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)

(2023-2024 onwards)

UG PROGRAMMES

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

Financial Literacy-I Financial Literacy -II	23UCON12 23UCON21	I II	Commerce (SF)
Self-Employment and Startup Business Fundamentals of Marketing	23UCCN11 23UCCN21	I II	Commerce CA (SF)
Women Protection Laws	23UCPN11	I	Commerce (Professional Accounting)
Basic Labour Laws	23UCPN21	II	
Basics of Event Management	23UBAN11	I	Business Administration
Business Management	23UBAN21	II	
Quantitative Aptitude I	23UMTN11	I	Mathematics
Quantitative Aptitude II	23UMTN21	II	
Physics for Everyday life -I	23UPHN11	I	Physics
Physics for Everyday life -II	23UPHN21	II	
Food Chemistry	23UCHN11	I	Chemistry
Drugs and Natural Products	23UCHN21	II	
Ornamental fish farming and Management	23UZYN11	I	Zoology
Biocomposting for Entrepreneurship	23UZYN21	II	
Foundations of Baking and Confectionery	23UHSN11	I	Home Science – Nutrition and Dietetics
Basic Nutrition and Dietetics	23UHSN21	II	
Nutrition and Health	23UBCN11	I	Biochemistry
Life Style Diseases	23UBCN21	II	
Social and Preventive Medicine	23UMBN11	I	Microbiology
Nutrition & Health Hygiene	23UMBN21	II	
Herbal Medicine	23UBON11	I	Biotechnology
Organic farming and Health Management	23UBON21	II	
Basics of Fashion	23UCFN11	I	Costume Design And Fashion
Interior Designing	23UCFN21	II	
Office Automation	23UCSN11	I	Computer Science
Introduction to Internet and HTML 5	23UCSN21	II	
Office Automation	23UITN11	I	Information Technology
Introduction to HTML	23UITN21	II	
Introduction to HTML	23UCAN11	I	Computer Applications
Fundamentals of Computers	23UCAN21	II	
Introduction to HTML	23UGDN11	I	Computer Applications - Graphic Design
Fundamentals of Computers	23UGDN21	II	
Organic Farming	23UBYN11	I	Botany
Nursery and Landscaping	23UBYN12		
Mushroom Cultivation	23UBYN21	II	
Medicinal Botany	23UBYN22		
Cadet Corps for Career Development I	23UNCN11	I	National Cadet Corps
Cadet Corps for Career Development II	23UNCN21	II	

B. OUTCOME BASED EDUCATION (OBE) FRAMEWORK

The core philosophy of Outcome Based Education rests in employing a student - centric learning approach to measure the performance of students based on a set of pre-determined

outcomes. The significant advantage of OBE is that it enables a revamp of the curriculum based on the learning outcomes, upgrade of academic resources, quality enhancement in research and integration of technology in the teaching –learning process. It also helps in bringing clarity among students as to what is expected of them after completion of the Programme in general and the Course in particular. The OBE directs the teachers to channelize their teaching methodologies and evaluation strategies to attain the PEOs and fulfill the Vision and Mission of the Institution.

Vision of the Institution

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

Mission of the Institution

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

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

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

Vision of the Department of Chemistry

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

Mission of the Department of Chemistry

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

B.1.1 Programme Educational Objectives (PEOs)

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

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

The students will be able to

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

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

B.1.2 Programme Outcomes (POs)

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

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

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

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

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

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

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

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

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

B.1.3 Programme Specific Outcomes (PSOs)

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

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

PO1-*Disciplinary Knowledge*

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

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

PO2-*Communication Skills*

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

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

PO3 -*Scientific Reasoning and Problem Solving*

PSO 3.a: Identify chemical formulae and analyse food, water and oil samples qualitatively and quantitatively by adapting updated skills in using modern tools and techniques for research activities..

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

PO4 -*Critical thinking and Analytical Reasoning*

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

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

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

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

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

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

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

PO7- *Moral and Ethical awareness*

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

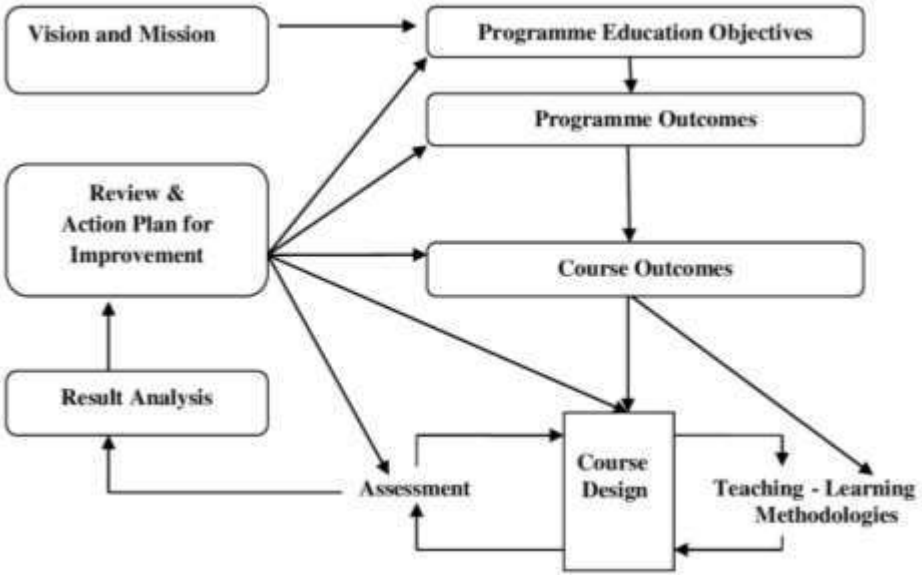
PO-PEO Mapping Matrix

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

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

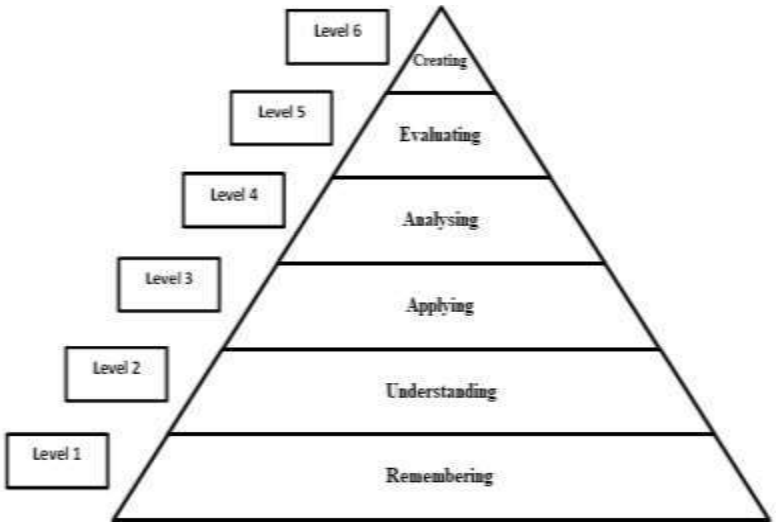
B.1.4 Course Outcomes (COs)

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



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

BLOOM'S TAXONOMY



CO – PO Mapping of Courses

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

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

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

ELIGIBILITY FOR ADMISSION

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

DURATION OF THE PROGRAMME

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

MEDIUM OF INSTRUCTION

English

COURSES OFFERED

Part I	:	Tamil/Hindi Course
Part II	:	English
Part III	:	Core Courses
		Elective Courses • 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.2.6 SELF STUDY COURSE

B.2.6.1 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.2.6 .2 PART IV - Practice for Competitive Examinations – Online

Assessment by Internal Examiner only

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

Subject wise Allotment of Marks

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

Distribution of Marks

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

Two Periodic Tests - Better of the two will be considered

B.2.7. Part V – Extension Activities

INTERNAL ASSESSMENT ONLY

Distribution of Marks

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

*The marks obtained will be calculated for 100 marks

B.2.8 EXTRA CREDIT COURSES (OPTIONAL)

2.8.1 Extra Credit Course offered by the Department.

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

Distribution of Marks

Mode of Evaluation		**Marks**
Quiz (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 for all the Courses.
  - ➢ Pass minimum for External Examination is 27 marks out of 75 marks for Core Courses, Elective Courses (Generic Elective, DSEC Courses)
  - ➢ Pass minimum for External Examination is 18 marks out of 50 marks for Skill Enhancement Courses and Non Major Elective Courses (NMEC).
  - ➢ The aggregate minimum pass percentage is 40.
  - ➢ Pass minimum for External Practical Examination is 21 marks out of 60 marks.

- **ATTENDANCE**

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

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

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

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

- ➢ 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 Programme Outcomes
	Co-curricular / Extracurricular activities 15%	For participation in Co-curricular / Extracurricular activities during the period of their study.

Programme Articulation Matrix (PAM)

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

Indirect Attainment of POs for all Courses

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

Attainments of POs for all Courses

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

Overall PO Attainment= 75% of Direct PO Attainment +
25% of Indirect PO Attainment (Graduate Exit Survey
& Participation in Co- curricular and
Extracurricular Activities)

Expected Level of Attainment for each of the Programme Outcomes

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

Level of PO attainment

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

B.3.3 Assessment Process for PEOs

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

Target for PEO Attainment

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

Attainment of PEOs

Assessment Criteria &Tool	Weightage
Record of Employment	10
Progression to Higher Education	20
Record of Entrepreneurship	10
Feedback from Alumnae	30
Feedback from Parents	10
Feedback from Employers	20
Total Attainment	**100**

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

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

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

Expected Level of Attainment for each of the Programme Educational Objectives

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

Level of PEO Attainment

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

C. PROCESS OF REDEFINING THE PROGRMME EDUCATIONAL OBJECTIVES

The college has always been involving the key stakeholders in collecting information and suggestions with regard to curriculum development and curriculum revision. Based on the information collected the objectives of the Programme are defined, refined and are inscribed in the form of PEOs. The level of attainment of PEOs defined earlier will be analyzed and will identify the need for redefining PEOs. Based on identified changes in terms of curriculum, regulations and PEOs, the administrative system like Board of Studies, Academic Council and Governing Body may recommend appropriate actions. As per the Outcome Based Education Framework implemented from the Academic Year 2020 -2021, the following are the Programme Structure, the Programme Contents and the Course Contents of B.Sc. Chemistry Programme.

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Quality Education with Wisdom and Values

BACHELOR OF SCIENCE CHEMISTRY (2017)

Outcome Based Education with Choice Based Credit System

Programme Structure - Allotment of Hours and Credits

For those who join in the Academic Year 2023-2024

Components	Semester						Total Number of Hours (Credits)
	I	II	III	IV	V	VI	
Part I : Tamil /Hindi	6 (3)	6 (3)	6 (3)	6 (3)	-	-	24 (12)
Part II : English	6 (3)	6(3)	6 (3)	6 (3)	-	-	24 (12)
Part III : Core Courses, Elective Courses & Self Study Course							
Core Course	5 (5)	5 (5)	5 (5)	4 (4)	6 (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 &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 (0)	1	-	-	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

Semester- V

S.No.	Components		Title of the Course	Course Code	Hours Per Week	Credits	Exam. Hours	Marks		
								Int.	Ext.	Total
1.	**Part III**	Core Course -9	Organic Chemistry–I	23UCHC51	6	6	3	25	75	100
2.		Core Course -10	Inorganic Chemistry-I	23UCHC52	6	6	3	25	75	100
3.		Core Course -11	Physical Chemistry-I	23UCHC53	6	5	3	25	75	100
4.		Elective Course – I (DSEC)	Biochemistry/Textile Chemistry	23UCHE51/ 23UCHE52	5	4	3	25	75	100
5.		Elective Course – II (DSEC)	Industrial Chemistry / Soil Chemistry	23UCHE53/ 23UCHE54	4	2	3	25	75	100
6.		Core Course -12	Project	23UCHC54PR	1	1	-	100	-	100
7.	**Part IV**		Value Education	23UGVE51	2	2	2	100	-	100
		Self study course	Practice for competitive examinations-online	23UGCE51	-	1	-	100	-	100
8.		Internship / Industrial Training	Internship	23UCHI51	-	1	-	100	-	100
				Total	**30**	**28**				**900**
	Extra Credit Course (Self Study Course)		Laboratory Practices and Safety Measures	23UCHO51	-	2	3	100	-	100

B.Sc. CHEMISTRY - Semester- VI

S.No.	Components		Title of the Course	Course Code	Hours Per Week	Credits	Exam. Hours	Marks		
								Int.	Ext.	Total
1.	**Part III**	Core Course -13	Organic Chemistry–II	23UCHC61	6	5	3	25	75	100
2.		Core Course -14	Inorganic Chemistry-II	23UCHC62	6	5	3	25	75	100
3.		Core Course -15	Physical Chemistry-II	23UCHC63	5	5	3	25	75	100
4.		Core Course -16	Physical Chemistry Practical II	23UCHC61P	3	2	5	40	60	100
5.		Elective Course – III (DSEC)	Fundamentals of Spectroscopy/Green Chemistry	23UCHE61/ 23UCHE62	5	5	3	25	75	100
6.		Elective Course – IV (DSEC)	Nanoscience / Pharmaceutical Chemistry	23UCHE63/ 23UCHE64	3	2	3	25	75	100
7.		Self study course	Discipline Specific quiz-online	23UCHQ61	-	1	-	100	-	100
8.	**Part IV**	SEC-7	Cosmetics and Personal Grooming	23UCHS61	2	2	2	25	75	100
9.		Extension Activity	Extension Activity		-	1	-	100	-	100
				Total	**30**	**28**				**900**

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For those who join in 2023-2024

Semester V	**ORGANIC CHEMISTRY - I**	Hours/Week: 6	
Core Course-9		Credits: 6	
Course Code **23UCHC51**		Internal 25	External 75

COURSE OUTCOME

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 Book

1. 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& Company Pvt. 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 23UCHC51	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.A.Prasanna

Course Designer

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For those who join in 2023-2024

Semester V	**INORGANIC CHEMISTRY - I**	Hours/Week: 6	
Core Course-10		Credits: 6	
Course Code **23UCHC52**		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 elements and Polymers. [K1]

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

CO3 : describe the Crystal field theory, properties of metal carbonyls, inner transition and 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 of 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 ofhardness 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 sulphurnitride), boron based polymers (borazine polymers) – industrial applications of inorganic polymers. **(18 Hours)**

Recommended Text

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 23UCHC52	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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(for those who join in 2023-2024)

Semester V	**PHYSICAL CHEMISTRY-I**	**Hours/week:6**	
Core Course-11		**Credits:5**	
23UCHC53		**Internal 25**	**External 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, chemicalpotentialofasystemofidealgases,Gibbs-

Duhem-Margulesequation – 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 reaction rates– Collision theory–derivation of rate constant of bimolecular gaseous 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)

UNIT III

Adsorption

Chemical and physical adsorption and their general characteristics- distinction between them Different types of isotherms –Freundlich and Langmuir. Adsorption isotherms and their limitations –BET theory, kinetics of enzyme catalysed reaction –Michaelis- Menten and 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 a catalyst – 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–rate law–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)

Recommended Text

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
5. edition,.
6. B.R.Puri, L.R.Sharma and M.S.Pathania, Principles of Physical Chemistry, (2001),
7. 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 23UCHC53	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
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VIRUDHUNAGAR
Quality Education with Wisdom and Values

B.Sc. CHEMISTRY

(For those who join in 2023-2024)

Semester V	**BIOCHEMISTRY**	**Hours/week:5**	
Elective Course-I		**Credits:4**	
23UCHE51		**Internal**	**External**
		25	**75**

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)

Recommended Text

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, VishalPublications: 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 23UCHE51	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)

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B.Sc. CHEMISTRY

(For those who join in 2023-2024 and after)

Semester V	**TEXTILE CHEMISTRY**	Hours/Week: 5	
Elective Course I (DSEC)		Credits: 4	
Course Code **23UCHE52**		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 syntheticfibres.

(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 23UCHE52	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		3	3

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

Semester V	**INDUSTRIAL CHEMISTRY**	**Hours/week:4**	
Elective Course –II (DSEC)		**Credits:2**	
23UCHE53		**Internal**	**External**
		25	**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, producergas, 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; testingand 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, boronnitride, 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)

Recommended Text

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.
5. 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:

i. 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 and Principles*, 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 23UCHE53	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)

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B.Sc. CHEMISTRY

(For those who join in 2023-2024)

Semester V	**SOIL CHEMISTRY**	**Hours/week:4**	
Elective Course –II (DSEC)		**Credits:2**	
23UCHE54		**Internal**	**External**
		25	**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. 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). *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 CompanyPvt.Ltd.

Course Code 23UCHE54	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

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B.Sc. CHEMISTRY

(For those who join in 2023-2024)

Semester V	**PROJECT**	Hours/Week: 1
Core Course-12		Credits: 1
Course Code **23UCHC54PR**		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. [K2]

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. [K3]

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	PO1		PO2		PO3		PO4		PO5		PO6	PO7
23UCHC54PR	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
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

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

B.Sc. CHEMISTRY

(For those who join in 2023-2024)

Semester V	**Internship**	Hours/Week: -
PART IV		Credit: 1
Course Code 23UCHI51		Internal 100

COURSE OUTCOMES

On completion of the Internship, 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. [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 23UCHI51	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	3	3	3	3	2
CO2	3	3	2	2	2	2	2
CO3	3	3	3	3	3	3	2
CO4	3	3	1	3	3	3	2
CO5	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

(For those who join in 2023-2024)

Semester V	**Laboratory Practices and Safety Measures**	Hours/Week: -
Extra credit Course-1		Credits: 2
Course Code **23UCHO51**		Internal 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

(For those who join in 2023-2024)

Semester VI	**ORGANIC CHEMISTRY - II**	Hours/Week: 6	
Core Course-13		Credits: 5	
Course Code **23UCHC61**		Internal 25	External 75

COURSE OUTCOME

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 aldose.

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)

Recommended Text

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 IndiaLtd., 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 23UCHC61	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

R.Nagasathya
Course Designer

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B.Sc. CHEMISTRY

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Semester VI	**INORGANIC CHEMISTRY - II**	Hours/Week: 6	
Core Course-14		Credits: 5	
Course Code **23UCHC62**		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)**

RecommendedText

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 23UCHC62	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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B.Sc. CHEMISTRY

(For those who join in 2023-2024)

Semester VI	**PHYSICAL CHEMISTRY-II**	**Hours/week:5**	
Core Course-15		**Credits:5**	
23UCHC63		**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 –silver and bismuth-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_4 gas –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–Clayperon equation–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; behaviour 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–determination of ionicmobility;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)

Recommended Text

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 23UCHC63	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

(For those who join in 2023 -2024)

Semester VI	**PHYSICAL CHEMISTRY PRACTICAL – II**	Hours/Week: 3	
Core Course-16		Credits: 2	
Course Code **23UCHC61P**		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, 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-
    a. 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 23UCHC61P	**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**
CO 1	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
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Dr.A.Prasanna
Course Designer

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B.Sc. CHEMISTRY

(For those who join in 2023-2024)

Semester VI	**FUNDAMENTALS OF SPECTROSCOPY**	**Hours/week:5**	
Elective Course – III (DSEC)		**Credits:5**	
23UCHE61		**Internal** 25	**External** 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)

Recommended Text

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*, 2nded. (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

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

Course Code 23UCHE61	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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VIRUDHUNAGAR
Quality Education with Wisdom and Values

B.Sc. CHEMISTRY

(For those who join in 2023-2024 and after)

Semester VI	**GREEN CHEMISTRY**	Hours/Week: 5	
Elective Course- III (DSEC)		Credits: 5	
Course Code **23UCHE62**		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 Hour

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.*2ndEdition. New Delhi: Anamaya Publishers.

Reference Books: -

1. Anastas, P. T., Warner, J. Green Chemistry: Theory and Practice; Oxford University Press: London, 1998.

2. Mukesh Doble, Anil Kumar Kruthiventi, in Green Chemistry and Engineering, 2007

3. V.K. Ahluwalia & M.R. Kidwai: New Trends in Green Chemistry, Anamalaya Publishers (2005).

4. P.T. Anastes & J.K. Warmer: Oxford Green Chemistry- Theory and Practical, University Press (1998).

5. A.S. Matlack: Introduction to Green Chemistry, Marcel Deckkar (2001).

6. M.C. Cann & M.E. Connely: Real-World cases in Green Chemistry, American Chemical Society, Washington (2000).

7. M.A. Ryan & M. Tinnesand, Introduction to Green Chemistry, American Chemical Society, Washington (2002).

Course Code 23UCHE62	**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
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Dr.M.Amutha
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VIRUDHUNAGAR
Quality Education with Wisdom and Values

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

Semester VI	**NANOSCIENCE**	Hours/week:3	
Elective Course-IV		Credits:2	
Course Code 23UCHE63		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. (9Hours)

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. (9Hours)

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]. (9Hours)

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. (9Hours)

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. (9Hours)

Recommended Text

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 Ïler.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 23UCHE63	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)

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

Semester VI	**PHARMACEUTICAL CHEMISTRY**	**Hours/week:3**	
Elective Course-IV		**Credits:2**	
Course Code 23UCHE64		**Internal** 25	**External** 75

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. (9Hours)

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.

(9Hours)

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, pentolinium tartarate; vasodilator- tolazoline hydrochloride, sodium nitroprusside.AIDS – causes, symptoms and prevention – anti HIV drugs - AZT, DDC. (9Hours)

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. (9Hours)

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. (9Hours)

Recommended Text

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 23UCHE64	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
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B.Sc. CHEMISTRY

For those who join in 2023-2024)

Semester VI	**COSMETICS AND PERSONAL GROOMING**	Hours/Week: 2	
SEC-7		Credits: 2	
Course Code **23UCHS61**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: know the composition of various cosmetic products. [K1]

CO2: understand the chemical aspects and applications of hair care, dental care and skincare products. [K1]

CO3: recognize the chemical aspects and applications of perfumes. [K2]

CO4: comprehend the methods of beauty treatments, their advantages and disadvantages. [K2]

CO5: realize the hazards of cosmetic products. [K3]

Unit I Skin care

Nutrition of the skin, skin care and cleansing of the skin; face powder – ingredients; creams and lotions – cleansing, moisturizing all purpose, shaving and sunscreen (formulation only); Gels – formulation and advantages; astringent and skin tonics – key ingredients, skin lightness, depilatories (6 Hours)

Unit II

Hair care

Shampoos – types – powder, cream, liquid, gel – ingredients; conditioner – types – ingredients Dental care -Tooth pastes – ingredients – mouth wash (6 Hours)

Unit III

Make up

Base – foundation – types – ingredients; lipstick, eyeliner, mascara, eye shadow, concealers, rouge

Classification - Natural – plant origin – parts of the plant used, chief constituents; animal origin – amber gries from whale, civetone from civet cat, musk from musk deer; synthetic – classification emphasizing characteristics –esters – alcohols – aldehydes – ketones (6 Hours)

Unit IV Perfumes

Classification - Natural – plant origin – parts of the plant used, chief constituents; animal origin – amber gries from whale, civetone from civet cat, musk from musk deer; synthetic – classification emphasizing characteristics –esters – alcohols – aldehydes – ketones

(6 Hours)

Unit V

Beauty treatments

Facials - types – advantages – disadvantages; face masks – types; bleach - types – advantages– disadvantages; shaping the brows; eyelash tinting; perming types; hair colouring and dyeing; permanent waving – hair straightening; wax –types – waxing; pedicure, manicure - advantages – disadvantages. (6 Hours)

TEXT BOOKS

1. Thankamma Jacob, *Foods, drugs and cosmetics* – A consumer guide,Macmillan publication, London. 1st edition, 1997

REFERENCE BOOKS

1. Wilkinson J B E and Moore R J, (1997) *Harry's cosmeticology*, 7th ed., Chemical Publishers, London.
2. George Howard, (1987) *Principles and practice of perfumes and cosmetics*, Stanley Therones, Chettenham

Course Code 23UCHS61	**PO1**		**PO2**		**PO3**		**PO4**		**PO5**		**PO6**	**PO7**
	PSO 1 a	**PSO 1 b**	**PSO 2a.**	**PSO 2a**	**PSO 3 a**	**PSO 3 b**	**PSO 4 a**	**PSO 4 b**	**PSO 5a**	**PSO 5.b**	**PSO 6**	**PSO 7**
CO 1	3	2	3	1	3	1	1	2	2	2	1	2
CO 2	3	3	3	1	3	2	2	2	2	2	1	2
CO 3	3	3	3	1	3	3	3	3	3	3	2	3
CO 4	3	3	2	1	2	3	1	2	2	2	2	3
CO 5	3	3	3	1	2	2	2	2	2	2	2	3

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