metal ions – trace elements - As, Cd, Pb, Hg. (18 Hours)

UNIT II

Metal ion transport and storage

Iron – storage, transport - Transferrin and Ferretin; Iron-porphyrins – myoglobin, haemoglobin – oxygen transport - Bohr effect; Sodium/potassium pump, calcium pump; transport and storage – copper and zinc. (18 Hours)

UNIT III

Metallo enzymes

Isomerase and synthetases, structure of cyanocobalamin (Vitamin B12), nature of Co-C bond; Metalloenzymes - functions of carboxy peptidase A, zinc metalloenzyme – mechanism and uses, Zn-Cu enzyme - structure and function, carbonic anhydrase, Vitamin B-12 as transferase and isomerase - Iron-sulphur proteins - 2Fe-2S – rubredoxin, 4Fe-2S – ferridoxin, Iron sulphur cluster enzymes. Invivo and Invitro nitrogen fixation – biological functions of nitrogenase and molybdo enzymes. (18 Hours)

UNIT IV

Silicates

Introduction – general properties of silicates, structure – types of silicates – ortho silicates(zircon), pyrosilicates (thortveitite), chain silicates(pyroxenes), ring silicates(beryl), sheet silicates(talc, mica, asbestos), silicates having three dimensional structure (feldspars, zeolites, ultramarines) (18 Hours)

UNIT V

Industrial Applications of Inorganic Compounds

Refractories, pyrochemical, explosives. Alloys, Paints and pigments - requirements of a good paint; classification, constituents of paints – pigments, vehicles, thinners, driers, extenders, anti-knocking agents, anti-skinning agents, plasticizers, binders-application; varnishes- oils, spirit; enamels.

Nanocomposite Hydrogels: synthesis, characterization and uses.

Industrial visits and internship mandatory. (18 Hours)

TEXT BOOKS

1. Puri B R, Sharma L R, Kalia K C (2011), Principles of InorganicChemistry, 31th ed., Milestone Publishers & Distributors, Delhi.
2. Satya Prakash, Tuli G. D., Basu S. K., Madan R. D. (2009), AdvancdInorganic Chemistry, 18th Edition, S. Chand & Co., New Delhi
3. Lee J D, (1991), Concise Inorganic Chemistry, 4th ed., ELBS WilliamHeinemann, London.
4. W V Malik, G D Tuli, R D Madan, (2000), Selected Topics inInorganic Chemistry, Schand and Company Ltd.
5. A. K. De, Text book of Inorganic Chemistry, Wiley East Ltd, seventhedition, 1992

REFERENCE BOOKS

1. Madan R D, Sathya Prakash, (2003), Modern Inorganic Chemistry,2nded., S.Chand and Company, New Delhi.
2. Gopalan R, (2009) Inorganic Chemistry for Undergraduates, IstEdition, University Press (India) Private Limited, Hyderabad
3. Sivasankar B, (2013) Inorganic Chemistry. Ist Edition, Pearson,Chennai
4. Alan G. Sharp (1992), Inorganic Chemistry, 3rd Edition, Addition-Wesley, England
5. Peter Atkins, Tina Overton, Jonathan Rourke and Mark Weller, Inorganic Chemistry, Oxford University Press, sixth edition, 2014.

Course Code	**PO1**		**PO2**		**PO3**		**PO4**		**PO5**		**PO6**	**PO7**
24UCHC62	**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.Dhanalakshmi
Course Designer

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B.Sc. CHEMISTRY
(2024-2025 onwards)

Semester VI	**PHYSICAL CHEMISTRY-II**	**Hours/week:5**	
Core Course-15		**Credits:5**	
24UCHC63		**Internal**	**External**
		25	**75**

COURSE OUTCOMES

On completion of the course, students will be able to

CO1: understand the basic principles of phase diagram for one component and two component systems, chemical equilibrium in dissociation of PCl_5, N_2O_4 and formation of HI, NH_3, SO_3 and decomposition of calcium carbonate, distillation method for the separation of binary liquid mixtures such as azeotropic mixtures, Arrhenius theory, Debye-Huckel theory, Onsager equation. [K1]

CO2:explain the concepts of properties of freezing mixture, component with congruent melting points and solid solutions, Lechatelier principle, van't Hoff reaction isotherm and Clausius-Clayperon equation, partially miscible mixtures and immiscible liquids, Kohlrausch's law in conductance and potentiometric titrations. [K2]

CO3: apply the concepts of simple eutectic and freezing mixtures, equilibrium constant and degree of dissociation, effect of impurities on critical solution temperature, Ionic mobility, degree of dissociation of weak electrolyte and Nernst equation for electrode potential and cell EMF. [K2]

CO4: evaluate compound formation with- congruent melting points, temperature dependence of equilibrium constant, van't Hoff reaction isochore, binary liquid mixtures, ionicproductofwater,solubilityandsolubilityproductofsparinglysolublesalts and applications of emf measurements. [K3]

CO5: predict phase rule, Nernst distribution law, electrical conductance and transference, applications of galvanic cells and industrial component.[K3]

UNIT I

Phase rule

Definition of terms; derivation of phase rule; application to one component systems – water and

sulphur- super cooling, sublimation; two component systems – solid liquid equilibria- simple eutectic (lead -silverandbismuth-cadmium),freezing mixtures (potassiumiodide-water), compound formation with- congruent melting points(magnesium–zinc and ferric chloride–water system), peritectic change(sodium–potassium), solid solution(gold-silver); copper sulphate–water system. (15 hours)

UNIT II

Chemical equilibrium

Law of mass action – thermodynamic derivation – relationship between K_p and K_c –application to the homogeneous equilibria – dissociation of PCl_5 gas, N_2O_4gas –equilibrium constant and degree of dissociation –formation of HI, NH_3, and SO_3– heterogeneous equilibrium–decomposition of solid calcium carbonate –Lechatelier principle – van'tHoff reaction isotherm–temperature dependence of equilibrium constant –van'tHoff reaction isochore – Clayperonequation–Clausius Clayperon equation and its applications. (15 hours)

UNIT III

Binary liquid mixtures

Ideal liquid mixtures–non ideal solutions– azeotropic mixtures– fractional distillation–partially miscible mixtures–phenol-water, triethyl amine-water, nicotine-water–effect of impurities on critical solution temperature; immiscible liquids-steam distillation; Nernst distribution law–applications. (15 hours)

UNIT IV

Electrical Conductance and Transference

Arrhenius theory of electrolytic dissociation – Ostwald's dilution law, limitations of Arrhenius theory; behavior of strong electrolytes– interionic effects– Debye Huckel theory–Onsager equation (no derivation), significance of Onsager equation, Debye Falkenhagen effect, Wien effect. Ionic mobility – Discharge of ions on electrolysis (Hittorf'stheoretical device), transport number – determination – Hittorf's method, moving boundary method–factors affecting transport number–determinationofionicmobility;Kohlrausch'slaw-applications; molar ionic conductance and viscosity (Walden's rule); applications of conductance measurements– determination of-degree of dissociation of weak electrolyte, dissociation constant of weak acid and weak base, ionic product of water, solubility and solubility product of sparingly soluble salts- conductometric titrations–acid base titrations. (15 hours)

UNIT V

Galvanic Cells and Applications

Galvanic cell, representation, reversible and irreversible cells, EMF and its measurement – standard

cell; relationship between electrical energy and chemical energy; sign of EMF and spontaneity of a reaction, Thermodynamics and EMF– calculation of ΔG, ΔH, and ΔS from EMF data; reversible electrodes, electrode potential, standard electrode potential, primary and secondary reference electrodes, Nernst equation for electrode potential and cell EMF; types of electrodes – metal/metal ion, metal amalgam/metal ion, metal, insoluble salt/anion, gas electrode ,redox electrode; electrochemical series–applications of electro chemical series. Chemical cells with and without transport, concentration cells with and without transport;

Applications of EMF measurements

Applications of EMF measurements – determination of activity coefficient of electrolytes, transport number, valency of ions, solubility product, pH using hydrogen gas electrode, quinhydrone electrode and glass electrode, potentiometric titrations–acid base titrations, redox titrations, precipitation titrations, ionic product of water and degree of hydrolysis; redox indicators- use of diphenyl amine indicator in the titration of ferrous iron against dichromate.

Industrial component

Galvanic cells- lead storage, Ni-Cd, Li and Zn-air, Al-air batteries. Fuel cells–H_2-O_2cell–efficiency of fuel cells.corrosion– mechanism, types and methods of prevention. (15 hours)

TEXT BOOKS

1. B.R.Puri and L.R.Sharma, Principles of Physical Chemistry, (2021), Shoban Lal Nagin Chand and Co., forty eighth edition.
2. Peter Atkins, and Juliode Paula, James Keeler, Physical Chemistry, (2018), Oxford University press, International eleventh edition,.
3. Arun Bahl ,B.S. Bahl, G.D.Tuli, Essentials of physical chemistry, 28th edition (2019), S, Chand & Co.
4. S.K. Dogra and S. Dogra, Physical Chemistry through Problems: (1996), New Age International, fourth edition,.
5. J.Rajaram and J.C. Kuriacose, Thermodynamics, (1986), Shoban Lal Nagin Chand and CO.,.

REFERENCE BOOKS

1. K.L. Kapoor, A Text book of Physical Chemistry, (2009), Macmillan India Ltd ,third edition.
2. Gilbert. W. Castellen, Physical Chemistry, (1985), Narosa Publishing House, third edition,.
3. P.W. Atkins ,and Juliode Paula, Physical Chemistry, (2002), Oxford University press, seventh edition,.
4. B.R.Puri, L.R.Sharma and M.S.Pathania, Principles of Physical Chemistry, Shobanlal Nagin Chand and Co. (2001), Jalendhar, forty first, edition,

5. D.N. Bajpai, Advanced Physical Chemistry, (2001), S.Chand & Co.

Website and e-learning source

1. https://nptel.ac.inhttps://swayam.gov.in
2. https://archive.nptel.ac.in/content/storage2/courses/112108150/pdf/PPTs/MTS_07_m.pdf

Thermodynamics-NPTEL

3. https://www.youtube.com/watch?v=f0udxGcoztEIntroductiontochemicalequilibrium–MITopencourseware.

Course Code 24UCHC63	PO1		PO2		PO3		PO4		PO5		PO6	PO7
	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	3	3	3	2	3	3	3	2	3	3	3	2
CO2	3	3	3	2	1	2	2	2	2	2	2	2
CO3	3	3	3	2	1	3	3	3	3	3	3	2
CO4	3	3	3	2	3	1	3	3	3	3	3	2
CO5	3	3	3	2	3	3	3	3	3	3	3	2

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

Dr.M.Dhanalakshmi
Head of the Department

Dr. J. Kavitha
Course Designer

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

B.Sc. CHEMISTRY
(2024 -2025 onwards)

Semester VI	**PHYSICAL CHEMISTRY PRACTICAL – II**	**Hours/Week: 3**	
Core Course-16		**Credits: 2**	
CourseCode 24UCHC61P		**Internal 25**	**External 75**

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, phase diagrams and distribution laws for carrying out the practical work. [K3]

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

CO5 : Interpret the phase diagrams, distribution law and conductometric and potentiometric titrations [K3]

UNIT-I

Phase diagrams

1. Simple eutectic - determination of eutectic temperature and composition of naphthalene-diphenyl amine or naphthalene-diphenyl system.

2. Determination of transition temperature of a salt hydrate.

3. Determination of upper critical solution temperature of phenol – water system

4. Effect of an electrolyte on miscibility temperature of phenol – water system

5. Determination of concentration of sodium chloride using phenol- sodium chloride system

(15 Hours)

UNIT II

Distribution law

6. Determination of the distribution coefficient of iodine between carbon tetrachloride and water.

7. Determination of equilibrium constant of the reaction

$$I_2 + I \rightleftharpoons I_3$$

8. Determination of concentration of the given potassium iodide solution using the above equilibrium constant. (15 Hours)

UNIT III

Electrochemistry

9. Conductometric titration of hydrochloric acid against sodium hydroxide

10. Potentiometric titration of ferrous ion against potassium dichromate using quinhydrone electrode. (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 24UCHC41P	**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	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
Head of the Department

Dr.A.Prasanna
Course Designer

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B.Sc. CHEMISTRY
(2024-2025 onwards)

Semester VI	**FUNDAMENTALS OF SPECTROSCOPY**	**Hours/week:5**	
Elective Course – III (DSEC)		**Credits:5**	
24UCHE61		**Internal**	**External**
		25	**75**

COURSE OUTCOMES

On completion of the course, students will be able to

CO1: know the electrical and magnetic properties of materials and microwave spectroscopy, Ultraviolet and Visible spectroscopy, Infrared spectroscopy, Raman Spectroscopy, Nuclear magnetic resonance spectroscopy and Mass spectrometry. [K1]

CO2: understand the principles and instrumentation of microwave spectroscopy, Ultraviolet and Visible spectroscopy and Infrared spectroscopy. [K2]

CO3: explain the principles and instrumentation of Raman Spectroscopy, Nuclear magnetic resonance spectroscopy and Mass spectrometry. [K2]

CO4: apply the concepts of microwave spectroscopy, Ultraviolet and Visible spectroscopy and Infrared spectroscopy to analyse the chemical compounds. [K3]

CO5: apply the concepts of Raman Spectroscopy, Nuclear magnetic resonance spectroscopy and Mass spectrometry to analyse the chemical compounds. [K3]

UNIT I

Electrical and Magnetic properties of molecules

Dipole moment – polar and nonpolar molecules – polarisability of molecules. Application of dipole moments in the study of organic and inorganic molecules.

Magnetic permeability, volume susceptibility, mass susceptibility and molar susceptibility; diamagnetism, paramagnetism – determination of magnetic susceptibility using Guoy balance, ferromagnetism, anti ferromagnetism

Microwave spectroscopy

Rotation spectra - diatomic molecules (rigid rotator approximation)selection rules – determination of bond length, effect of isotopic substitution – instrumentation and applications (15 hours)

UNIT II

Ultraviolet and Visible spectroscopy

Electronic spectra of diatomic molecules (Born Oppenheimer approximation) - vibrational coarse structure – rotational fine structureof electronic vibration transitions – Frank Condon principle – dissociation in electronic transitions – BirgeSponer method of evaluation of dissociation energy – pre-dissociation transition - σ -σ *, π-π*, n-σ*, n-π* transitions.

Applications of UV-Woodward – Fieser rules as applied to conjugated dienes and α, β - unsaturated ketones. Elementary Problems.

Colorimetry - principle and applications (estimation of Fe^{3+}) (15 hours)

UNIT III

Infrared spectroscopy

Vibration spectra –diatomic molecules – harmonic oscillator and anharmonic oscillator; Vibration – rotation spectra – diatomic molecule as rigid rotator and anharmonic oscillator (Born-Oppenheimer approximation oscillator) - selection rules, vibrations of polyatomic molecules – stretching and bending vibrations – applications – determination of force constant, moment of inertia and internuclear distance – isotopic shift – application of IR spectra to simple organic and inorganic molecules – (group frequencies)

Raman Spectroscopy

Rayleigh scattering and Raman scattering of light – Raman shift – classical theory of Raman effect – quantum theory of Raman effect – Vibrational Raman spectrum – selection rules – mutual exclusion principle – instrumentation (block diagram) – applications. (15 hours)

UNIT IV

Nuclear magnetic resonance spectroscopy:

PMR – theory of PMR – instrumentation - number of signals – chemical shift – peak areas and proton counting – spin-spin coupling – applications. Problems related to shielding and deshielding of protons, chemical shifts of protons in hydrocarbons, and in simple monofunctional organic compounds; spin-spin splitting of neighbouring protons in vinyl and allyl systems. (15 hours)

UNIT V

Mass spectrometry

Principle – different kinds of ionisation – instrumentation – the mass spectrum – types of ions – determination of molecular formula- fragmentation and structural elucidation – McLafferty rearrangement; Retro Diels Alder reaction - illustrations with simple organic molecules. Solving structure elucidation problems using multiple spectroscopic data (NMR, MS, IR and UV-Vis).

(15 hours)

TEXT BOOKS

1. Gopalan, R.; Subramaniam, P. S.; Rengarajan, K. *Elements ofAnalytical Chemistry*; (2003) S Chand: New Delhi.
2. Usharani, S. *Analytical Chemistry*, 1st ed. (2002); Macmillan: India.
3. Banwell, C.N.; Mc Cash, E. M. *Fundamentals of MolecularSpectroscopy*, 4th ed. (2017); Tata McGraw Hill, New Delhi.
4. U.N.Dash, Analytical Chemistry Theory and Practice, (2005), Sultan Chand&Sons,2nd Ed.,
5. B.K.Sharma, Spectroscopy,22nd ed., (2011), Goel Publishing House.

REFERENCE BOOKS

1. Srivastava, A. K.; Jain, P. C. *Chemical Analysis an Instrumental Approach*, 3rd ed. (1997); S.Chand, New Delhi.
2. Robert D Braun. *Introduction to Instrumental Analysis*; (1987) Mc.Graw Hill: New York.
3. Skoog, D. A.; Crouch, S. R.; Holler, F.J.; West, D. M. *Fundamentals of Analytical Chemistry*, 9thed(2013).; Harcourt college Publishers: USA.
4. Madan, R. L.; Tuli, G. D. *Physical Chemistry*, 2nd ed. (2005); S.Chand: New Delhi.
5. Puri, B. R.; Sharma, L. R.; Pathania, M.S. *Principles of Physical Chemistry*, 43rd ed. (2008); Vishal Publishing: Delhi,.

Website and e-learning source

1. http://vallance.chem.ox.ac.uk/pdfs/SymmetryLectureNotes2004.pdf
   2.http://chemistry.rutgers.edu/undergrad/chem207/SymmetryGroupThe ory.html
2. www.epgpathshala.nic.in
3. www.nptel.ac.in
4. http:/swayam.gov.in

Course Code 24UCHE61	PO1		PO2		PO3		PO4		PO5		PO6	PO7
	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	3	3	3	2	3	3	3	2	2	3	3	3
CO2	3	3	3	2	3	3	3	3	2	3	3	3
CO3	3	3	3	2	3	3	3	3	2	3	3	3
CO4	3	3	3	2	3	3	3	3	2	3	3	3
CO5	3	3	3	2	3	3	3	3	2	3	3	3

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

Dr.M.Dhanalakshmi
Head of the Department

Dr. A. Anitha
Course Designer

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B.Sc. CHEMISTRY
(2024-2025 onwards)

Semester VI	**GREEN CHEMISTRY**	Hours/Week: 5	
Elective Course- III (DSEC)		Credits: 5	
Course Code **24UCHE62**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: understand the need and basic concepts in energy sources of green chemistry. [K1]

CO2: summarize the concept of utility of atoms in greener process and reactions. [K2]

CO3: prepare the greener composites using microwave irradiation in solvents and solvent less. [K2]

CO4: compare the green and classical reactions. [K3]

CO5: illustrate the chemical synthesis using green chemical technology [K3]

UNIT I

Introduction

Need for green chemistry-Goals of green chemistry-Twelve
principles of green chemistry Prevention of chemical accidents, designing greener processes, inherent safer design, principle of ISD - greener alternative to Bhopal Gas Tragedy (safer route to carbaryl) and Flixiborough accident (safer route to cyclohexanol) subdivision of ISD, minimization, simplification, substitution, moderation and limitation. Importance of green chemistry in- daily life, Industries and solving human health problems (four examples each). Real-time analysis for pollution prevention

(15 Hours)

UNIT II

Green metrics to assess greenness of a reaction

Environmental impact factor, atom economy and calculation of atom economy for substitution, elimination, rearrangement, addition
reactions-concept of selectivity- chemoselectivity, regioselectivity, enantioselectivity

and diastereoselectivity. Green solvents-supercritical fluids, water as a solvent for organic reactions, ionic liquids, solvent less reactions, solvents obtained from renewable sources.

Catalysis and green chemistry- comparison of heterogeneous and homogeneous catalysis, biocatalysis, asymmetric catalysis and photocatalysis.- Real-time analysis for pollution prevention (15 Hours)

UNIT III

Designing a green synthesis

Choice of starting materials, choice of reagents,choice of catalysts, choice of solvents Designing of environmentally safe marine antifoulant. Rightfit pigment: Synthetic azo pigments to replace toxic organic and inorganic pigments. An efficient, green synthesis of a compostable and widely applicable plastic (polylactic acid) made from corn. careful use of blocking/protecting groups. (15 Hours)

UNIT IV

Microwave technology

Theory of microwave heating-Comparison between conventional and microwave heating- microwave assisted reactions- in water-hydrolysis of benzyl chloride, benzamide, methyl benzoate and oxidation of toluene- in organic solvents- Fries rearrangement, Diels-Alder reaction and decarboxylation- solid state reactions-Deprotection, saponification and synthesis of nitriles from aldehydes. (15 Hours)

UNIT V

Sonochemical technology

Theory- Ultra sound assisted reactions-Esterification, saponification, substitution reactions, alkylation, oxidation, reduction, coupling, cannizzaro, Strecker and Reformatsky reactions. ultrasonic energy Selection of starting materials; avoidance of unnecessary derivatization . (15 Hours)

TEXT BOOK

1. Kumar.V.(2015).*AnIntroduction to Green Chemistry*. 1st Edition.Jalandhar: Vishal Publishing Co.
2. Green Chemistry Theory and Practical. P.T.Anatas and J.C. Warner
3. Green Chemistry V.K. Ahluwalia Narosa, New Delhi.
4. Real world cases in Green Chemistry M.C. Cann and M.E. Connelly

REFERENCE BOOK

1. Ahluvalia, V.K.&Kidwai.(2007).*New Trends in Green Chemistry*.2nd Edition. New Delhi: Anamaya Publishers.
2. Anastas, P. T., Warner, J. Green Chemistry: Theory and Practice; Oxford University Press: London, 1998.
3. Mukesh Doble, Anil Kumar Kruthiventi, in Green Chemistry and Engineering, 2007
4. V.K. Ahluwalia & M.R. Kidwai: New Trends in Green Chemistry, Anamalaya Publishers (2005).
5. P.T. Anastes & J.K. Warmer: Oxford Green Chemistry- Theory and Practical, University Press (1998).
6. A.S. Matlack: Introduction to Green Chemistry, Marcel Deckkar (2001).
7. M.C. Cann & M.E. Connely: Real-World cases in Green Chemistry, American Chemical Society, Washington (2000).
8. M.A. Ryan & M. Tinnesand, Introduction to Green Chemistry, American Chemical Society, Washington (2002).

Course Code 24UCHE62	**PO1**		**PO2**	**PO3**		**PO4**		**PO5**	**PO6**	**PO7**
	PSO 1a	**PSO 1b**	**PSO 2**	**PSO 3a**	**PSO 3b**	**PSO 4a**	**PSO 4b**	**PSO 5**	**PSO 6**	**PSO 7**
CO1	3	3	3	1	3	1	2	1	-	2
CO2	3	3	3	2	2	3	2	2	-	2
CO3	3	3	3	2	3	3	2	2	-	2
CO4	3	3	3	2	1	3	3	2	-	2
CO5	3	3	3	1	1	2	2	2	-	2

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
(2024-2025 onwards)

Semester VI	**NANOSCIENCE**	Hours/week:3	
Elective Course-IV		Credits:2	
24UCHE63		Internal 25	External 75

COURSE OUTCOMES

On completion of the course, students will be able to

CO1: know about introduction to nanoparticles/clusters and nanocomposites [K1]

CO2: understand the properties of nanomaterials [K2]

CO3: analyze the characterization of nanomaterials by different methods [K2]

CO4: outline the synthesis of carbon nanotubes, graphene, quantum dots, self-assembled particles [K3]

CO5: apply the nanomaterial as sensors [K3]

UNIT I

Introduction to nanoscience

Definition of terms – nanoscience, nanoparticles, clusters, quantum dots, nanostructures and nanocomposites. Electron behaviour in free space, bulk material and nanomaterials. Synthesis and stabilization of nanomaterialsTop down approach (physical methods), mechanical dispersion – ball milling, methods based on evaporation of a precursor-inert gas condensation, ion sputtering, spray pyrolysis, aerosol synthesis-nanolithography. Bottom–up approach (chemical methods) - solvothermal synthesis, photochemical method, gamma radiolysis, sonochemical synthesis, electro deposition, sol-gel method, nanomaterials via chemical routes- solvents reducing agents, capping agents-stabilization of nanoparticles -electrostatic and steric stabilization, common stabilizers, nanoparticle growth in solution, templated growth, Langmuir – Blodgett (L-B) method, reverse micelles- emulsion method. (9 Hours)

UNIT II

Properties of materials on a nanoscale

Optical properties of metal and semiconductor nanomaterials- surface Plasmon resonance (SPR), surface enhanced Raman spectra (SERS), quantum confinement effect, tuning of optical spectrum. Magnetic properties - Fe3O4 particle, supra magnetic properties, electronic properties, Chemical properties- chemical process on the surface of nanoparticles, catalysis, mechanical properties.

(9 Hours)

UNIT III

Techniques employed for characterisation of nanomaterials

Spectrocopy – UV-visible, Photoelectron spectroscopy – Electron microscopy – Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Scanning probe microscopy (SPM) – Atomic Force Microscopy (AFM), Scanning Tunneling Microscopy (STM), Optical microscopy – confocal microscopy, X-ray diffraction (XRD) [Principle and Block diagram only].

(9 Hours)

UNIT IV

Special nanomaterials Carbon Nano Structures Carbon nanotubes: Introduction - types - zigzag, armchair, helical, synthesis by CVD, Functionalization of Carbon Nanotubes, Reactivity of Carbon Nanotubes, Field emission, Fuel Cells, Display devices . Other Important Carbon based materials: Preparation and Characterization Fullerene, Graphene, properties, DLC and nanodiamonds and Applications Semiconductor nanoparticles: Quantum dots, synthesis – chemical synthesis using clusters, properties, porous silicon – electrochemical etching, aerogel – types – silica aerogel, resorcinol formaldehyde (RF) aerogels, zeolites – applications. Self Assembled Nanomaterials: Self Assembled Monolayers (SAMS) – inorganic, organic molecules. (9 Hours)

UNIT V

Application of nanomaterials

Biomedical Applications- drug, drug delivery, biolabelling, artificial implants, cancer treatment. Sensors – Natural nanoscale sensors, chemical sensors, biosensors, electronic noses. Optics & Electronics – Nanomaterials in the next generation computer technology, high definition TV, flat panel displays, quantum dot laser, single electron transistors [SET]. Nanotechnology in agriculture – Fertilizer and pesticides nanomaterials for water purification, nanomaterials in food and packaging materials, fabric industry. Impacts of Nanotechnology – human & environmental safety risks. (9 Hours)

TEXT BOOKS

1. Sulabha K. Kulkarni, Nanotechnology: Principles and Practices, Capital Publishing Co., New Delhi.
2. Pradeep. T, Nano: The Essentials, Understanding Nanoscience and Nanotechnology; Tata McGraw-Hill Publishing Company Limited, NewDelhi, 2007.
3. Shah. M.A.; Tokeer Ahmad, Principles of Nanoscince and Nanotechnology; Narosa Publishing House, New Delhi, 2010.
4. Murthy. B.S; Shankar. P, Baldev Raj.; Rath. B.B. JamesMurday, Textbook of Nanoscience and Nanotechnology; Universities press, India Ltd ,Hyderabad. 2012.

REFERENCE BOOKS

1. Sharma. P.K., Understanding Nanotechnology; Vista International Publishing House, Delhi. 2008.
2. Charles P. Poole Jr.; Frank J. Owens. Introduction to Nanotechnology; A John Wiley & Sons, INC., Publication, 2003.
3. Viswanathan B., Nano Materials;Narosa Publishing House, New Delhi, 2009.
4. Edited by C.N.R. Rao; Mu¨ller.A; Cheetham. A.K.Nanomaterials Chemistry Recent Developments and New Directions, WILEY-VCH Verlag GMBH & Co.,KGaA, Darmstad.
5. Jing Zhong Zhang, Optical properties and spectroscopy of Nanomaterials; World Scientific Publishing Pvt. Ltd., Singapore. Website and e-learning source

1) http://www.nanotechnology.com/docs/wtd015798.pdf

2) http://nccr.iitm.ac.in/Nanomaterials.pdf

Course Code 24UCHE63	PO1		PO2		PO3		PO4		PO5		PO6	PO7
	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	3	3	3	2	3	3	2	2	3	3	3	2
CO2	3	3	3	2	2	2	2	2	2	2	2	2
CO3	3	3	2	2	3	3	1	3	3	3	2	2
CO4	3	3	3	2	3	1	3	2	1	3	3	2
CO5	3	3	3	2	3	3	3	2	3	1	3	2

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

Dr.M.Dhanalakshmi
Head of the Department

Dr.M.Amutha
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B.Sc. CHEMISTRY
(2024-2025 onwards)

Semester VI	**PHARMACEUTICAL CHEMISTRY**	**Hours/week:3**	
Elective Course-IV		**Credits:2**	
24UCHE64		**Internal**	**External**
		25	**75**

COURSE OUTCOMES

On completion of the course, students will be able to

CO1: Know the drugs design and drug metabolism [K1]

CO2: Understand the important Indian medicinal plants, common diseases and antibiotics [K2]

CO3 Illustrate drugs for major diseases like cancer, diabetes and AIDS [K2]

CO4: explain the analgesics and antipyretic agents [K3]

CO5: predict the significance of clinical tests [K3]

UNIT I

Introduction

Important terminologies – drug, pharmacognosy, pharmacy, pharmacology, pharmacodynamics, pharmacokinetics, clinical pharmacology, pharmacotherapeutics, chemotherapy, toxicology, pharmacophore, antimetabolites, mutation, bacteria, virus, fungi, actinomycetes, vaccines, pharmacopeia, posology and therapeutic index. Sources of drugs – dosage forms – bio availability – routes of administration – absorption, distribution and elimination of drugs – drug metabolism –prescription terms.

Structure and pharmacological activity

Effect of – unsaturation, chain length, isomerism; groups – halogens amino, nitro, nitrite, cyano, acidic, aldehydic, keto, hydroxyl and alkyl groups.

Development of Drugs

Development of a drug – classic steps- lead compounds- comparison of traditional and modern methods of development of drugs – drug design by method of variation – disjunction and conjunction methods. (9 Hours)

UNIT II

Indian medicinal plants

Some important Indian medicinal plants – tulsi, neem, kizhanelli, mango, semparuthi, adadodai, turmeric and thoothuvalai – uses.

Common diseases and their treatment

Causes, prevention and treatment of the following diseases: Insect borne diseases– malaria, filariasis, plague;Air borne diseases– diphtheria, whooping cough, influenza, measles, mumps, common cold, tuberculosis; Water borne diseases – cholera, typhoid , dysentery. Digestive system – jaundice; Respiratory system – asthma; Nervous system – epilepsy.

Antibiotics

Definition – classification – structure and therapeutic uses of chloramphenicol, penicillins , structure activity relationship of chloramphenicol ; therapeutic uses of ampicillin, streptomycin, erythromycin, tetracycline, rifamycin. (9 Hours)

UNIT III

Drugs for major diseases

Cancer – common causes – chemotherapy – anti neoplastic agents - classification –adverse effects of cytotoxic agents ; alkylating agents – chlorambucil ; anti metabolites – methotrexate, fluouracil ; Vinca alkaloids – vincristine, vinblastine.Diabetes– types – management of diabetes – insulin ; oral hypoglycemic agents - sulphonyl ureas – chlorpropamide ; biguanides - metformin – thiazolidinediones .Cardiovascular drugs– cardio glycosides ; anti arrhythmic agents – quinidine, propranolol hydrochloride ; anti- hypertensive drugs - Aldomet, pentoliniumtartarate; vasodilator- tolazoline hydrochloride, sodium nitroprusside.AIDS – causes, symptoms and prevention – anti HIV drugs - AZT, DDC. (9 Hours)

UNIT IV

Analgesics and antipyretic agents

Classification – action of analgesics – narcotic analgesics –morphine; synthetic analgesics – pethidine, methadone; antipyretic analgesics – salicylic acid derivatives, indolyl derivatives, p-aminophenol derivatives. **Anaesthetics**

Definition, characteristics, classification - general anaesthetics – volatile anaesthetics – nitrous oxide, ethers, cyclopropane, chloroform, halothane, trichloro ethylene– storage, advantages and disadvantages ; non volatileanaesthetics – thiopental sodium ; local anaesthetics – requisites – advantages- esters – cocaine, benzocaine ; amides – lignocaine, cinchocaine.

Blood and haemotological agents

Blood– composition, grouping – physiological functions of plasma proteins – mechanism of clotting; Coagulants – vitamin K, protamine sulphate, dry thrombin; Anti coagulants – coumarins, citric acid and heparin; antifibrinolytic agents – aminocaproic acid and tranexamic acid. Anaemia– causes, types and control – anti anaemic drugs. (9 Hours)

UNIT V

Clinical Chemistry

Blood tests – blood count – complete haemotogram – Hb, RBC, GTT, TC, DC, platelets, PCV, ESR; bleeding and clotting time –- glucose tolerance test. Significance of Clinical Tests Serum electrolytes - blood Glucose - orthotoluidine method; Renal functions tests - blood urea, creatinine; liver function tests – serum proteins, albumin globulin ratio, serum bilirubin, enzymes SGOT, SGPT; lipid profile – cholesterol, triglycerides, HDL, LDL, coronary risk index. Urine examination – pH, tests for glucose, albumin and bile pigment. (9 Hours)

TEXT BOOKS

1. Jayashree Ghosh, (1999), A text book of pharmaceutical chemistry, 2 nd ed., S.Chand& company, New Delhi.

2. Lakshmi S, (2004), Pharmaceutical chemistry, 3rd ed., Sultan chand& sons, Delhi.

3. Tripathi K D, (2018), Essentials of medical pharmacology, 8th ed., Jaypee brothers medical publishers (P) Limited, New Delhi.

4. Ashutosh Kar, (2018), Medicinal chemistry, 7th ed., New age international (P) Limited, Publishers, New Delhi.

REFERENCE BOOKS

1. Chatwal G R, (2013), Pharmaceutical chemistry, inorganic (vol-I) 6 thed ., Himalaya publishing house, Bombay.

2. Chatwal G R, (1991), Pharmaceutical chemistry, organic (vol-II)., Himalaya publishing house, Bombay.

3. Patrick G, (2002), Instant Notes Medicinal Chemistry, Viva Books Private Limited, New Delhi.

4. Intellectual Property Rights, NeerajPandey, Khushdeep Dharni.

Publisher: PHI Learning Pvt. Ltd., 2014 ISBN: 812034989X, 9788120349896.

Website and e-learning source

1.http://www.pharmacy.umaryland.edu/faculty/amackere/courses/phar5

31_delete/lectures/qsar_1.pdf

2. http://www.indianmedicinalplants.info/

3. https://www.wipo.int/about-ip/en/

Course Code 24UCHE64	**PO1**		**PO2**		**PO3**		**PO4**		**PO5**		**PO6**	**PO7**
	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	3	3	3	2	3	3	2	2	3	3	3	2
CO2	3	3	3	3	1	2	2	2	2	2	2	2
CO3	3	2	2	2	1	3	3	3	3	3	2	2
CO4	3	3	3	3	3	1	3	2	3	3	3	2
CO5	3	2	3	2	3	3	3	2	3	1	3	2

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

Dr.M.Dhanalakshmi
Head of the Department

Dr.M.Amutha
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B.Sc. CHEMISTRY
(2024-2025 onwards)

Semester VI	**QUANTITATIVE ANALYSIS OF ORGANIC AND INORGANIC COMPOUNDS PRACTICAL**	**Hours/week:2**	
SEC-7		**Credits:2**	
24UCHS61P		**Internal 40**	**External 60**

COURSE OUTCOMES

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

CO1: learn the principle of organic estimation. [K2]

CO2: determine the procedure for estimation of organic compounds. [K2]

CO3: estimate the accurate analytical procedure of estimation of lactose and glucose. [K3]

CO4: appreciates the importance of estimation of glycine, phenol, aniline and ethyl methyl ketone. [K3]

CO5: validate the strength and amount of of glycine, phenol, aniline, ethyl methyl ketone, glucose, lactose and formalin. [K3]

I. Estimation of Organic Compounds
   (i) Estimation of Phenol
   (ii) Estimation of Aniline
   (iii) Estimation of Glycine
   (iv) Estimation of Glucose
   (v) Estimation of Formalin
   (vi) Estimation of Ethyl methyl ketone (iodimetry)
   (vii) Estimation of Acetone
   (viii) Estimation of Lactose

II. Gravimetric Estimation of Lead/Barium as Chromate (Demo only)

TEXT BOOKS

1. Donald L Pavia, Gary M. Lampman, George and S Kritz, (2009).Organic Chemistry – A Lab Manual New Delhi: Sengage Learning. Print.
2. N.S. Gnanpragasam and G. Ramamurthy, Organic Chemistry Lab Manual, S. Viswanathan Pvt. Ltd

REFERENCE BOOKS

1. Venkateswaran, V.; Veeraswamy, R.; Kulandaivelu, A.R. Basic Principles of Practical Chemistry, 2nd ed. (2012); Sultan Chand: New Delhi.
2. Manna, A.K. Practical Organic Chemistry, (2018),Books and Allied: India.
3. Gurtu, J. N; Kapoor, R. Advanced Experimental Chemistry (Organic), (1987),Sultan Chand: New Delhi.
4. Furniss,B. S.; Hannaford, A. J.; Smith, P. W. G.; Tatchell, A.R. Vogel's Textbook of Practical Organic Chemistry, 5th ed. (1989); Pearson: India.

Web Resources:

https://www.vlab.co.in/broad-area-chemical-sciences

Course Code 24UCHS61P	PO1		PO2		PO3		PO4		PO5		PO6	PO7
	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	3	3	3	2	3	3	3	2	3	3	3	2
CO2	3	3	3	2	1	2	2	2	2	2	2	2
CO3	3	3	3	2	1	3	3	3	3	3	3	2
CO4	3	3	3	2	3	1	3	3	3	3	3	2
CO5	3	3	3	2	3	3	3	3	3	3	3	2

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

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