



V.V.VANNIAPERUMAL COLLEGE FOR WOMEN
(Belonging to Virudhunagar Hindu Nadars)
An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
Re-accredited with 'A' Grade (3rd Cycle) by NAAC
VIRUDHUNAGAR - 626 001

OUTCOME BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM

REGULATIONS AND SYLLABUS
(with effect from Academic Year 2020 - 2021)

V.V.Vanniaperumal College for Women, Virudhunagar, established in 1962, offers 20 UG Programmes, 14 PG Programmes, 6 M.Phil. 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 (TANSCHÉ) 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 and Computer Applications.

Commerce & Management : Commerce, Commerce (Computer Applications),
Commerce (Professional Accounting),
Business Administration.

PG PROGRAMMES

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

PRE-DOCTORAL PROGRAMMES (M.Phil.)

Arts & Humanities : History, English, Tamil
Physical & Life Sciences : Mathematics, Biochemistry
Commerce & Management : Commerce

OUTLINE OF CHOICE BASED CREDIT SYSTEM - UG

1. Core Courses
2. Discipline Specific Elective Courses (DSEC)
3. Allied Courses
4. Skill Enhancement Courses (SEC)
5. Non Major Elective Courses (NMEC)
6. Ability Enhancement Compulsory Courses (AECC)
7. Generic Elective Courses (GEC)
8. Internship / Field Project
9. Self Study Courses
10. Extra Credit Courses (optional)

List of Non Major Elective Courses (NMEC) Offered

UG PROGRAMMES

Name of the Course	Semester	Department
History of India upto A.D.1858	III	History(EM)
இந்திய வரலாறு கி.பி. 1858 வரை	III	History (TM)
Indian National Movement (A.D 1885-1947)	IV	History(EM)
இந்திய தேசிய இயக்கம் (கி.பி. 1885 – 1947)	IV	History(TM)
English for Professions I	III	English
English for Professions II	IV	
இக்கால நீதி இலக்கியம்	III	Tamil
உரைநடை இலக்கியம்	IV	
Basic Hindi – I	III	Hindi
Basic Hindi – II	IV	
Practical Banking	III	Commerce
Basic Accounting Principles	IV	
Business Management	III	Business Administration
Entrepreneurship	IV	
Quantitative Aptitude – I	III	Mathematics
Statistics and Operation Research	IV	
Physics in Everyday life	III	Physics
Fundamentals of Electronics	IV	
Industrial Chemistry	III	Chemistry
Drugs and Natural Products	IV	
Applied Zoology	III	Zoology
Animal Science	IV	
Basic Food Science	III	Home Science – Nutrition and Dietetics
Basic Nutrition and Dietetics	IV	
Women and Health	III	Biochemistry
Lifestyle associated disorders	IV	
Medical Lab Technology	III	Microbiology
Applied Microbiology	IV	
Infectious Diseases	III	Biotechnology
Organic Farming	IV	
Basics of Fashion	III	Costume Design And Fashion
Interior Designing	IV	
Introduction to Computers and Office Automation	III	Computer Science
Introduction to Internet and HTML 5	IV	
Spreadsheet	III	Information Technology
Introduction to HTML	IV	
Fundamentals of Computers	III	Computer Applications
Web Design with HTML	IV	
Horticulture – I	III	Botany
Horticulture – II	IV	
மருத்துவ தாவரவியல் - I	III	
மருத்துவ தாவரவியல் - II	IV	
Library and Information Science – I	III	Library Science
Library and Information Science - II	IV	

மேல்நிலை கல்வி வரை தமிழை முதன்மை பாடமாக எடுத்து படிக்காத மாணவிகள் கீழ்க்கண்ட பாடங்களை கட்டாயம் படிக்க வேண்டும்

1. அடிப்படைத் தமிழ் - எழுத்தறிதல்
2. அடிப்படைத் தமிழ் - மொழித்திறனறிதல்

List of Non Major Elective Courses (NMEC)

(2023-2024 onwards)

UG PROGRAMMES

Name of the Course	Semester	Department
History of India upto A.D.1858	III	History(EM)
இந்திய வரலாறு கி.பி. 1858 வரை	III	History (TM)
Indian National Movement (A.D 1885-1947)	IV	History(EM)
இந்திய தேசிய இயக்கம் (கி.பி. 1885 – 1947)	IV	History(TM)
English for Professions I	III	English
English for Professions II	IV	
இக்கால நீதி இலக்கியம்	III	Tamil
உரைநடை இலக்கியம்	IV	
Basic Hindi – I	III	Hindi
Basic Hindi – II	IV	
Fundamental Hindi – I	III	Hindi
Fundamental Hindi – II	IV	
Practical Banking	III	Commerce
Basic Accounting Principles	IV	
Financial Literacy I	III	
Financial Literacy II	IV	
Self-Employment And Start-Up Business	III	Commerce CA
Fundamentals Of Marketing	IV	
Women Protection Laws	III	Commerce (Professional Accounting)
Basic Labour Laws	IV	
Business Management	III	Business Administration
Entrepreneurship	IV	
Quantitative Aptitude I	III	Mathematics
Basic Statistics		
Quantitative Aptitude II		
Operations Research	IV	
Physics in Everyday life -I	III	Physics
Physics in Everyday life -II	IV	
Industrial Chemistry	III	Chemistry
Drugs and Natural Products	IV	
Applied Zoology	III	Zoology
Animal Science	IV	
Basic Food Science	III	Home Science – Nutrition and Dietetics
Basic Nutrition and Dietetics	IV	

Women and Health	III	Biochemistry
Lifestyle Associated Disorders	IV	
Medical Lab Technology	III	Microbiology
Applied Microbiology	IV	
Infectious Diseases	III	Biotechnology
Organic Farming	IV	
Basics of Fashion	III	Costume Design And Fashion
Interior Designing	IV	
Introduction to Computers and Office Automation	III	Computer Science
Introduction to Internet and HTML 5	IV	
MS Office	III	Information Technology
Introduction to HTML	IV	
Fundamentals of Computers	III	Computer Applications
Web Design with HTML	IV	
Horticulture – I	III	Botany
Horticulture – II	IV	
மருத்துவ தாவரவியல் - I	III	
மருத்துவ தாவரவியல் - II	IV	
Library and Information Science – I	III	Library Science
Library and Information Science – II	IV	
Cadet Corps for Career Development I	III	National Cadet Corps
Cadet Corps for Career Development II	IV	

மேல்நிலைக் கல்வி வரை தமிழை முதன்மைப் பாடமாக எடுத்துப் படிக்காத மாணவிகள் கீழ்க்கண்ட பாடங்களைக் கட்டாயம் படிக்க வேண்டும்

1. அடிப்படைத் தமிழ் - எழுத்தறிதல்
2. அடிப்படைத் தமிழ் - மொழித்திறனறிதல்

**List of Ability Enhancement Compulsory Courses (AECC) &
Generic Elective Courses (GEC) Offered**

ABILITY ENHANCEMENT COMPULSORY COURSES (AECC)

1. Value Education
2. Environmental Studies

GENERIC ELECTIVE COURSES 1

1. Human Rights
2. Women Studies

GENERIC ELECTIVE COURSES 2

1. Constitution of India
2. Modern Economics
3. Adolescent Psychology
4. Disaster Management

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 communicate proficiently and confidently with the ability to express original/complex ideas effectively in different situations. (*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 for the betterment of the society. (*Critical Thinking and Analytical Reasoning*)
- 5 use ICT in a variety of self-directed lifelong learning activities to face career challenges in the changing environment. (*Digital Literacy, Self - Directed and Lifelong Learning*)
- 6 self-manage and function efficiently as a member or a leader in diverse teams in a multicultural society for nation building. (*Co-operation/Team Work and Multicultural Competence*)
- 7 uphold the imbibed ethical and moral values in personal, professional and social life for sustainable environment. (*Moral and Ethical Awareness*)

B.1.3 Programme Specific Outcomes (PSOs)

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

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

PO1-Disciplinary Knowledge

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

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

PO2-Communication Skills

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

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

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 design experiments and thereby developing their analytical eriences.

PO5 -Digital Literacy, Self - directed and Lifelong learning

PSO 5: 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.

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.

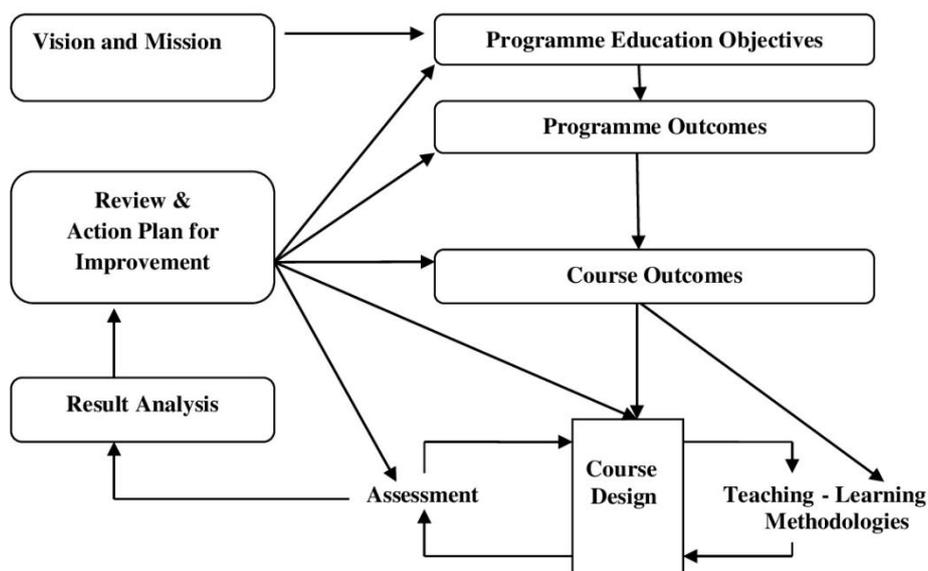
PO-PEO Mapping Matrix

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.

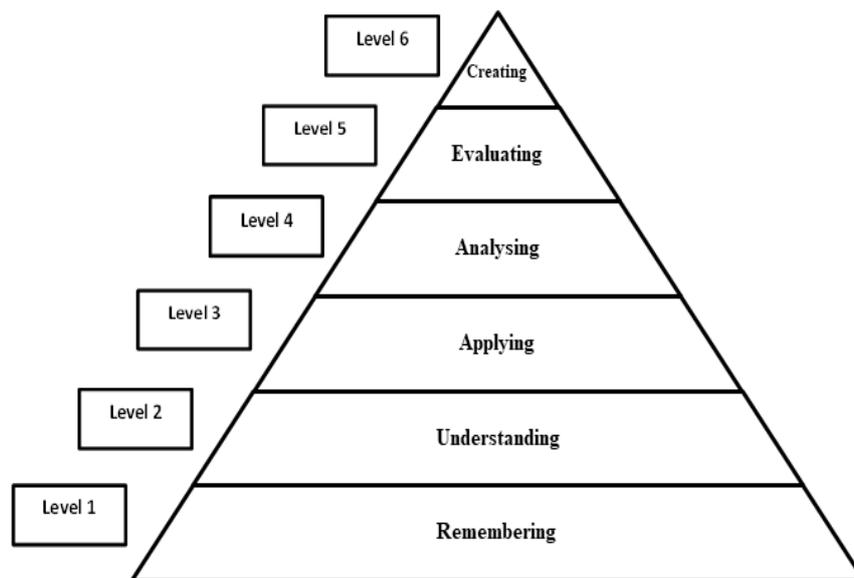
PEOs	PEO1	PEO2	PEO3
PO1/PSO1	✓	✓	✓
PO2/PSO2	✓	✓	✓
PO3/PSO3	✓	✓	✓
PO4/PSO4	✓	✓	-
PO5/PSO5	✓	-	✓
PO6/PSO6	✓	✓	✓
PO7/PSO7	✓	-	✓

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 to any 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, 2 and 1 respectively.

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

PO/PSOs	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/Alternate Course
Part II	:	English
Part III	:	Core Courses
	:	Allied Courses
	:	Elective Courses: Discipline Specific Elective Courses
	:	Self Study Course
Part IV	:	Skill Enhancement Courses (SEC)
	:	Field Project/Internship
	:	Non-Major Elective Courses (NMEC)
	:	Ability Enhancement Compulsory Courses (AECC)
	:	Generic Elective Courses (GEC)
Part V	:	Self Study Course
	:	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 and National Cadet Corps/ Rotaract club

B.2. EVALUATION SCHEME

B.2.1 PART II

Components	Internal Assessment Marks	External Examination Marks	Total Marks
Theory	15	75	100
Practical	5+5	-	

INTERNAL ASSESSMENT**Distribution of Marks**

Mode of Evaluation		Marks
Periodic Test	:	15
Practical	:	10
Total		25

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

B.2.1.1 PART II (II UG – 2023-2024 onwards)

Components	Internal Assessment Marks	External Examination Marks	Total Marks
Test	15	60	100
Practical	10	15	

INTERNAL ASSESSMENT**Distribution of Marks**

Mode of Evaluation		Marks
Periodic Test	:	15
Practical	:	10
Total		25

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

EXTERNAL ASSESSMENT**Distribution of Marks**

Mode of Evaluation		Marks
Theory	:	60
Practical	:	15
Total		75

B.2.1 PART I & PART III - Core Courses, Discipline Specific Elective Courses & Allied Courses

Components	Internal Assessment Marks	External Examination Marks	Total Marks
Theory	25	75	100
Practical	40	60	100
Project	100	----	100

INTERNAL ASSESSMENT

Distribution of Marks

Theory

Mode of Evaluation			Marks
Periodic Test		:	15
Assignment	Core:I UG-K4 Level, II & III UG – K5 Level	:	5
	Part I & Allied: K4 Level		
	DSEC:K5 Level		
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

Practical

Mode of Evaluation			Marks
Test		:	15
Model Examination			15
Performance		:	10
Total		:	40

Test- Average of the two will be considered

Model Examination - Better of the two will be considered

Performance - Attendance and Record

Question Pattern for Periodic Tests**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- 4)	Multiple Choice	4	4	1	4
B Q.No.(5- 7)	Internal Choice - Either Or Type	3	3	7	21
C Q.No.(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

EXTERNAL EXAMINATION**Question Pattern****Duration: 3 Hours**

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A Q. No.(1- 10)	Multiple Choice	10	10	1	10
B Q. No.(11 -15)	Internal Choice – Either Or Type	5	5	7	35
C Q. No.(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.2.2 SELF STUDY COURSE**Core Courses Quiz – Online**

Assessment by Internal Examiner only

- Question Bank is prepared by the Faculty Members of the Departments.
- 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		:	40
Model Examination		:	60
	Total	:	100

Two Periodic Tests - Better of the two will be considered

B.2.3 PART IV - Skill Enhancement Courses & Non Major Elective Courses**INTERNAL ASSESSMENT****Distribution of Marks****Theory**

Mode of Evaluation			Marks
Periodic Test		:	25
Assignment	SEC:K4 Level	:	10
	NMEC:K3 Level		
Quiz	K2 Level	:	5
Total		:	40

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

Two Assignments - Best of the two will be considered

Three Quiz Tests - Best of the three will be considered

Practical

Mode of Evaluation		Marks
Continuous Assessment	:	15
Model Examination	:	15
Performance	:	10
Total	:	40

Model Examination - Average of the best two will be considered**Performance - Attendance and Record****Question Pattern****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	5	15
B Q. No.(4)	Internal Choice - Either Or Type	1	1	10	10
Total					25

EXTERNAL EXAMINATION**Question Pattern****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- 6)	Internal Choice Either Or Type	6	6	5	30
B Q. No.(7- 9)	Internal Choice Either Or Type	3	3	10	30
Total					60

B.2.4 PART IV- Ability Enhancement Compulsory Courses (AECC) & Generic Elective Courses (GEC)

Assessment by Internal Examiner only

- Model Examination is conducted after two periodic tests.
- Book and Study Material prepared by the Faculty Members of the respective departments will be prescribed.

Distribution of Marks

Mode of Evaluation			Marks
Periodic Test		:	30
Assignment	K2 Level	:	10
Model Examination		:	60
Total		:	100

Two Periodic tests - Better of the two will be considered

Two Assignments - Better of the two will be considered

Question Pattern for Periodic Test

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.(5)	Internal Choice - Either Or Type	1	1	12	12
Total					30

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.2.5 PART IV- Internship/ Field Project

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

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

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

Part IV - SELF STUDY COURSE**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	:	40
Model Examination	:	60
Total	:	100

Two Periodic Tests - Better of the two will be considered

B.2.6 Part V – Extension Activities

Assessment by Internal examiner only

Distribution of Marks

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

*The marks obtained will be calculated for 100 marks

B.2.7 EXTRA CREDIT COURSES (OPTIONAL)

Assessment by internal Examiner Only

Distribution of Marks**Question Pattern**

Section	Types of Question	No.of Questions	No.of Questions to be answered	Marks for each Question	Total Marks
A Q.No.(1-10)	Multiple Choice	10	10	1	10
B Q.No.(11-15)	Intrnal Choice- Either or Type	5	5	9	45
C Q.No.(16-20)	Open Choice	5	5	15	45
				Total	100

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.

Attendance, progress and conduct certification from the Head of the Institution will be required for the students to write the examination.

- No Pass minimum for Internal Assessment.
- Pass minimum for External Examination is 27 marks out of 75 for Core Courses, Discipline Specific Elective Courses and Allied Courses.
- Pass minimum for External Examination is 21 marks out of 60 for Skill Enhancement Courses and Non Major Elective Courses.
- Pass minimum for Internal Assessment for Practical Examination is 19 marks out of 40.
- The aggregate minimum pass percentage is 40

- Pass minimum for External Practical Examination is 21 marks out of 60 marks.
- Pass minimum for Ability Enhancement Compulsory Course and Generic Elective Course is 40 marks.
- Pass minimum for Self Study Courses is 40.

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.
 - These rules are applicable to UG, PG and M.Phil. Programmes and come into effect from 2020-2021 onwards.
 - For Certificate, Diploma, Advanced Diploma and Post Graduate Diploma Programmes, the students require 75% of attendance to appear for the Theory/Practical Examinations.

B.3 ASSESSMENT MANAGEMENT PLAN

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

B.3.1 Assessment Process for CO Attainment

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

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

Indirect Assessment –Done through Course Exit Survey.

CO Assessment Rubrics

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

CO Attainment

Direct CO Attainment

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

Attainment Levels of COs

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

Target Setting for Assessment Method

For setting up the target of internal assessment tools, 55% of the maximum mark is fixed as 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

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

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 attainment of 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 against 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
Value \geq 70%	Excellent
Value \geq 60 % and Value $<$ 70%	Very Good
Value \geq 50 % and Value $<$ 60%	Good
Value \geq 40% and Value $<$ 50%	Satisfactory
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	25% of the class strength	30% of the class strength
Progression to Higher Education	40% 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
Value \geq 70%	Excellent
Value \geq 60 % and Value $<$ 70%	Very Good
Value \geq 50 % and Value $<$ 60%	Good
Value \geq 40% and Value $<$ 50%	Satisfactory
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 PROGRAMME EDUCATIONAL OBJECTIVES

The college has always been involving the key stake holders 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. Programme.



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BACHELOR OF SCIENCE

CHEMISTRY (2017)

Outcome Based Education with Choice Based Credit System

Programme Structure - Allotment of Hours and Credits For

those who join in the Academic Year 2020-2021

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, Discipline Specific Elective Courses, Allied Courses & Self Study Course							
Core Course	4 (4)	4 (4)	5 (5)	5 (5)	4 (4)	5 (4)	27 (26)
Core Course	4 (4)	4 (4)	-	-	4 (4)	5 (4)	17(16)
Core Course	-	-	-	-	4 (4)	5 (4)	9 (8)
Core Course Practical	2 (0)	2 (2)	2 (0)	2 (2)	3 (0) 3 (0) 2 (0)	3 (3) 3 (3) 2 (2)	14 (7) 6 (3) 4 (2)
DSEC	-	-	-	-	4 (4)	5 (4)	9 (8)
Project					0(1)		0(1)
Allied Course I	6 (4)/4(4)	3(3)/4(4) 3(3)/-	-	-	-	-	9 (7)/8(8) 3 (3)/-
Allied Course II	-	-	4 (4)	4 (4)	-	-	8 (8)
Allied Course Practical	- /2(0)	-/2(2)	2 (0)	2 (2)	-	-	4 (2)/8(4)
Self Study Course	-	-	-	-		0 (1)	0 (1)
Part IV : Skill Enhancement Courses, Non Major Elective Courses, Ability Enhancement Compulsory Courses, Generic Elective Courses, Self Study Course & Internship/ Field Project							
SEC	-	2 (2)	2 (2)	2 (2)	2 (2)	2 (2)	10 (10)
SEC	-	-	-	-	2 (2)	-	2 (2)
Non Major Elective Course	-	-	2(2)	2(2)	-	-	4 (4)
AECC - Value Education	2 (2)	-	-	-	-	-	2 (2)
AECC - Environmental Studies	-	-	-	-	2 (1)	-	2 (1)
GEC -1	-	-	1 (1)	-	-	-	1 (1)
GEC -2	-	-	-	1 (1)	-	-	1 (1)
Self Study Course					0 (1)	-	0 (1)
Internship/ Field Project	-	-	-	0 (1)	-	-	0 (1)
Part V : Extension Activities	-	-	-	0 (1)	-	-	0 (1)
Total	30 (20)	30 (24)	30 (20)	30 (26)	30 (23)	30(27)	180 (140)
Extra Credit Course			0(2)		0(2)		0(4)

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

AECC- Ability Enhancement Compulsory Courses; GEC- Generic Elective Courses



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PART – I-TAMIL

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I	20UTAG11	பொதுத்தமிழ் தாள்: I	3	100
2.	II	20UTAG21	பொதுத்தமிழ் தாள்: II	3	100
3.	III	20UTAG31	பொதுத்தமிழ் தாள்: III	3	100
4.	IV	20UTAG41	பொதுத்தமிழ் தாள்: IV	3	100
TOTAL				12	400

PART I – HINDI

S. No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I	20UHDG11 22UHDG11	Hindi - Paper I Prose – I & II, Ancient Stories - I, General Essays, Functional Hindi – I & Grammar General Hindi – I	3	100
2.	II	20UHDG21 22UHDG21	Hindi - Paper II Drama, One Act Play, Letter, Correspondence, Functional Hindi – II & Grammar General Hindi – II	3	100
3.	III	20UHDG31 22UHDG31	Hindi - Paper III Ancient Poetry, Drama, Indian History, Hindi Grammar & Functional Hindi III Advanced Hindi – I	3	100
4.	IV	20UHDG41 22UHDG41	Hindi - Paper IV Modern Poetry, Hindi Literary Essays, Letter Correspondence, Conversation & Functional Hindi IV Advanced Hindi - II	3	100
TOTAL				12	400

PART II - ENGLISH

S.No.	Sem.	Code	Title of the Course	Cre dits	Marks
1.	I	20UENG11A 20UENG11B 20UENG11C	English – Paper I English for Advanced Learners I English for Career Guidance - I English for Communicative Competence-I	3	100

2.	II	20UENG21A 20UENG21B 20UENG21C	English – Paper II English for Advanced Learners II English for Career Guidance - II English for Communicative Competence - II	3	100
3.	III	20UENG31A 20UENG31B 20UENG31C 22UENG31	English – Paper III English for Advanced Learners III English for Career Guidance – III English for Communicative Competence – III Communicative English – I	3	100
4.	IV	20UENG41A 20UENG41B 20UENG41C 22UENG41	English – Paper IV English for Advanced Learners IV English for Career Guidance – IV English for Communicative Competence – IV Communicative English – II	3	100
TOTAL				12	400

PART III – CORE, DISCIPLINE SPECIFIC ELECTIVE COURSES

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1	I	20UCHC11	Inorganic Chemistry-I	4	100
2	I	20UCHC12	Organic and Physical Chemistry	4	100
3	II	20UCHC21/20UCHC21N	Organic Chemistry-I	4	100
4	II	20UCHC22	Inorganic and Physical Chemistry	4	100
5	II	20UCHC21P	Core Practical- I Volumetric Analysis	2	100
6	III	20UCHC31	Inorganic, Organic and Physical Chemistry-I	5	100
7	IV	20UCHC41/ 20UCHC41N	Inorganic, Organic and Physical Chemistry-II	5	100
8	IV	20UCHC41P	Core Practical –II Inorganic Semi-micro Qualitative Analysis	2	100
9	V	20UCHC51	Organic Chemistry-II	4	100
10	V	20UCHC52	Inorganic Chemistry-II	4	100
11	V	20UCHC53	Physical Chemistry-I	4	100
12	V	20UCHE51/ 20UCHE51/	Discipline Specific Elective 1 (DSEC 1) 1. Analytical Instrumentation and	4	100

		20UPHE52/ 20UCHE53	CHEMDRAW 2. Nanoscience 3. Textile Chemistry		
13	V	20UCHC5PR	Project	1	100
14	VI	20UCHC61	Organic Chemistry-III	4	100
15	VI	20UCHC62	Physical Chemistry-II	4	100
16	VI	20UCHC63	Applied Chemistry	4	100
17	VI	20UCHE61 20UPHE62 20UCHE63	Discipline Specific Elective 2 (DSE 2) 1. Dairy Chemistry 2. Medical Physics 3. Medicinal Chemistry	4	100
18	VI	20UCHQ61	Core Courses Quiz - Online	1	100
19	VI	20UCHC61P	Practical –III Gravimetric Analysis and Organic Preparation	3	100
20	VI	20UCHC62P	Practical –IV Organic Analysis and Estimation	3	100
21	VI	20UCHC63P	Practical –V Physical Chemistry Experiments	2	100
Total				72	2100

PART III – ALLIED COURSE I- MATHEMATICS

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I	20UMTA11	Allied Course I Mathematics –I	4	100
2.	II	20UMTA21	Allied Course I Mathematics – II	3	100
		20UMTA22	Mathematics - III	3	100
Total				10	300

PART III – ALLIED COURSE I- BOTANY

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I	20UBYA11	Allied Course I Taxonomy of Angiosperms and Medicinal Botany	4	100
2.	II	20UBYA21	Allied Course I Applied Botany	3	100
3.	II	20UBYA21P	Allied Course I Practical Taxonomy of Angiosperms, Medicinal Botany and Applied Botany	3	100
Total				10	300

PART III - ALLIED COURSE II- PHYSICS

S. No.	Sem.	Code	Title of the Course	Credits	Marks
1.	III	20UPCA31	Allied Course II Properties of Matter and Heat	4	100
2.	IV	20UPCA41	Allied Course II Optics, Electricity & Electromagnetism and Electronics	4	100
3.	IV	20UPCA41P	Allied Course II Practical General Physics	2	100
Total				10	300

PART IV -SKILL ENHANCEMENT COURSES

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1.	II	20UCHS21/20UCHS21N	Polymer Chemistry	2	100
2.	III	20UCHS31	Food Chemistry	2	100
3.	IV	20UCHS41	Leather Chemistry	2	100
4.	V	20UCHS51P	Analysis of Oils/Fats & Water Practical	2	100
5.	V	20UCHS52	Soil chemistry	2	100
6.	VI	20UCHS61	Green Chemistry	2	100
Total				12	600

PART IV –NON MAJOR ELECTIVE COURSES

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1.	III	20UCHN31	Industrial Chemistry	2	100
2.	IV	20UCHN41	Drugs and Natural Products	2	100
Total				4	200

PART IV- ABILITY ENHANCEMENT COMPULSORY COURSES, GENERIC ELECTIVE COURSES AND INTERNSHIP / FIELD PROJECT

S. No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I	20UGVE11	Value Education	2	100
2.	V	20UGES51	Environmental Studies	1	100
3	III	20UGEH31 20UGEW32	Human Rights/ Women Studies	1	100
4.	IV	20UGEC41	Constitution of India/	1	100
		20UGEM42	Modern Economics/		
		20UGEA43	Adolescent Psychology/		
		20UGED44	Disaster Management		
		20UCHIF41	Internship/Field Project	1	100
5.	V	20UGCE51	Practice for Competitive Examinations - Online	1	100
Total				7	600

PART –V EXTENSION ACTIVITIES

S.No.	Sem.	Code	Title of the Course	Credit
1	I, II, III & IV	20UVNS1 20UVNS2	National Service Scheme	1
2		20UVPE1 20UVPE2	Physical Education	
3		20UVYR1 20UVYR2	Youth Red Cross Society	
4		20UVRR1	Red Ribbon Club	
5		20UVSF1	Science Forum	
6		20UVEC1	Eco Club	
7		20UVLI1	Library and Information Science	
8		20UVCC1	Consumer Club	

9		20UVHF1	Health and Fitness Club	
10		20UVNC1	National Cadet Corps	
		20UVNC2		
11		20UVRO1	Rotaract Club	

PART III – ALLIED COURSE I CHEMISTRY FOR ZOOLOGY, BIOCHEMISTRY, MICROBIOLOGY, BIOTECHNOLOGY

S. No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I	20UCHA11	Allied Course I Organic, Inorganic and Physical chemistry – I	4	100
2.	II	20UCHA21	Allied Course I Organic, Inorganic and Physical chemistry – II	4	100
3.	II	20UCHA21P	Allied Course I Practical Volumetric Analysis	2	100
Total				10	300

PART III – ALLIED COURSE I CHEMISTRY FOR HOME SCIENCE – NUTRITION AND DIETITICS

S. No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I	20UCNA11	Allied Course I Organic, Inorganic and Physical chemistry – I	4	100
2.	II	20UCNA21	Allied Course I Organic, Inorganic and Physical chemistry – II	4	100
3.	II	20UCNA21P	Allied Course I Practical Volumetric Analysis	2	100
Total				10	300

PART III – ALLIED COURSE II CHEMISTRY FOR PHYSICS (SF)

S. No.	Sem.	Code	Title of the Course	Credits	Marks
1.	III	20UCHA31	Allied Course II General Chemistry - I	4	100
2.	IV	20UCHA41	Allied Course II General Chemistry - I	4	100
3.	IV	20UCHA41P	Allied Course II Practical Volumetric Analysis	2	100
Total				10	300

EXTRA CREDIT COURSES (Optional)

S.No.	Sem	Code	Title of the course	Credit	Total Marks
1	V	20UCHO51/22UCHO51	Laboratory Skills and Safety Measures	2	100



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BACHELOR OF CHEMISTRY

Programme Code – 2017

Semester	Course Code	Courses	Hours per week	Credits	Exam. Hours	Mark			
						Int.	Ext.	Total	
I	Part I	20UTAG11/20UHDG11	Tamil I/Hindi I	6	3	3	25	75	100
	Part II	20UENG11A/ 20UENG11B/ 20UENG11C	English I	6	3	3	25	75	100
	Part III	20UCHC11	Core Course -1 Inorganic Chemistry-I	4	4	3	25	75	100
		20UCHC12	Core Course - 2 Organic and Physical Chemistry	4	4	3	25	75	100
		20UCHC21P	Core Course Practical – I Volumetric Analysis	2	-	3	-	-	-
		20UMTA11/ 20UBYA11 20UBYA21P	Allied Course –I Mathematics – I / Allied Botany-I Allied Botany Practical	6/4 2	4 -	3 3	25 -	75 -	100
	Part IV	20UGVE11	Value Education	2	2	-	100	-	100
	TOTAL			30	20				600

Semester	Course Code	Courses	Hours per week	Credits	Exam. Hours	Mark			
						Int.	Ext.	Total	
II	Part I	20UTAG21/ 20UHDG21	Tamil II/Hindi II	6	3	3	25	75	100
	Part II	20UENG21A/ 20UENG21B/ 20UENG21C	English II	6	3	3	25	75	100
	Part III	20UCHC21	Core Course - 3 Organic Chemistry-I	4	4	3	25	75	100
		20UCHC22	Core Course - 4 Inorganic and Physical Chemistry	4	4	3	25	75	100
		20UCHC21P	Core Course Practical –I Volumetric Analysis	2	2	3	40	60	100
		20UMTA21/ 20UBYA21 20UMTA22/ 20UBYA21P	Allied Course -I Allied Mathematics - II/ Allied Botany-II Allied Mathematics III/ Allied Botany Practicals	3 /4 3/2	3/4 3/2	3 3	25 25/40	75 75/60	100 100
	Part IV	20UCHS21	Skill Enhancement Course -1 Polymer Chemistry	2	2	2	25	75	100
	TOTAL			30	24				800

Semester	Course Code	Courses	Hours per week	Credits	Exam. Hours	Marks			
						Int.	Ext.	Total	
III	Part I	20UTAG31/ 20UHDG31	Tamil III/ Hindi III	6	3	3	25	75	100
	Part II	20UENG31A/ 20UENG31B/ 20UENG31C	English III	6	3	3	25	75	100
	Part III	20UCHC31	Core Course -5 Inorganic, Organic and Physical Chemistry-I	5	5	3	25	75	100
		20UCHC41P	Core Course Practical – 2 Inorganic Semi-micro Qualitative Analysis	2	-	3	-	-	-
		20UPCA31 20UPCA41P	Allied-Course -II Allied Physics -I Allied Physics Practical	4 2	4 -	3 3	25 -	75 -	100
	Part IV	20UCHS31	Skil Enhancement Course -2 Food Chemistry	2	2	2	40	60	100
		20UCHN31	NMEC-1 Industrial Chemistry	2	2	2	40	60	100
	Part IV	20UGEH31/ 20UGEW32	Generic Elective -1 1.Human Rights/ 2. Women studies	1	1	2	100	-	100
	TOTAL			30	20				700

Semester	Course Code	Courses	Hours per week	Credits	Exam. Hours	Marks			
						Int.	Ext.	Total	
IV	Part I	20UTAG41/ 20UHDG41	Tamil IV /Hindi IV	6	3	3	25	75	100
	Part II	20UENG41A/ 20UENG41B/ 20UENG41C	English IV	6	3	3	25	75	100
	Part III	20UCHC41	Core Course - 6 Inorganic, Organic and Physical Chemistry-II	5	5	3	25	75	100
		20UCHC41P	Core Course Practical –2 Inorganic Semi -micro Qualitative Analysis	2	2	3	40	60	100
		20UPCA41 20UPCA41P	Allied Course – II Allied Physics -II Allied Physics Practical	4 2	4 2	3 3	25 40	75 60	100 100
	Part IV	20UCHS41	SEC -3 Leather Chemistry	2	2	2	40	60	100
		20UCHN41	NMEC-2 Drugs and Natural Products	2	2	2	40	60	100
		20UCHIF41	Internship/Field Project	0	1	-	100	-	100
		20UGEC41/ 20UGEM42/ 20UGEA43/ 20UGED44	Generic Elective -2 Constitution of India/ Modern Economics/ Adolescent Psychology/ Disaster Management	1	1	2	100	-	100
	Part V		Extension Activities	-	1	-	100	-	100
			TOTAL	30	26				1100

Semester	Course Code	Courses	Hours per week	Credits	Exam. Hours	Marks		
						Int.	Ext.	Total
V	20UCHC51	Core Course – 7 Organic Chemistry-II	4	4	3	25	75	100
	20UCHC52	Core Course - 8 Inorganic Chemistry-II	4	4	3	25	75	100
	20UCHC53	Core Course – 9 Physical Chemistry-I	4	4	3	25	75	100
	20UCHC61P	Core Course Practical - 3 Gravimetric Analysis and Organic Preparation	3	-	3	-	-	-
	20UCHC62P	Core Course Practical - 4 Organic Analysis and Estimation	3	-	3	-	-	-
	20UCHC63P	Core Course Practical -5 Physical Chemistry Experiments	2	-	3	-	-	-
	20UCHE51 20UPHE52 20UCHE53	DSEC -1 1. Analytical Instrumentation and CHEMDRAW 2. Nanoscience 3. Textile Chemistry	4	4	3	25	75	100
	20UCHC5PR	Core Course 10 Project	0	1	-	100		100
	20UCHS51P	Skill Enhancement Course -4 Analysis of Oils/Fats & Water	1T*+1P	2	2	40	60	100
	20UCHS52	SEC -5 Soil Chemistry	2	2	2	40	60	100
	20UGCE51	Self-Study Course Practice for Competitive Examinations - Online	-	1	-	100		100
	20UGES51	Environmental Studies	2	1	2	100		100
			TOTAL	30	23			900

Semester	Course Code	Courses	Hours per week	Credits	Exam. Hours	Marks			
						Int.	Ext.	Total	
VI	Part III	20UCHC61	Core Course -11 Organic Chemistry-III	5	4	3	25	75	100
		20UCHC62	Core Course -12 Physical Chemistry-II	5	4	3	25	75	100
		20UCHC63	Core Course -13 Applied Chemistry	5	4	3	25	75	100
		20UCHC61P	Core Course Practical - 3 Gravimetric Analysis and Organic Preparation	3	3	3	40	60	100
		20UCHC62P	Core Course Practical - 4 Organic Analysis and Estimation	3	3	3	40	60	100
		20UCHC63P	Core Course Practical -5 Physical Chemistry Experiments	2	2	3	40	60	100
		20UCHE61 20UPHE62 20UCHE63	DSEC -2 1. Dairy Chemistry 2. Medical Physics 3. Medicinal Chemistry	5	4	3	25	75	100
		20UCHQ61	Self-Study Course Core Courses Quiz - Online	-	1	-	100		100
	Part IV	20UCHS61	Skill Enhancement Course -6 Green Chemistry	2	2	2	40	60	100
TOTAL			30	27				900	



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VIRUDHUNAGAR - 626 001

BACHELOR OF CHEMISTRY

Programme Code – 2017

REVISED PROGRAMME CONTENT

Semester	Course Code	Courses	Hours per week	Credits	Total Marks		
					Int.	Ext.	
I	Part I	20UTAG11	Tamil/Hindi I	6	3	25	75
	Part II	20UENG11	English I	6	3	25	75
	Part III	20UCHC11	Core Course -1 Inorganic Chemistry-I	4	4	25	75
		20UCHC12	Core Course - 2 Organic and Physical Chemistry	4	4	25	75
		20UCHC21P	Core Course Practical – I Volumetric Analysis	2	-	-	-
		20UMTA11/ 20UBYA11 20UBYA21P	Allied Course –I Mathematics – I / Allied Botany-I Allied Botany Practical	6/4 2	4 -	25 -	75 -
	Part IV	20UGVE11	Value Education	2	2	40	60
	TOTAL			30	20	600	

Semester	Course Code	Courses	Hours per week	Credits	Total Marks		
					Int.	Ext.	
II	Part I	20UTAG21	Tamil /Hindi II	6	3	25	75
	Part II	20UENG21	English II	6	3	25	75
	Part III	20UCHC21N	Core Course - 3 Organic Chemistry-I	4	4	25	75
		20UCHC22	Core Course - 4 Inorganic and Physical Chemistry	4	4	25	75
		20UCHC21P	Core Course Practical –I Volumetric Analysis	2	2	40	60
		20UMTA21/ 20UBYA21	Allied Course – Allied Mathematics - II / Allied Botany-II	3 /4	3/4	25	75
		20UMTA22/ 20UBYA21P	Allied Mathematics – III / Allied Botany Practicals	3/2	3/2	25/40	75/60
	Part IV	20UCHS21N	SEC -1 Polymer Chemistry	2	2	25	75
	TOTAL			30	24	800	

Semester	Course Code	Courses	Hours per week	Credits	Total Marks			
					Int.	Ext.		
III	Part I	20UTAG31	Tamil/ Hindi III	6	3	25	75	
	Part II	20UENG31	English III	6	3	25	75	
	Part III	20UCHC31	Core Course -5 Inorganic, Organic and Physical Chemistry-I	5	5	25	75	
		20UCHC41P	Core Course Practical – 2 Inorganic Semi-micro Qualitative Analysis	2	-	-	-	
		20UPCA31 20UPCA41P	Allied-Course -II Allied Physics -I Allied Physics Practical	4 2	4 -	25 -	75 -	
	Part IV	20UCHS31	SEC -2 Food Chemistry	2	2	40	60	
		20UCHN31	NMEC-1 Industrial Chemistry	2	2	40	60	
	Part IV	20UGHR31/ 20UGWS32	Generic Elective -1 1.Human Rights/ 2. Women studies	0	1	40	60	
		20UGEC41/ 20UGEM42/ 20UGEA43/ 20UGED44 20UGED44N	Generic Elective -2 Constitution of India/ Modern Economics/ Adolescent Psychology/ Disaster Management Disaster Management	1	-	-	-	
		TOTAL			30	20	700	

Semester	Course Code	Courses	Hours per week	Credits	Total Marks		
					Int.	Ext.	
IV	Part I	20UTAG41	Tamil /Hindi IV	6	3	25	75
	Part II	20UENG41	English IV	6	3	25	75
	Part III	20UCHC41N	Core Course - 6 Inorganic, Organic and Physical Chemistry-II	5	5	25	75
		20UCHC41P	Core Course Practical -2 Inorganic Semi -micro Qualitative Analysis	2	2	40	60
		20UPCA41 20UPCA41P	Allied Course – II Allied Physics -II Allied Physics Practical	4 2	4 2	25 40	75 60
	Part IV	20UCHS41	SEC -3 Leather Chemistry	2	2	40	60
		20UCHN41	NMEC-2 Drugs and Natural Products	2	2	40	60
		20UCHI41G	Internship/Field Project	0	1	100	-
			Generic Elective -2	1	1	40	60
		20UGEC41/	Constitution of India/				
		20UGEM42/	Modern Economics/				
		20UGEA43/	Adolescent Psychology/				
	20UGED44 20UGED44N	Disaster Management Disaster Management					
	Part V		Extension Activities	-	1	-	
			TOTAL	30	26	1000	

Semester	Course Code	Courses	Hours per week	Credits	Total Marks		
					Int.	Ext.	
V	Part III	20UCHC51	Core Course – 7 Organic Chemistry-II	4	4	25	75
		20UCHC52	Core Course - 8 Inorganic Chemistry-II	4	4	25	75
		20UCHC53	Core Course – 9 Physical Chemistry-I	4	4	25	75
		20UCHC61P	Core Course Practical - 3 Gravimetric Analysis and Organic Preparation	3	-	-	-
		20UCHC62P	Core Course Practical - 4 Organic Analysis and Estimation	3	-	-	-
		20UCHC63P	Core Course Practical -5 Physical Chemistry Experiments	2	-	-	-
		20UCHE51	DSEC -1 1.Analytical Instrumentation and CHEMDRAW/ 2.Nano Science 3.Textile Chemistry	4	4	25	75
		20UPHE52					
		20UCHE53					
		20UGCE51	Self-Study Course Practice for Competitive Examinations - Online	-	1	50	
	Part IV	20UCHS51P	SEC -4 Analysis of Oils/Fats & Water Practical	1T+1P	2	40	60
		20UCHS52	SEC -5 Nanotechnology	2	2	40	60
		20UGES51	Environmental Studies	2	2	40	60
			TOTAL	30	23	750	

Semester		Course Code	Courses	Hours per week	Credits	Total Marks	
						Int.	Ext.
VI	Part III	20UCHC61	Core Course -10 Organic Chemistry-III	5	4	25	75
		20UCHC62	Core Course -11 Physical Chemistry-II	5	4	25	75
		20UCHC63	Core Course -12 Applied Chemistry	5	4	25	75
		20UCHC61P	Core Course Practical - 3 Gravimetric Analysis and Organic Preparation	3	3	40	60
		20UCHC62P	Core Course Practical - 4 Organic Analysis and Estimation	3	3	40	60
		20UCHC63P	Core Course Practical -5 Physical Chemistry Experiments	2	2	40	60
		20UCHE61 20UPHE62 20UCHE63	DSEC -2 1. Dairy Chemistry 2. Medical Physics 3. Medicinal Chemistry	5	4	25	75
		20UCHQ61	Self-Study Course Core Courses Quiz - Online	-	1	50	
	Part IV	20UCHS61	SEC -6 Green Chemistry	2	2	40	60
TOTAL				30	27	850	



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VIRUDHUNAGAR - 626 001

B.Sc. CHEMISTRY

(2020 -2021 onwards)

Semester I	INORGANIC CHEMISTRY - I	Hours/Week: 4	
Core Course-1		Credits: 4	
Course Code 20UCHC11		Internal 25	External 75

COURSE OUTCOME

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

- CO1: explain the basic concepts of inorganic chemistry, arrangements of elements in the long form of the Periodic table, nature of bonding, compounds of hydrogen and general properties of IA, IIA, and IIIA group elements. [K1]
- CO2: understand the periodic properties of elements, postulates of various theories, molecular forces, redox reactions, manufacturing process, properties and uses of some inorganic compounds. [K2]
- CO3: determine the periodic properties by different scales, hybridization- sp, sp², sp³, sp³d and sp³d² of inorganic molecules, balancing of redox equation, diagonal relationship of IA, IIA and IIIA group elements. [K2]
- CO4: examine the shielding effect on periodic properties, VSEPR theory in simple inorganic molecules, oxidation state of redox equations, peculiar structure of IA, IIA and III A elements. [K3]
- CO5: analyze the cause of effective nuclear charge in periodicity, lattice energy, bonding properties, oxidation number and ion-electron methods, process of metallurgy and contrast behavior of elements in the same group. [K4]

UNIT I Periodic table

Long form of the periodic table, characteristics – classification of elements on the basis of electronic configuration. Periodicity of properties –cause of periodicity- factors influencing the periodicity of properties – Ionisation energy, electron affinity,

electronegativity, atomic radius and ionic radius - shielding effect and its applications- effective nuclear charge- Slater's rules, variation of screening constant (σ) in the periodic table. (12 Hours)

UNIT II Chemical bonding

- a) Covalent bond - VB approach – types of overlapping – sigma and pi bonds- principles of hybridization- sp, sp^2, sp^3, sp^3d and sp^3d^2 hybridisation with an example. VSEPR theory – simple Inorganic molecules [$BeCl_2, BF_3, CH_4, PCl_5, NH_3, \&H_2O$]. MO Theory – Bonding and Antibonding Orbitals – Application of MO Theory to H_2, He_2, N_2, CO – Comparison of VB and MO Theories.
- b) Ionic bond : Lattice energy of NaCl – Born Haber Cycle (12 Hours)

UNIT III

- a) Metallic bond- nature -explanation of properties of metallic bond- conditions for the formation of the metallic bond – Hydrogen bond - types of hydrogen bond –effects of hydrogen bonding – van der Waals forces – types – factors affecting the strength of van der Waals forces –applications.
- b) Oxidation - Reduction :Modern concept – Oxidation number – calculation of oxidation number – Redox reactions – Oxidising agents – reducing agents – auto-oxidation – balancing redox equations oxidation number and ion-electron methods. (12 Hours)

UNIT IV

a) Hydrogen

Position of hydrogen in the periodic table - isotopes of hydrogen – preparation and uses of occluded hydrogen, nascent hydrogen- Hydrides – classification .

b) **Hydrogen peroxide:** Manufacture, properties, and structure- different terms used in expressing the strength of H_2O_2

c) **Ozone:** commercial preparation, properties, uses, structure

d) **Water:** Hard and soft water - water softening methods. (12 Hours)

UNIT V

a) Group I A elements:

Diagonal relationship of Li and Mg – comparison of Li with other members of the family – Extraction, properties and uses of Li. Compounds of Lithium –chloride & carbonate

b) Group II A elements:

Beryllium– Diagonal relationship with Al-comparison of Be & Mg with other alkaline earth metals - Extraction of Be from Beryl- uses of Be.

c) Group III A elements:

Diagonal relationship between B and Si – preparation , properties and structure of diborane and borazole

(12 Hours)

TEXT BOOKS:

1. Madan.R.D, *Modern Inorganic Chemistry*, S.Chand& Company Ltd.
2. SoniP.L(2008)*Text book of Inorganic Chemistry*, Sultan Chand & Sons, Latest Edition.

REFERENCE BOOK:

1. Puri, Sharma, Kalia,(2008)*Principles of Inorganic Chemistry*, Milestone Publishers.
2. SatyaPrakash, Tuli G.D., Basu, Madan R.D. (2011), *Advanced Inorganic chemistry*, S.Chand&Company.,Ltd, First Edition

Course Code 20UCHC11	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1. b	PSO 2	PSO 3a	PSO 3.b	PSO 4a	PSO 4b	PSO 5	PSO 6	PSO 7
CO1	L	L	H	L	M	L	M	L	-	L
CO2	L	L	H	M	M	H	M	M	-	L
CO3	M	M	H	M	H	H	M	M	-	L
CO4	M	M	H	L	L	H	H	M	-	L
CO5	M	M	H	L	L	M	M	M	-	L

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Head of the Department

Dr.M.Amutha
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VIRUDHUNAGAR - 626 001

B.Sc. CHEMISTRY (2020 -2021 onwards)

Semester I	ORGANIC AND PHYSICAL CHEMISTRY	Hours/Week: 4	
Core Course-2		Credits: 4	
Course Code 20UCHC12		Internal 25	External 75

COURSE OUTCOME

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

- CO1: remember the IUPAC nomenclature of organic compounds, the gas laws, postulates of kinetic theory of gases, velocity of gas, movement of gas particles, size and types of colloids. [K1]
- CO2: understand the detection procedure for the elements present, nature of intermediates, nature of isomeric relation existing between organic compounds, critical phenomena, liquefaction of gases, effect of temperature on the various velocities, nature of collision, classification and properties of colloids. [K2]
- CO3: determine the molecular weight of organic acids and bases, empirical and molecular formula, Avogadro number – Loschmidt number, calculation of various velocities, van der Waal's and critical constants and applications of colloids. [K3]
- CO4: examine the type of organic reaction, polarization effects on the reaction mechanism, stability of intermediates, the reactivity of hydrocarbons, deviation of gases from ideal behavior, the different types of velocities, properties of colloids. [K4]
- CO5: analyse the PV isotherm of real and ideal gases, Maxwell's distribution curve, effect of temperature on various velocities, verification of Maxwell's law, stability of colloids. [K4]

UNIT I Basic concepts in organic chemistry

- a) Detection of elements-nitrogen, sulphur and halogens- Determination of molecular weight- Silver salt method, Platinichloride method – Determination of empirical formula and molecular formula.
- b) Naming of aliphatic compounds (upto 10 Carbon Systems)
- c) Structural isomerism – Chain isomerism, position isomerism, functional isomerism and metamerism.
- e) Electron displacement effects: Inductive effect, mesomeric and electromeric effect, resonance – steric inhibition of resonance and hyper conjugative effect. (12 Hours)

UNIT II Reaction intermediates and aliphatic hydrocarbons

- a) Cleavage of bonds : Homolytic and Heterolytic cleavage - reaction intermediates- carbocations, carbanions and freeradicals – Formation, structure and their stability- Electrophilic and Nucleophilic reagents-types of organic reactions(elementary idea only).
- b) Alkanes: Cracking and pyrolysis.
- c) Alkenes: Preparation by dehydrohalogenation of alkyl bromides– Electrophilic addition reactions– Markownikoff’s rule–peroxide effect.
- d) Dienes: Classification- Butadiene – Diels–Alder reaction with mechanism.
- e) Alkynes: Acidity of acetylene. (12 Hours)

UNIT III Gaseous State-I

- a) Postulates of kinetic theory of gases – Derivation of ideal gas laws from kinetic gas equation – Deviations- van der Waal’s equation – equation of state – Clausius, Berthelot and Dieterici equations of state – law of corresponding states – compressibility factor for gases – Boyle and inversion temperature of gases.
- b) PV isotherm of real and ideal gases – Andrew’s experiments – Critical state of gases – definition and determination of critical constants – relation between critical constants and van der Waal’s constants. (12 Hours)

UNIT IV Gaseous State-II

- a) Maxwell-Boltzmann law of distribution of velocities (Derivation not necessary) - graphical representation - effect of temperature on various velocities – experimental verification of Maxwell’s law.

- b) Mean free path - collision number – Brownian movement and determination of Avagadro number – Loschmidt number – principle of equipartition of energy. (12 Hours)

UNIT V Colloids

- a) Colloids- Definition – dispersed phase and dispersion medium- Classification.
 - b) Solid in liquid (sol) – kinetic, optical and electrical properties – stability of colloids and protective action – Hardy-Schulze law – gold number - Hofmeister series.
 - c) Liquid in liquid (Emulsion) – types of emulsion – emulsifier with suitable examples.
 - d) Liquid in solid (Gel) – Classification – preparation – properties – thixotropy – syneresis and imbibition – Donnan membrane equilibrium- applications of colloid.
- (12 Hours)

TEXT BOOKS

1. Arun Bahl & Bahl, B.S.(2009). *Advanced Organic Chemistry .19th edition*. New Delhi: S.Chand&Company Ltd.
2. ArunBahl, Bahl, B.S & Tuli G.D, (2017) *Essentials of Physical chemistry*. New Delhi: S.Chand& Company Ltd.

REFERENCE BOOKS

1. Tewari, K.S & Vishnoi, N.K.(2006). *A Text book of Organic Chemistry.3rd edition*. New Delhi: Vikas. Publishing House Pvt. Ltd.
2. Finar, I.L.Volume I.(2006). *Organic Chemistry. 6th edition*.Singapore: Pearson Education Pvt. Ltd.
3. Soni, P.L. (2008). *Text Book of Physical Chemistry.2nd Edition*. New Delhi: Sultan Chand & Sons..
4. Negi, A.S. & Anand, S.C.(2008). *A text book of Physical Chemistry.2nd Edition*. New Delhi: A New Age International Publishers.
5. Puri, Sharma, Pathania.(2008). *Elements of Physical Chemistry.4th Edition*. Jalandhar: Vishal Publishing & Co.
6. Robert Thornton Morrison, Robert Neilson Boyd & Saibal Kanti Bhattacharjee (2013) *Organic Chemistry, 7th Edition*. Pearson.

Course Code 20UCHC12	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1. a	PSO 1. b	PSO 2	PSO 3. a	PSO 3. b	PSO 4. a	PSO 4. b	PSO 5	PSO 6	PSO 7
CO1	L	L	H	L	L	M	M	H	-	L
CO2	L	L	H	L	L	L	M	M	-	M
CO3	M	L	M	L	L	L	M	H	-	L
CO4	M	M	H	L	L	H	M	H	-	L
CO5	M	M	M	L	L	H	M	H	-	M

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B.Sc.PHYSICS AND CHEMISTRY
(2020-21onwards)

Semester I	ALLIED MATHEMATICS-I	Hours/Week:6	
Allied Course-I		Credits:4	
Course Code 20UMTA11		Internal 25	External 75

COURSE OUTCOMES

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

CO1: retrieve the fundamental principles, concepts in the areas of differential calculus, integral calculus, differential equations and Algebra.[K1]

CO2: explain curvature & evolute of a curve, method of solving exact differential equations and Linear differential equations with constant coefficients.[K2]

CO3: find the derivative and partial derivative of a given function, solution of simultaneous linear equations, eigenvalues and eigen vectors of a given matrix and double & triple integrals.[K2].

CO4: apply the knowledge gained in calculus, differential equations and algebra to other field [K3]

CO5: analyse the challenging problems in calculus, differential equations and algebra.[K4]

UNIT I

Differential Calculus

Derivatives of some standard functions without proof–The chain rule for differentiation–Differentiation of inverse function–Differentiation by transformation– n^{th} derivative of some standard function –Leibnitz theorem. (18 Hours)

UNIT II

Differential Calculus Continued

Partial differentiation –Curvature-Evolutes. (17 Hours)

UNIT III**Integral Calculus**

Double integrals– Evaluation of double integrals – Triple integrals. (20 Hours)

UNIT IV**Differential equations**

Exact Differential equations–Integrating factors– Linear Equations with constant coefficients- Methods of finding complementary functions–Methods of finding Particular integrals. (20 Hours)

UNIT V**Algebra**

Matrices-Simultaneous linear equations –Cayley Hamilton Theorem(statement only)– Problems– Eigenvalues and Eigenvectors. (15 Hours)

TEXTBOOKS

1. Arumugam.S .and ThangapandiIsaac.A.(2011).*Calculus*, New Gamma Publishing House.
2. Arumugam.S.and ThangapandiIsaac.A.(2012).*Allied Mathematics Paper I II*, New Gamma Publishing House.
3. Arumugam.S. and ThangapandiIsaac.A.(2011).*Allied Mathematics Paper II*, New Gamma Publishing House.

Unit	Chapter	Section
Text Book1		
I	PartI-2	2.3,2.4, 2.5, 2.6 2.12, 2.13
II	PartI-2 PartI-3	2.14 3.4,3.5
III	PartII-3	3.1, 3.2,3.3
Text Book2		
IV	1 2	1.3,1.4 2.1,2.2,2.3
Text Book3		
V	3	3.1, 3.2, 3.3,3.4

Course Code 20UMTA11	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	M	H	M	L	M	-
CO2	H	M	H	M	L	M	-
CO3	M	M	H	M	L	M	-
CO4	H	H	H	H	L	M	-
CO5	H	M	H	M	L	H	-

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ALLIED BOTANY

(2020 -2021 onwards)

Semester I	TAXONOMY OF ANGIOSPERMS AND MEDICINAL BOTANY	Hours/Week: 4	
Allied Paper		Credits: 4	
Course Code		Internal	External
20UBYA11		25	75

COURSE OUTCOMES

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

- CO1 : state the important plants in the natural ecosystem.[K1]
- CO2 : interpret the different groups of plants on earth with their names, distribution, habit, characteristics and affinities. [K2]
- CO3 : explain the medicinal and economic importance of angiosperms. [K2]
- CO4 : identify angiosperms in the field condition with their vegetative and floral characters and prepare herbarium as per the principles. [K3]
- CO5 : distinguish the use of traditional medicine in their life and to develop herbal preparations. [K4]

TAXONOMY OF ANGIOSPERMS

UNIT I

Principles of Taxonomy, Basics of classification: Species, Genus and Family, Nomenclature and Binomial system. Natural system of Classification - Bentham and Hooker's system of classification of plants (up to order level only) Merits and demerits of the classification .Field and Herbarium preparation techniques. (12 Hours)

UNIT II

Study of the following families with reference to their Systematic position, special characters, distribution, Indian genera, vegetative characters, floral characters and economic importance – Annonaceae, Rutaceae. Caesalpinioideae and Myrtaceae (12 Hours)

UNIT III

Study of the following families with reference to their Systematic position, special characters, distribution, Indian genera, vegetative characters, floral characters and economic importance – Apocyanaceae, Lamiaceae, Euphorbiaceae and Poaceae. (12 Hours)

UNIT IV

Study of the following medicinal plants with reference to their botanical name, description of the individual plant, family, morphology of the useful part, chemical constituents, medicinal and other uses. *Aeglemarmelos* – Rutaceae, *Andrographispaniculata* – Acanthaceae, *Piper nigrum* –Piperaceae, *Curcuma longa* – Zingiberaceae and *Aloevera*– Asphodeloideae (Liliaceae) (12 Hours)

UNIT V

Classification of Drugs. Study of the following medicinal plants with reference to their botanical name, description of the individual plant, family, morphology of the useful part, chemical constituents, medicinal and other uses. Drugs obtained from root - *Rauwolfiaserpentina*, Drugs obtained from underground bulb – *Allium sativum*, Drugs obtained from leaves – *Justiciaadhatoda*, Drugs obtained from fruits –*Phyllanthusemblica*, Drugs obtained from seeds–*Trigonellafoenum- graecum*. (12 Hours)

TEXT BOOKS

1. Pandey, B.P.1969. Taxonomy of Angiosperms. S. Chand & Company Ltd., New Delhi.
2. Narayanasamy, R.V. and K.N. Rao. 1976. Outlines of Botany. S.Viswanathan. Printers and Publishers, Chennai.
3. Pandey, B.P. 2000. Botany. S. Chand and Company Ltd., New Delhi.

REFERENCE BOOKS

1. Gamble, J.S. 1921. Flora of the Presidency of Madras, Volumes I, II and III. Adlard and Son Ltd. London.
2. Daniel, M. 2006. Medicinal Plants – Chemistry and Properties. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
3. Somasundram, S. 1997. Maruthurvathavaravial. Elangovanpathippaham, Tirunelveli, India. (Tamil)

4. Thirugnanam, S., M.A. Akbarsha and K.V. Krishnamurthy. 2010. Indian Medicinal Plants and Home Remedies. Selvi Pathippaham, Trichy, India
5. Warriar, P.K., V.P. K. Nambiar and C. Ramankutty. 1994. Indian Medicinal Plants – a compendium of 500 species. Vaidyaratnam P.S. Varier's Arya VaidyaSala, Kottakkal, Orient Longman Publications, Chennai.
6. Mohammed Ali, 1994. Text book of Pharmacognosy. CBS Publishers and Distributors, New Delhi.

Course Code 20UBYA11	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	M	M	L	L	-	-
CO2	H	M	M	L	L	-	-
CO3	H	M	M	L	L	-	-
CO4	M	M	M	M	L	-	-
CO 5	M	M	M	M	M	-	-

Dr.B.Karunai Selvi
Head of the Department

Dr.B. Karunai Selvi
Dr.R. Murugalakshmi Kumari
Course Designer/s



V.V.VANNIAPERUMAL COLLEGE FOR WOMEN

(Belonging to Virudhunagar Hindu Nadars)

An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
Re-accredited with 'A' Grade (3rd Cycle) by NAAC

VIRUDHUNAGAR - 626 001

B.Sc. CHEMISTRY (2020 -2021 Onwards)

Semester II	ORGANIC CHEMISTRY-I	Hours/Week: 4	
Core Course III		Credits: 4	
Course Code		Internal	External
20UCHC21		25	75

COURSE OUTCOMES

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

CO1: recognize the reactivities of organic compounds in a given chemical reaction. [K1]

CO2: explain the preparation, properties and uses of aliphatic halogens, alcohols, ethers and carbonyl compounds, summarise the chemistry of aliphatic acids and their derivatives. [K2]

CO3: sketch the process of rectification of alcohols, predict the mechanism of various organic reactions, relate the properties of aliphatic acids. [K3]

CO4: discriminate the reactivities of aldehydes and ketones, compare the acidity of aliphatic carboxylic acids, estimate the number of hydroxyl and alkoxy groups, categorise substituted acids. [K4]

CO5: analyze the synthetic utility of organometallic compounds, active methylene compounds, aldehydes & ketones, alcohols and ethers. [K4]

UNIT I Aliphatic halogen compounds

- Halogen derivatives: Detailed mechanism of aliphatic substitution reactions – S_N1 , S_N2 & S_Ni mechanisms – Elimination - E_1 , E_2 and E_1CB mechanisms – Hofmann and Saytzeff rule – relative reactivity of alkyl halides.
- Polyhalogen derivatives: Preparation and uses of chloroform, iodoform, carbon tetrachloride – chlorofluorocarbons – Westron and Freon.
- Halogen derivatives of Unsaturated hydrocarbons: Vinyl chloride, Allyl Iodide – preparation and properties.
- Organometallic compounds – Grignard reagents – preparation, structure, synthetic applications & limitations- organozinc compounds – applications- organolithium compounds - preparation & applications – organolead compounds. (12 Hours)

UNIT II Aliphatic alcohols

- a) Classification-Ascending and descending the series of alcohols – Rectification of alcohol – absolute alcohol, methylated spirit & power alcohol-Unsaturated alcohols - preparation, properties and uses of allyl alcohol. Dihydric alcohol: Ethylene glycol – Industrial preparation - properties – oxidation and dehydration reactions and uses. Trihydric alcohol: Glycerol – estimation of number of hydroxyl groups.
- b) Ethers: Classification – estimation of alkoxy groups.
- c) Thioalcohols and Thioethers: Preparation of ethyl mercaptan, sulphonal and mustard gas.
- d) Phosphorus Ylides: Preparation, Properties – Wittig reaction. (12 Hours)

UNIT III Aliphaticaldehydes and ketones

Electronic structure of carbonyl group – preparation of aldehydes and ketones from fatty acids – Rosenmund reaction – Stephen’s method- Mechanism of Nucleophilic addition to carbonyl compounds – hemiacetal and acetal formation – cyanohydrin formation – nucleophilic hydride ion transfer - Meerwein-Ponndorf-Verley reduction – Oppenauer oxidation – Relative reactivities of aldehydes and ketones - Chemistry of acrolein and crotonaldehyde – chloral – glycolaldehydes – hydroxy acetone – glyoxal and acetylacetone (12 Hours)

UNIT IV Aliphatic carboxylic acids and their derivatives

- a) Structure of carboxylic group – acidity of carboxylic acids – effect of substituents on acidity – Higher fatty acids – Palmitic acid and stearic acid–unsaturated monocarboxylic acids – chemistry of acrylic acid and oleic acid.
- b) Dicarboxylic acids: Preparation and properties of malonic acid- Blanc’s rule -action of heat on dicarboxylic acids.
- c) Unsaturated dicarboxylic acids: Preparation and properties of maleic acid and fumaric acid.
- d) Preparation and properties of acetyl chloride – acetic anhydride – acetamide.
- e) Esters: Distinction between ester and salts – esterification and ester hydrolysis – detailed mechanism of acid and base catalysed hydrolysis of ester-synthetic applications of malonic ester. (12 Hours)

UNIT V Substituted carboxylic acids

- a) Hydroxy acids: Preparation and properties of glycollic, lactic, malic, citric and tartaric acids – action of heat on hydroxy acids.
- b) Halogen substituted acids: Preparation and properties of monochloro, dichloro and trichloro acetic acids.
- c) Aldehydic and ketonic acids: Preparation and properties of glyoxylic acid, pyruvic acid, acetoacetic acid and laevulic acid. Preparation and Synthetic applications of acetoacetic ester.

(12 Hours)

TEXT BOOKS

1. Soni, P.L. &Chawla, H.M.(*Text Book of Organic Chemistry*.29thedition.New Delhi:SultanChand &Sons.
2. Arun Bahl & Bahl, B.S.(2009). *Advanced Organic Chemistry* .19th edition.New Delhi: S.Chand& Company Ltd.

REFERENCE BOOKS

1. Tewari, K.S. &Vishnoi, N.K.(2006).*A Text book of Organic Chemistry*.2nd edition. New Delhi: Vikas Publishing House Pvt. Ltd.
2. Finar, I.L. Volume I.(2003).*Organic Chemistry*. 6thedition.Singapore: Pearson EducationPvt. Ltd.

Course Code 20UCHC21	PO1		PO2	PO3		PO4		PO6	PO7	
	PSO 1. a	PSO 1. b	PSO 2	PSO 3. a	PSO 3. b	PSO 4 .a	PSO 4. b	PSO 5	PSO 6	PSO 7
CO1	M	M	M	M	H	H	M	M	-	L
CO2	L	L	M	M	H	H	M	M	-	L
CO3	L	L	L	L	H	H	H	H	-	-
CO4	L	L	H	H	H	H	H	H	-	L
CO5	H	H	L	M	M	H	H	H	-	L

Dr.M.Dhanalakshmi
Head of the Department

Dr.M.Amutha
Tmt.A.Prasanna
Course Designers



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VIRUDHUNAGAR - 626 001

B.Sc. CHEMISTRY

(2022 -23 Onwards)

Semester II	ORGANIC CHEMISTRY-I	Hours/Week: 4	
Core Course III		Credits: 4	
Course Code 20UCHC21N		Internal 25	External 75

COURSE OUTCOMES

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

CO1: recognize the reactivities of organic compounds in a given chemical reaction [K1]

CO2: explain the preparation, properties and uses of aliphatic halogens, alcohols, ethers and carbonyl compounds, summarise the chemistry of aliphatic acids and their derivatives [K2]

CO3: predict the mechanism of various organic reactions, relate the properties of aliphatic acids [K3]

CO4: discriminate the reactivities of aldehydes and ketones, compare the acidity of aliphatic carboxylic acids, estimate the number of hydroxyl and alkoxy groups, categorise substituted acids [K4]

CO5: analyze the synthetic utility of organometallic compounds, active methylene compounds aldehydes & ketones, alcohols and ethers [K4]

UNIT I Aliphatic halogen compounds

a) Halogen derivatives: Detailed mechanism of aliphatic substitution reactions – S_N1, S_N2 & S_Ni mechanisms – Elimination - E₁, E₂ and E₁CB mechanisms – Hofmann and Saytzeff rule – relative reactivity of alkyl halides.

b) Polyhalogen derivatives: Preparation and uses of chloroform, iodoform, carbon tetrachloride - chlorofluorocarbons – Westron and Freon.

c) Halogen derivatives of Unsaturated hydrocarbons: Vinyl chloride, Allyl Iodide - preparation and properties.

d) Organometallic compounds – Grignard reagents – preparation, structure, synthetic applications & limitations – organozinc compounds – applications – organolithium compounds – preparation & applications – organolead compounds. (12 Hours)

UNIT II Aliphatic alcohols

- a) Classification- Physical properties – alcohols as an acid and as a base – reactions involving the acidic and basic characteristics of alcohols – relative reactivity of 1^0 , 2^0 , 3^0 alcohols – ascent and descent in alcohol series – comparison of alcohol with thiols.
- b) Polyhydric alcohol: Ethylene glycol – oxidation reactions and uses - Glycerol – manufacture from oils and fats - oxidation reactions and uses- estimation of number of hydroxyl groups.
- c) Ethers: Preparation – Williamson ether synthesis – alkoxymercuration and demercuration of alkenes – reactions involving ethereal oxygen and ether linkage – comparison of ethers with thioethers – crown ethers (introduction only).
- d) Epoxides: Ring opening reactions of epoxides. (12 Hours)

UNIT III Aliphatic aldehydes and ketones

Structure and reactivity of carbonyl group – preparation of aldehydes and ketones from fatty acids – Rosenmund reaction – Stephen's method- nucleophilic addition reactions – reaction with carbon nucleophiles – oxygen nucleophiles – nitrogen nucleophiles – sulphur nucleophiles – oxidation reactions of aldehydes and ketones – distinguishing aldehydes from ketones – reduction reactions of carbonyl compounds – catalytic reduction – reduction with metal hydrides – MPV reduction - Chemistry of acrolein – glycolaldehydes – hydroxy acetone – glyoxal and acetylacetone. (12 Hours)

UNIT IV Aliphatic carboxylic acids and their derivatives

- a) Structure of carboxylic group – acidity of carboxylic acids – effect of substituents on acidity – Higher fatty acids – Palmitic acid and stearic acid–unsaturated monocarboxylic acids – chemistry of acrylic acid and oleic acid.
- b) Dicarboxylic acids: Blanc's rule -action of heat on dicarboxylic acids.
- c) Unsaturated dicarboxylic acids: Preparation and properties of maleic acid and fumaric acid.
- d) Preparation and properties of acetyl chloride – acetic anhydride – acetamide.
- e) Esters: Distinction between ester and salts – esterification and ester hydrolysis – detailed mechanism of acid and base catalysed hydrolysis of ester-synthetic applications of malonic ester. (12 Hours)

UNIT V Substituted carboxylic acids

- a) Hydroxy acids: Preparation and properties of glycollic, lactic, malic, citric and tartaric acids – action of heat on hydroxy acids.
- b) Halogen substituted acids: Preparation and properties of monochloro, dichloro and trichloro acetic acids.
- c) Aldehydic and ketonic acids: Preparation and properties of glyoxylic acid, pyruvic acid, acetoacetic acid and laevulic acid. Preparation and Synthetic applications of acetoacetic ester. (12 Hours)

TEXT BOOKS

1. Soni, P.L. & Chawla, H.M. (*Text Book of Organic Chemistry*, 29th edition, New Delhi: Sultan Chand & Sons.
2. Arun Bahl & Bahl, B.S. (2009). *Advanced Organic Chemistry*. 19th edition, New Delhi: S.Chand & Company Ltd.

REFERENCE BOOKS

1. Tewari, K.S. & Vishnoi, N.K. (2006). *A Text book of Organic Chemistry*. 2nd edition. New Delhi: Vikas Publishing House Pvt. Ltd.
2. Finar, I.L. Volume I. (2003). *Organic Chemistry*. 6th edition. Singapore: Pearson Education Pvt. Ltd.
3. Jerry March. (2010). *Advanced Organic Chemistry*. New Jersey: John Wiley & Sons. 4th Edition.
4. Robert Thornton Morrison, Robert Neilson Boyd & Saibal Kanti Bhattacharjee (2013), *Organic Chemistry*, 7th Edition. Pearson.

	PO1		PO2	PO3		PO4		PO5	PO6	PO7
20UCHC21N	PSO 1 a	PSO 1 b	PSO 2	PSO 3 a	PSO 3 b	PSO 4 a	PSO 4 b	PSO 5	PSO 6	PSO 7
CO 1	H	H	M	M	H	H	M	M	H	H
CO 2	H	H	M	M	H	H	M	M	H	H
CO 3	H	H	L	L	H	H	H	H	H	H
CO 4	H	H	H	H	H	H	H	H	H	H
CO 5	H	H	L	M	M	H	H	H	H	H

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VIRUDHUNAGAR - 626 001

B.Sc. CHEMISTRY

(2020 -21 onwards)

Semester II	INORGANIC AND PHYSICAL CHEMISTRY	Hours/Week: 4	
Core Course-4		Credits: 4	
Course Code 20UCHC22		Internal 25	External 75

COURSE OUTCOMES

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

CO 1: recognize the metallurgical process, adsorption, catalysis, characteristics of IV A, VA, VII group elements and liquid state. [K1]

CO 2: understand the important ores, extraction of the metals, oxides, preparation, properties and uses of carbon, nitrogen and halogen compounds, properties of liquid state and the importance of catalysis and adsorption. [K2]

CO 3: explain the extraction of metals from the ores, preparation and properties of sulphur compounds, estimation of available chlorine in bleaching powder, predict the various physical properties of substances in liquid state, surface area, factors influencing adsorption. [K2]

CO4: apply the alloys, oxides, interhalogen compounds, xenon compounds, properties of liquid state, types of adsorption isotherm and catalysis to diversified fields. [K3]

CO 5: analyze the separation, purification of metals, preparation and properties of various compounds in IV A and VA group, isolation and estimation of halogens, various properties of liquids, different isotherms and catalysis. [K4]

UNIT I Metallurgy

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

- b) Important ores and extraction of the following metals – Ti, Th, U, V and Mo-their important alloys and applications.
- c) Preparation and uses of some important compounds - titanium oxide, thorium oxide, ammonium molybdate (analytical use), vanadium pentoxide, sodium cobaltinitrite, chloroplatinic acid, uranium hexafluoride, uranyl acetate, thorium nitrate and ceric ammonium nitrate. (12 Hours)

UNIT II

- a) General characteristics of elements of Group IV A – Difference of carbon and silicon from the rest of the family –C₆₀ fullerenes – uses. Preparation, properties and uses of silicon carbide, silicontetrafluoride, permono and perdicarbonic acid.
- b) General characteristics of elements of group VA – Active nitrogen –preparation, properties and uses of hydrazine, hydroxylamine, hydrazoic acid, hyponitrous acid and nitramide.
- c) Classification of oxides with examples - Preparation, properties and structure of permono and perdisulphuric acid. (12 Hours)

UNIT III

- a) Halogens:
- i) Isolation of fluorine – Denissmethod, Moissans method, difficulties in the isolation of fluorine – manufacture of fluorine – Modern method – peculiarities of fluorine.
- ii) Chlorine - bleaching powder- estimation of available chlorine in bleaching powder - preparation, structure, properties and uses of perchloric acid and potassium perchlorate.
- iii) Bromine – Brominating mixture.
- iv) Iodine - Periodic acid & basic iodine.
- v) Interhalogen compounds, polyhalides & pseudohalogens.
- b) Position of noble gas in the periodic table – Preparation, properties and structure of Xenon compounds – XeF₂, XeF₄, XeF₆, XeO₃ - clathrates of noble gases (Brief study only). (12 Hours)

UNIT IV Liquid state

- a) Nature of cohesive forces in liquids – Trouton's rule and its significance.
- b) Physical properties and chemical constitution
- i. Surface tension – Parachor and its applications
 - ii. Viscosity – application to chemical constitution – Rheochor

- iii Refractive index – optical exaltation
- iv. Dipole moment – definition – electrical polarization of molecule – Clausius Mosotti equation – Debye equation – experimental determination – various applications.
- v. Magnetic moment – magnetic susceptibility – para, dia and ferro magnetism – specific, molar magnetic susceptibility – determination by Guoy's method – various applications. (12 Hours)

UNIT V

- a) Adsorption: Definition of various terms – characteristics of adsorption of gases on solids – physical adsorption and chemical adsorption – differences between them – factors influencing adsorption – adsorption isotherm – Freundlich & Langmuir adsorption isotherm - BET theory (Elementary idea only) - applications of adsorption.
- b) Catalysis: Definition- characteristics – theories of catalysis- promoters and poisons- enzyme catalysis- acid-base catalysis and autocatalysis- applications of catalysis. (12 Hours)

TEXT BOOKS

1. Satya Prakash, Tuli, G.D., Basu, Madan, R.D. (2011). *Advanced Inorganic Chemistry*, 1st Edition. New Delhi: S.Chand & Company Ltd.
2. Arun Bahl, Bahl, B.S & Tuli, G.D. (2009). *Essentials of Physical Chemistry*. Edition. New Delhi: S.Chand & Company Ltd.

REFERENCE BOOKS

1. Puri, Sharma, Kalia, (2008). *Principles of Inorganic Chemistry*, Milestone Publishers.
2. Soni P.L. (2008). *A Text book of Inorganic Chemistry*, Latest Edition. Sultan Chand & Sons.
3. Madan .R.D, *Modern Inorganic Chemistry*, S.Chand& Company Ltd.
4. Soni P.L (2008). *Text Book of Physical Chemistry*, Latest Edition. Sultan Chand& Sons.
5. Puri, Sharma, Pathania, (2008). *Elements of Physical Chemistry*, IV Edition. Jalandhar Delhi: Vishal Publishing & Co.

Course Code 20UCHC22	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	L	M	M	L	H	M	L	-	-	L
CO2	L	M	L	L	H	M	L	-	-	L
CO 3	M	L	L	L	H	L	M	-	-	L
CO4	M	M	H	L	H	L	M	-	-	-
CO5	M	M	H	L	H	L	M	-	-	L

Dr.M.Dhanalakshmi
Head of the Department

Tmt.M.Dhanalakshmi
Dr.A.Anitha
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VIRUDHUNAGAR - 626 001

B.Sc. CHEMISTRY (2020 -2021 onwards)

Semester I/II	CORE PRACTICAL - I VOLUMETRIC ANALYSIS	Hours/Week: 2	
Core Course Practical -I		Credits: 2	
Course Code 20UCHC21P		Internal 40	External 60

COURSE OUTCOMES

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

- CO1: apply the Principles involved in the Volumetric analysis. [K3]
- CO2: prepare the primary standard solutions. [K3]
- CO3: estimate the amount of the substance present in the given solution by volumetric analysis. [K3]
- CO4: determine the concentration of the unknown solutions. [K4]
- CO5: analyse and evaluate the accuracy of the results.[K4]

LIST OF EXPERIMENTS

I. ACIDIMETRY AND ALKALIMETRY

1. Estimation of Na₂CO₃
2. Estimation of NaOH/ KOH
3. Estimation of oxalic acid.

II.REDOX TITRATIONS

a)Permanganimetry

1. Estimation of ferrous ion
2. Estimation of oxalic acid

b)Dichrometry

Estimation of ferrous ion using external indicator

III. IODOMETRY AND IODIMETRY

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

IV. ARGENTOMETRY

Estimation of KCl

V. ANALYSIS OF SODIUM LEVEL IN VARIOUS JUNK FOODS BY FLAME PHOTOMETER

Course Code 20UCHC21P	PO1		PO2	PO3		PO4		PO6	PO7	
	PSO 1. a	PSO 1. b	PSO 2	PSO 3. a	PSO 3. b	PSO 4. a	PSO 4. b	PSO 5	PSO 6	PSO 7
CO1	L	L	L	L	L	L	L	M	H	H
CO2	L	M	M	M	M	M	M	M	H	H
CO3	M	L	H	M	M	M	M	L	H	H
CO4	H	M	H	M	M	H	M	L	H	H
CO5	H	H	H	H	M	M	M	L	H	H

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VIRUDHUNAGAR - 626 001

B.Sc. PHYSICS AND CHEMISTRY

(2020-21onwards)

Semester II	ALLIEDMATHEMATICS-II	Hours/Week:3	
Allied Course-I		Credits:3	
Course Code		Internal	External
20UMTA21		25	75

COURSEOUTCOMES

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

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

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

CO3: apply vector differentiation, vector integration and trigonometric functions in various fields. [K3]

CO4: find approximate solutions, establish the relation between roots and coefficients of an equation. [K3]

CO5: analyze the challenging problems in Vector Calculus, Algebra and Trigonometry. [K4]

UNIT I

Vector Differentiation

Differentiation of Vectors – Gradient – Velocity and Acceleration –Divergence and Curl

(Simple Theorems only) - Problems. (9 Hours)

UNIT II

Vector Integration

Line integrals – Surface integrals – Theorems of Green, Gauss and Stokes (Statements

only) – Problems. (9 Hours)

UNIT III

Algebra

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

UNIT IV**Algebra Continued**

Transformation of Equations – Approximate solutions of numerical equations.

(9 Hours)

UNIT V**Trigono****metry**Expansion of $\sin\theta$, $\cos\theta$, $\tan\theta$ in powers of θ –Hyperbolic Functions.

(9 Hours)

TEXTBOOKS1. Arumugam.S. and ThangapandiIsaac.A. (2004). *Ancillary Mathematics Paper II**(Revised)*, New Gamma Publishing House.2. Arumugam.S. and ThangapandiIsaac.A.(2014). *Allied Mathematics Paper I*, New Gamma Publishing House.

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

Course Code 20UMTA21	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	M	H	M	M	-	-
CO2	H	L	H	M	M	L	-
CO3	H	M	H	M	M	L	-
CO4	M	M	L	M	M	-	-
CO5	H	L	L	M	M	L	-

Dr. A.Uma Devi
Head of the DepartmentDr. A.Uma Devi
Course Designer



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VIRUDHUNAGAR - 626 001

B.Sc. PHYSICS AND CHEMISTRY

(2020-21onwards)

Semester II	ALLIED MATHEMATICS-III	Hours/Week:3	
Allied Course-I		Credits:3	
Course Code		Internal	External
20UMTA22		25	75

COURSEOUTCOMES

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

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

CO2:explain the techniques used to solve the problems in Statistics and Operations Research.

[K2]

CO3:calculate some statistical constants to get statistical inference and use O.R techniques to solve real life problems.[K3]

CO4:examine the statistical data to draw conclusion in Correlation and Regression. [K4]

CO5:analyze the challenging problems in real life to get solutions.[K4]

UNIT I

Statistics

Correlation

Correlation-Problems-Rank correlation

(9 Hours)

UNIT II

Regression

Regression –Properties of Regression coefficients–Problems.

(9 Hours)

UNIT III

Operations Research

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

(9 Hours)

UNIT IV**Operations Research Continued:**

Mathematical formulation of Transportation Problems – Initial Basic Feasible Solutions
(Method1, Method2, Method3, Method4). (9 Hours)

UNIT V**Operations Research Continued:**

Introduction- Mathematical formulation of an Assignment Problem – Solution to Assignment Problem – Hungarian Algorithm (balanced minimization problems only). (9 Hours)

TEXTBOOKS

1. Arumugam.Sand ThangapandiIsaac. A. (2011). *Statistics*, New Gamma Publishing House.
2. Arumugam.Sand ThangapandiIsaac. A.(2015). *Topics in Operations Research Linear Programming*, New Gamma Publishing house.

Unit	Chapter	Section
Text Book1		
I	6	6.0, 6.1, 6.2
II	6	6.3
Text Book2		
III	3	3.1, 3.2, 3.4
IV	4	4.1
V	5	5.0, 5.1, 5.2

Course Code 20UMTA22	PO1	PO2	PO3	PO4	PO5	PO6	PO 7
CO1	H	M	H	H	H	H	-
CO2	H	M	H	H	H	M	-
CO3	H	H	H	H	H	H	-
CO4	H	M	H	H	H	H	-
CO5	H	M	H	H	H	H	

Dr.A.Uma Devi
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Mrs.P.Getchial Pon Packiavathi
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VIRUDHUNAGAR - 626 001

ALLIED BOTANY

(2020 -2021 onwards)

Semester II	APPLIED BOTANY	Hours/Week: 4	
Allied Course		Credits: 4	
Course Code		Internal	External
20UBYA21		25	75

COURSE OUTCOMES

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

- CO1 : state the applied areas of Botany.[K1]
- CO2 : learnt skills related to laboratory as well as industries based work. [K2]
- CO3 : explain the applications of plants in various industries and how to become an entrepreneur. [K2]
- CO4 : solve the issues related to the applied areas of Botany. [K3]
- CO5 : analyze the applied potential areas/branches of Botany. [K4]

UNIT I

Plant tissue culture

History of plant tissue culture, biosafety guidelines and regulations, Good Laboratory Practices in plant tissue culture: Basic Requirements - Equipments, Media: MS medium composition and preparation and Maintenance of aseptic condition, General Techniques: tissue culture protocol, cellular totipotency, cytodifferentiation. Types of culture of plant materials – callus culture, meristem and anther cultures, applications of plant tissue culture. (12 Hours)

UNIT II

Mushroom cultivation

Historical background, nutritional value, morphology and reproduction of mushroom, cultivation methods: Pure culture, spawn preparation, preparation of compost, and spawning, cultivation of Oyster mushroom and Button mushroom, post harvesting techniques of

mushrooms: Long term and short term storage methods, recipes of edible mushrooms and importance of mushrooms. Keys to differentiate edible from poisonous mushrooms. (12 Hours)

UNIT III

Bio-fertilizers

Introduction, Isolation, Identification, mass cultivation and production of biofertilizers: Bacterial inoculants – *Rhizobium*, Cyanobacterial inoculants – *Anabaena*, Fungal inoculants - AMfungi, methods of seed inoculation. Field applications of biofertilizers and advantages of biofertilizers. Good laboratory practices in biofertilizer technology. Intellectual Property Right (IPR) for Bio-products - forms of protections and patenting of Biological materials.

(12 Hours)

UNIT IV

Bioenergy

Composting methods: Backyard, Indoor and Bangalore method of composting, benefits of composting, Biodiesel production from algal source (*Chlorella* and *Ulvalactuca*). Biogas: characteristics features of Biogas, production of Biogas (Indian Biogas plant), Biogas form different feed stocks, factors affecting methane formation and uses of biogas. (12 Hours)

UNIT V

Horticulture

Introduction, tools of horticulture techniques, methods of vegetative propagation – cuttage – stem and leaf, layerage – simple, compound and air layering, graftage – whip and cleft. Indoor gardening - Hanging pots, Planning and layout of kitchen garden and orchards. (12 Hours)

REFERENCE BOOKS

1. Gupta, P.K.1994. Elements of Biotechnology. Rastogi& company, Meerut.
2. Suman, B.C. and Sharma, V.P. 2005. Mushroom cultivation & uses. Agrobios (India), Jodhpur.
3. Kumar, N. 1999. Introduction to Horticulture. Rajalakshmi Publications, Nagercoil.

TEXT BOOKS

1. Dubey, R. C. 2006. A Text book of Biotechnology. S. Chand & company Ltd., New Delhi.
- Albert, F. Hill. 1974.
2. Rao, K.M.Text Book of Horticulture. Mac Millan India Ltd., New Delhi.

Course Code 20UBYA21	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	M	L	L	L	-	-
CO2	H	M	M	M	L	-	-
CO3	H	M	M	M	L	-	-
CO4	M	M	M	M	L	-	-
CO5	M	M	M	M	L	-	-

Dr.B. KarunaiSelvi
Head of the Department

Dr.B. KarunaiSelvi
Dr.R. Murugalakshmi Kumari
Course Designers



V.V.VANNIAPERUMAL COLLEGE FOR WOMEN

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Re-accredited with 'A' Grade (3rd Cycle) by NAAC

VIRUDHUNAGAR - 626 001

ALLIED BOTANY

(2020 -2021 onwards)

Semester II	TAXONOMY OF ANGIOSPERMS, MEDICINAL BOTANY AND APPLIED BOTANY	Hours/Week: 2	
Allied Course		Credits: 2	
Course Code 20UBYA21P		Internal 40	External 60

COURSE OUTCOMES

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

- CO1 : apply the basic concepts learn in taxonomy for the identification of Botanical families and preparation of slides. [K3]
 - CO2 : draw the morphological features and identify the therapeutic properties of medicinal plants. [K3]
 - CO3 : observe and comment on the applied botany specimens. [K3]
 - CO4 : infer about the Horticulture technique. [K3]
 - CO5 : analyze and categorize the horticultural techniques and in the related areas.[K4]
1. To make dissections using dissection microscope of the floral parts of angiospermic plants and to make drawings to bring out the salient features [floral diagram also expected], to learn to mount the floral parts on a given slide.
 2. Identification of medicinal plants and recording their morphological features and therapeutic values.
 3. Microscopic Studies – Observation of different types of pollens in Lamiaceae, different types of anthers in Apocynaceae,
 4. Spotters from Applied Botany – Callus, Oyster and Button Mushroom, *Azolla*, Biogas Plant and Horticultural Tools
 5. Oyster and Button Mushroom Spawn preparation
 6. Compost and Biofertilizers preparation

7. Demonstration of techniques of Horticulture - Tongue and Whip grafting demonstration
8. To maintain an observation note book and to submit it for external valuation.
9. Field trips can be arranged for plant collection and identification in various biologically important areas.
10. Submission of Herbarium sheets (10) - Different types of leaves in Rutaceae and Collection of Euphorbiaceae members

Course Code 20UBYA21P	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	M	H	M	L	-	L
CO2	H	M	H	M	L	M	L
CO3	H	M	H	M	L	M	L
CO4	H	M	H	M	L	M	L
CO5	H	M	H	M	L	M	L

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VIRUDHUNAGAR - 626 001

B.Sc. CHEMISTRY

(2020 -2021 onwards)

Semester II	POLYMER CHEMISTRY	Hours/Week: 2	
Skill Enhancement Course -1		Credits: 2	
Course Code 20UCHS21		Internal 40	External 60

COURSE OUTCOMES

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

CO1: remember the basic concepts in organic and inorganic polymers. [K1]

CO2: understand the various types and synthesis of organic and inorganic polymers. [K2]

CO3: discuss about the various types of polymerization, plastics and rubber with its preparation and uses. [K2]

CO4: apply the steps to prepare and improve the quality of different types of polymers. [K3]

CO5: analyse the different methodology for preparations, classification, properties and uses of polymers. [K4]

UNIT I

Polymers - Introduction - definition - Classification of polymers- Types of polymerization reactions - Addition, condensation polymerization – examples-differences between addition and condensation polymerization. (6 Hours)

UNIT II

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

UNIT III

Resins -Definition - Types – Examples - Phenolic resin, amino resin and polyurethanes – preparation and uses. Fibres – Nylon-6, 6, Nylon 6 and polyester preparation and uses. (6 Hours)

UNITIV

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

UNITV

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

TEXT BOOKS

- 1.Jain& Jain. (2013).*Engineering Chemistry*, 16thEdition.DhanpatRai Publishing Company (P) Ltd.
- 2.JayashreeGhosh.(2013).*Fundamental concepts of Applied Chemistry*, S.Chand& Company Ltd.

REFERENCE BOOKS

- 1.K.BagavathiSundari.(2006). *Applied Chemistry*, MJP Publishers.
- 2.B.K.Sharma.(2008).*Industrial Chemistry*, 13thEdition.GOEL Publishing House.

Course Code 20UCHS21	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1. a	PSO 1. b	PSO 2	PSO 3. a	PSO 3. b	PSO 4. a	PSO 4 b	PSO 5	PSO 6	PSO 7
CO1	H	M	H	H	L	L	M	--	-	M
CO2	H	H	H	H	M	M	M	--	-	M
CO3	H	H	H	H	H	H	H	---	-	H
CO4	H	H	M	M	H	L	M	---	-	H
CO5	H	H	H	M	M	M	M	---	-	H

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Head of the Department

Mrs.R.Nagasathya
Course Designer



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VIRUDHUNAGAR - 626 001

B.Sc. CHEMISTRY (2022 -23 onwards)

Semester II	POLYMER CHEMISTRY	Hours/Week: 2	
Skill Enhancement Course -1		Credits: 2	
Course Code 20UCHS21N		Internal 40	External 60

COURSE OUTCOMES

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

CO1: explain the classification of polymers[K1]

CO2: to recognize the chemistry of polymer formation [K2]

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

CO4: apply the techniques of polymer preparation into a novel polymeric compound [K3]

CO5: analyse the utility of different polymers[K4]

UNIT I :

Polymers - Introduction - definition-Classification of polymers-Types of polymerization reactions-Addition, condensation polymerization examples-Polymerization techniques.

(6 Hours)

UNIT II :

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

(6 Hours)

UNIT III :

Resins-Definition - Types – Examples - Phenolic resin, amino resin and polyurethanes – preparation and uses. Fibres – Nylon-6,6, Nylon- 6 and polyester - preparation and uses.

(6 Hours)

UNIT IV :

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

UNIT V :

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

TEXT BOOKS

- 1.Jain& Jain. (2013).*Engineering Chemistry*, 16th Edition.DhanpatRai Publishing Company (P) Ltd.
- 2.JayashreeGhosh.(2013).*Fundamental concepts of Applied Chemistry*, S.Chand& Company Ltd.

REFERENCE BOOKS

- 1.K.BagavathiSundari.(2006). *Applied Chemistry*, MJP Publishers.
- 2.B.K.Sharma.(2008).*Industrial Chemistry*, 13th Edition.GOEL Publishing House.
- 3.V.R. Gowariker(2018) *Polymer Science* New Age International (P) Ltd, Publishers.

	PO1		PO2	PO3		PO4		PO5	PO6	PO7
20UCHS21N	PSO 1 a	PSO 1 b	PSO 2	PSO 3 a	PSO 3 b	PSO 4 a	PSO 4 b	PSO 5	PSO 6	PSO 7
CO 1	H	M	H	H	L	L	M	M	L	M
CO 2	H	H	H	H	M	M	M	M	L	M
CO 3	H	H	H	H	H	H	H	H	M	H
CO 4	H	H	M	M	H	L	M	M	M	H
CO 5	H	H	H	M	M	M	M	M	M	H

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B.Sc. CHEMISTRY

(2020 -21 onwards)

Semester III	INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY-I	Hours/Week: 5	
Core Course-5		Credits: 5	
Course Code 20UCHC31		Internal 25	External 75

COURSE OUTCOMES

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

- CO1: know the basic concepts of semi micro qualitative analysis, aliphatic nitrogen and alicyclic compounds colligative properties, solid state and group theory . [K1]
- CO2: explain the principles of qualitative analysis, properties of aliphatic nitrogen and alicyclic compounds and the theory of dilute solutions solid state and group theory. [K2]
- CO3: apply the principles of qualitative analysis, sketch the conformations of cyclic and alicyclic compounds, experiment with the colligative properties and identify the types of solid and group properties.[K3]
- CO4:analyse the applications of solubility product principle in qualitative analysis, Tautomerism, Nitrogen the relation between different colligative properties, crystal structure and various aspects of group theory. [K4]
- CO5: appraise the use of organic reagents in inorganic analysis, the stability of conformers and the structure of crystal systems. [K5]

UNIT I

a) Principles and techniques of semi micro methods –Aims of semi micro qualitative analysis – Types of reactions involved in qualitative analysis –Dry reactions – Precipitation reactions – applications of solubility product principle in qualitative analysis – Complexation reaction – Oxidation and reduction reactions- Spot tests - Preparation of solution for cation testing on semi micro scale- Removal of interfering ions in the analysis of cations –Oxalate , tartarate, borate, fluoride, chromate, phosphate and arsenite.

b) Organic reagents in inorganic analysis – applications of organic reagents – dimethyl glyoxime – aluminon – thiourea – uranyl zinc acetate - Rhodamine B- cupron - Magneson – alizarin. (15 Hours)

UNIT II

Aliphatic Nitrogen compounds:

- Nitrocompounds: Isomerism – General methods of preparation and properties of nitroalkanes Differences between nitroalkanes and alkyl nitrites.
- Alkyl cyanides and isocyanides: Thorpe nitrile condensation – carbylamine reaction – differences between cyanides and isocyanides.
- Amines: Classification – preparation of amines by Hofmann method - reaction of amines with nitrous acid – Mannich reaction - Hofmann mustard oil reaction – Basic character of amines – Quaternary ammonium salts – phase transfer catalysis
- Diamines: Preparation, properties and uses of ethylene diamine and hexamethylenediamine
- Diazo compounds: Preparation and synthetic applications of diazoacetic ester and diazomethane.
- Amide: Introduction to amides - Urea – Preparation, Properties, uses and structure.

(15 Hours)

UNIT III

Alicyclic Compounds, Conformational Analysis & Tautomerism

- Alicyclic compounds: Preparation-Freund's and Dieckmann methods-properties of cycloparaffins – relative stability of cycloalkanes – Baeyer's strain theory – its limitations and modification.
- Conformational analysis: Differences between configuration and conformation. Fischer, Sawhorse and Newman projection formulae –conformational analysis of ethane, n- butane, 1,2-dichloroethane, cyclohexane and monosubstituted cyclohexane.
- Civetone and muscone –synthesis and structure only (no Structural elucidation)
- Tautomerism: Definition-conditions of tautomerism-prototropy and anionotropy. Difference between tautomerism and resonance. Keto-enol tautomerism, nitro-acinitro tautomerism, lactum-lactim tautomerism. (15 Hours)

UNIT IV**Theory of Dilute Solution:**

- Colligative properties – lowering of vapour pressure – Raoult's law – Derivation of Raoult's law – Measurement of lowering of vapour pressure – Ostwald & Walker's Dynamic method – Determination of molecular weight from lowering of vapour pressure
- Elevation of boiling point – Measurement of elevation of boiling point by Cottrell's method – determination of molecular weight – Relation between lowering of vapour pressure and elevation of boiling point – Ebullioscopic constant
- Depression of freezing point – Measurement of depression of freezing point by Beckmann's method – Determination of molecular weight from depression of freezing point – Cryoscopic constant
- Osmotic pressure – laws of osmotic pressure – Determination of Osmotic pressure by modern Osmometer – van't Hoff theory of dilute solution – Reverse osmosis – Desalination of sea water. (15 Hours)

UNIT V**Group theory and Solid State**

- Introduction – molecular symmetry elements and symmetry operations – product of symmetry operations – commutative symmetry operations – properties of group – similarity transformation – matrix representation of symmetry elements - classes and sub groups.
- Point group – definition – classification of molecules into point groups – C_{2v} , C_{3v} , C_{2h} , D_{2h} , T_d , D_{6h} and O_h – group multiplication table for C_{2v} point group.
- Isotropy and anisotropy – laws of crystallography – Representation of planes – Miller indices, space lattice, Unit cell, Bravais lattices – Seven crystal systems – X-ray diffraction – Derivation of Bragg's equation – Determination of structure of NaCl by rotating crystal method – Ionic crystals - CsCl – Covalent crystals – diamond. (15 Hours)

TEXT BOOKS

- Gopalan, R. (2011). *Elements of Analytical Chemistry*, 3rd Edition. New Delhi: Sultan Chand & Sons.
- ArunBahl&Bahl, B.S. (2012). *Advanced Organic Chemistry*, 1^{9th} Edition. New Delhi: S.Chand& Company Ltd.
- ArunBahl, Bahl, B.S. & Tuli, G.D. (2017). *Essentials of Physical Chemistry*, 2nd Edition. New Delhi: S.Chand& Company Ltd.
- Swarnalakshmi, S. (2012). *A Simple Approach to Group Theory in Chemistry*, 1st Edition. Hyderabad: University Press.

REFERENCE BOOKS

1. Tewari, K.S. & Vishnoi, N.K. (2006). *A Text book of Organic Chemistry*, 3rd Edition. New Delhi: Vikas Publishing House Pvt. Ltd.
2. Finar, I.L. (2006). *Organic Chemistry*, Volume -I, 6th Edition. Singapore: Pearson Education Pvt. Ltd.
3. Soni, P.L. (2008). *Text Book of Physical Chemistry*, 2nd Edition. New Delhi: Sultan Chand & Sons.
4. Negi, A.S. & Anand, S.C. (2008). *A text book of Physical Chemistry*, 2nd Edition. New Delhi: A New Age International Publishers.
5. Puri, Sharma, Pathania, (2008). *Elements of Physical Chemistry*, 4th Edition. Jalandhar Delhi: Vishal Publishing & Co.
6. Ramakrishnan, V. & Gopinathan, M.S. (2014). *Group Theory in Chemistry*, 1st Edition. Jalandhar, Delhi: Vishal Publishing Company.
7. Bajpai, (2011). *Advanced Physical Chemistry*, 2nd Edition. New Delhi: S. Chand & Company Limited.

Course Code 20UCHC31	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1. a	PSO 1. b	PSO 2	PSO 3.a	PSO 3. b	PSO 4. a	PSO 4. b	PSO 5	PSO 6	PSO 7
CO1	L	L	H	L	M	M	M	--	-	H
CO2	M	M	H	H	M	H	H	---	-	H
CO3	L	L	L	L	M	H	M	---	-	L
CO4	M	M	M	H	H	H	H	---	-	H
CO5	H	H	L	M	L	H	H	--	-	M

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Dr.M.Amutha
Tmtty.A.Prasanna
Course Designer



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VIRUDHUNAGAR - 626 001

B.Sc. CHEMISTRY

(2020-2021 onwards)

Semester III	Properties of Matter and Heat	Hours/Week:4	
Allied Course		Credits:4	
Course Code 20UPCA31		Internal 25	External 75

COURSE OUTCOMES

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

CO1: explain the basic laws, concepts in properties of matter and heat. [K1]

CO2: derive mathematical relations involved in properties of matter and heat.[K2]

CO3: discuss the experimental methods to determine the physical parameters related to properties of matter and heat.[K2]

CO4: illustrate the applications of properties of matter and heat.[K3]

CO5: analyze the different moduli of elasticity, molecular theory of surface tension, Isothermal and adiabatic changes, Applications of Curie's law and Maxwell's law of distribution of molecular speed. [K4]

UNIT I

Elasticity-Different Moduli of elasticity-Poisson's ratio-Bending of beams- Expression for the bending moment -Determination of Young's modulus by uniform bending -Determination of Young's modulus by non-uniform bending-I-Section girders-Torsion of a cylinder - Expression for couple per unit twist -Work done in twisting-Torsional oscillations of a body - Determination of Rigidity modulus by Torsion pendulum (12 Hours)

UNIT II

Viscosity- Stream line flow and turbulent flow-Co-efficient of viscosity-Derivation of Poiseuille's formula - Terminal Velocity-Stokes' Law - Determination of η of a highly viscous liquid-lubrication- Surface Tension: Molecular theory of Surface Tension-excess pressure inside a liquid drop-excess pressure inside a soap bubble- Applications of Bernoulli's theorem.

(12 Hours)

UNIT III

Expansion of crystals – Determination of α by air wedge method – Expansion of anisotropic solids-solids of low expansivity and their uses- an anomalous expansion of water-thermostats. Isothermal and adiabatic changes– Derivation of equations for both C_v , and C_p of a gas – relation between them – experimental determination of C_v by Joly's method- determination of C_p by Regnault's method. (12 Hours)

UNIT IV

Kinetic theory of gases – Mean free path – transportphenomena –diffusion, viscosity and thermal conductivity-Maxwell's law of distribution of molecular speed-experimental verification – degreeoffreedom-Boltzman'slawofequipartitionofenergy-calculationof C_p for mono atomic and diatomic gases. (12 Hours)

UNIT V

Thermodynamics- Carnot's theorem –Derivation of efficiency- second law of thermodynamics – entropy – change of entropy in Carnot' scycle-change of entropyin conversion of ice into steam -Joule - Kelvin Effect – simple theory of Porous -Plug experiment -adiabatic demagnetisation - Curie's Law- Giauque's Method- Superconductivity. (12 Hours)

TEXT BOOK

1. Murugesan, R (2014), *Allied Physics*, New Delhi. Sultan Chand & Company Private Ltd.

REFERENCE BOOKS

1. Brijilal, N, Subramanian and Hemne, P.S. (2014). *Heat, Thermodynamics and Statistical Physics*, New Delhi: Sultan Chand & Company Private Ltd.
2. Ubald Raj, A., & Jose Robin, G (2016). *Allied Physics–I*, Marthandam: Indira Publications.

Course Code 20UPCA31	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	M	L	-	-	-	M
CO2	H	H	H	L	-	-	-
CO3	H	M	M	M	-	-	-
CO4	H	H	H	M	-	L	-
CO5	H	M	M	M	H	-	-

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VIRUDHUNAGAR - 626 001

B.Sc. CHEMISTRY

(2020 -21 onwards)

Semester III	FOOD CHEMISTRY	Hours/Week: 2	
Skill Enhancement Course- 2		Credits: 2	
Course Code 20UCHS31		Internal 40	External 60

COURSE OUTCOMES

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

CO1:state the classification and functions of food, food processing, food preservation, food additives, food adulteration and food poisons. [K1]

CO2:explain the functions of food, types of food preservation, food processing, sweeteners, common food adulterants and sources of chemical poisons in food. [K2]

CO3:discuss the role of carbohydrates, proteins, chemical preservatives, food colours, food adulterants and food poisons. [K2]

CO4:interpret the functions of proteins, lipids, effect of cooking on various food stuffs, flavouring agents, antioxidants, food adulterants in food items and food poisons. [K3]

CO5:analyze the concept of various nutrients in food, food processing methods, food additives, food adulteration and treatment of food poisoning. [K4]

UNIT I

Introduction – Food – classification – Functions of food- metabolism – role of carbohydrates, proteins, lipids, vitamins, minerals and water. (6 Hours)

UNIT II

Food Processing– Cooking-effect of cooking on nutrients, various food stuffs - preservation – types of preservation – Physical preservation – refrigeration, freezing, canning, dehydration and freeze drying - chemical preservatives. (6 Hours)

UNIT III

Food Additives-Sweeteners – Food colours – Flavouring agents – Antioxidants – Emulsifiers – Acidulants. (6 Hours)

UNIT IV

Food Adulteration -Common food adulterants – Analysis of food adulterants – Harmful effects of food adulterants. (6 Hours)

UNIT V

Food poison-Natural poisons (alkaloids, Nephrotoxins) –Sources of chemical poison in food -lead and mercury - Pesticides (DDT, BHC, Malathion) – Treatments for food poisoning. (6 Hours)

TEXT BOOKS

1. Ramani, V. (2014). *Food Chemistry*, 1st Edition. Chennai: MJP Publishers.
2. Thankamma Jacob, (1979). *A Text Book of Applied Chemistry for Home Science and Allied Sciences*, 1st Edition. New Delhi: The Macmillan Company of India Ltd.

REFERENCE BOOKS

Jayashree Ghosh, (2013). *Fundamental Concepts of Applied Chemistry*, 1st Edition. New Delhi: S. Chand & Company Ltd.

Course Code 20UCHS31	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1. a	PSO 1. b	PSO 2	PSO 3. a	PSO 3. b	PSO 4. a	PSO 4. b	PSO 5	PSO 6	PSO 7
CO1	L	M	L	H	M	H	M	---	-	H
CO2	L	M	L	H	L	H	H	---	-	H
CO3	M	L	L	H	L	L	H	---	-	H
CO4	M	L	L	M	L	L	H	---	-	H
CO5	H	M	M	H	L	M	H	---	-	H

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VIRUDHUNAGAR - 626 001

B.Sc. CHEMISTRY

(2020 -21 onwards)

Semester IV	INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY-II	Hours/Week: 5	
Core Course-6		Credits: 5	
Course Code 20UCHC41		Internal 25	External 75

COURSE OUTCOMES

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

CO1: know the basic concepts of d block elements, stereochemistry, carbohydrates, oils and fats, nuclear and quantum chemistry. [K1]

CO2: understand the properties of d block elements, stereoisomers, sugars and non-sugars, oils and fats, theory behind nuclear and quantum chemistry. [K2]

CO3: explain the metallurgy of coinage metals, dualistic nature of matter and principle of nuclear bomb, sketch the configuration of stereoisomers and carbohydrates. [K3]

CO4: compare coinage metals and eighth group elements, chiral and achiral compounds, oils and fats, applications of radioactivity and derive Schrodinger equation. [K4]

CO5: interpret the alloys and compounds of coinage metals, parameters of stereoisomers, oils and fats, uncertainty principle, life period of radioactive elements. [K5]

UNIT I

Chemistry of d block elements:

Electronic configuration –Oxidation states – complex formation – Non – stoichiometric compounds – example - coinage metals – Resemblance among Cu, Ag and Au – Resemblance between Coinage metals and the Eighth group elements – Extraction and alloys of Cu, Ag & Au.

(15 Hours)

UNIT II

Nuclear chemistry

- a) Constitution of the nuclei – stable and unstable nuclei – their relationship to n-p ratio-magic number – mass defect and binding energy – whole number rule – packing fraction – mass energy relationship - Soddy's group displacement law.
- b) Artificial radioactivity: Definition – different types of artificial radioactivity brought about by accelerated particles. Nuclear fusion and fission- Theories of fission – application of fission – principle of atom bomb – nuclear fusion – emission of energy – stellar energy and hydrogen bomb.
- c) Applications of radioactivity: Applications in medicine, agriculture and industry – as trace elements in the elucidation of structure and in the investigation of reaction mechanism in analytical chemistry – activation analysis – carbon dating. (15 Hours)

UNIT III

Stereochemistry

- a) Geometrical isomerism – definition – geometrical isomerism of maleic and fumaric acids – aldoximes and ketoximes – determination of configuration of geometrical isomers – E, Z – notation.
- b) Optical isomerism:
- i) Optical activity – specific rotation – elements of symmetry – cause for optical activity.
 - ii) Optical isomerism of compounds containing asymmetric carbon atom: optical isomerism of lactic acid and tartaric acid - racemisation and resolution of racemic mixtures – Walden inversion and asymmetric synthesis – chirality – specification of absolute configuration by R and S notation.
 - iii) Optical activity of compounds without asymmetric carbon atoms – allenes, spiranes and biphenyl compounds. (15 Hours)

UNIT IV

Carbohydrates, Oils & Fats

- a) Carbohydrates: Introduction – Classification with example – Monosaccharide – differences between glucose and fructose – configuration of glucose – interconversion of glucose and fructose – ascending and descending of sugar series – mutarotation – epimerization.

Disaccharide – Properties and structure elucidation of sucrose and maltose – Polysaccharide - Preparation, properties, structure (elucidation not necessary) and industrial uses of starch and cellulose.

b) Oils and fats: Definition- properties-hydrolysis, hydrogenation, hydrogenolysis, drying of oils, rancidification and its types - determination and applications of saponification value, iodine value and acid value - Difference between oils and fats. (15 Hours)

UNIT V

Quantum Chemistry

Introduction – Black body radiation and Planck’s theory (no derivation) – Compton effect – Photo electric effect – Heisenberg’s uncertainty principle - Dualistic nature of matter – de-Broglie equation – derivation - Postulates of quantum mechanics – derivation of Schrodinger’s wave equation – its significance – Application of SWE to 1-dimensional and 3-dimensional box. (15 Hours)

TEXT BOOKS

1. SatyaPrakash, Tuli, G.D. Basu, Madan, R. (2011). *Advanced Inorganic Chemistry*, 1st Edition. New Delhi: S.Chand& Company, Ltd.
2. ArunBahl&Bahl B.S, (2009) *Advanced Organic Chemistry*, 19th Edition. New Delhi:S.Chand& Company Ltd.
3. Chandra,A.K. (2000). *Introductory Quantum Chemistry*, 3rd Edition. New Delhi: Tata McGraw Hill Publishing Co.
4. Prasad.R.K,(2004). *Quantum Chemistry*,4th Edition.New Delhi: New Age International Publishers.

REFERENCE BOOKS

1. Puri, Sharma, Kalia, (2017). *Principles of Inorganic Chemistry*,33rd Edition.New Delhi: Vishal Publishers.
2. Soni, P.L. (2008). *A Text book of Inorganic Chemistry*, 20th Edition. New Delhi: Sultan Chand & Sons.
3. Madan, R.D. (2018). *Modern Inorganic Chemistry*, 3rd Edition.New Delhi: S.Chand& Company Ltd.
4. Tewari, K.S. &Vishnoi, N.K. (2006). *A Text book of Organic Chemistry*,3rd Edition. New Delhi:Vikas Publishing House Pvt. Ltd.
5. Finar, I.L. (2003).-Volume I, *Organic Chemistry*, 6th Edition. Singapore: Pearson Education Pvt. Ltd.

6. Agarwal, O. P. (2017). *Organic Chemistry Reactions and Reagents*, 22nd Edition. Meerut: GOEL Publishing House.
7. Soni, P.L, (2008). *Text Book of Physical Chemistry*, 2nd Edition. New Delhi: Sultan Chand & Sons.
Negi, A.S. & Anand S.C, (2008). *A text book of Physical Chemistry*, 2nd Edition. New Delhi: New Age International Publishers.
8. Puri, Sharma, Pathania, (2008). *Elements of Physical Chemistry*, 4th Edition. Delhi: Vishal Publishing & Co.
9. Jalandhar, Lee, J.D. (2007). *Concise Inorganic Chemistry*, 4th Edition. Malden USA:

Course Code 20UCHC41	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1. a	PSO 1. b	PSO 2	PSO 3. a	PSO 3. b	PSO 4. a	PSO 4. b	PSO 5	PSO 6	PSO 7
CO1	L	L	L	H	H	H	H	L	-	---
CO2	L	L	L	H	M	H	M	L	-	---
CO3	L	M	M	L	L	H	H	--	-	---
CO4	M	H	H	H	H	H	H	--	-	--
CO5	H	M	L	L	M	M	H	--	-	--

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Head of the Department

Mrs.R.Nagasathya
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VIRUDHUNAGAR - 626 001

B.Sc. CHEMISTRY

(2022-23 onwards)

Semester IV	INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY-II	Hours/Week: 5	
Core Course-6		Credits: 5	
Course Code 20UCHC41N		Internal 25	External 75

COURSE OUTCOMES

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

CO1: comprehend the chemistry of d block elements, basic concepts of stereochemistry, carbohydrates, oils, fats, nuclear and quantum chemistry. [K1]

CO2: understand the characteristics of d block elements, distinguish the stereoisomers, sugars and non- sugars, oils and fats, different types of nuclear reactions and reactors.[K2]

CO3: relate coinage metals and the eighth group elements, dualistic nature of matter and principle of atom bomb and hydrogen bomb, predict the configuration of stereoisomers and elucidate the structure of carbohydrates. [K3]

CO4: analyse the metallurgy of coinage metals, the cause of optical activity in chiral and achiral compounds, artificial radioactivity and significance of Schrodinger's wave equation and examine oils and fats. [K4]

CO5: categorize the alloys of coinage metals, select appropriate methods for racemization, resolution of racemic mixtures and asymmetric synthesis, ascend and descend the sugar series and apply carbon dating and Schrodinger's wave equation to 1-dimensional and 3-D boxes. [K5]

UNIT I :

Chemistry of d block elements:

Electronic configuration –Oxidation states – complex formation – Non – stoichiometric compounds – example - coinage metals – Resemblance among Cu, Ag and Au – Resemblance between Coinage metals and the Eighth group elements – Extraction and alloys of Cu, Ag &Au.

(15 Hours)

UNIT II :

Nuclear chemistry

- a) Constitution of the nuclei – stable and unstable nuclei – Isotopes-Isotones- α , β decay, decay constants, Nuclear reactor-Breeder reactor their relationship to n-p ratio-magic number Soddy's group displacement law.
- b) Artificial radioactivity: Definition – different types of artificial radioactivity brought about by accelerated particles. Nuclear fusion and fission- Theories of fission – application of fission – principle of atom bomb – nuclear fusion – emission of energy – stellar energy and hydrogen bomb.
- c) Applications of radioactivity: Applications in medicine, agriculture and industry – as trace elements in the elucidation of structure and in the investigation of reaction mechanism in analytical chemistry – activation analysis – Principles of carbon dating. (15 Hours)

UNIT III :

Stereochemistry

- a) Geometrical isomerism – definition – geometrical isomerism of maleic and fumaric acids – aldoximes and ketoximes – determination of configuration of geometrical isomers – E, Z – notation-Stereochemistry of addition of bromine to alkenes.
- b) Optical isomerism:
 - i) Optical activity – specific rotation and its polarimetric determination– elements of symmetry – cause for optical activity.
 - ii) Optical isomerism of compounds containing asymmetric carbon atom: optical isomerism of lactic acid and tartaric acid - racemisation and resolution of racemic mixtures – Walden inversion and asymmetric synthesis – chirality – specification of absolute configuration by R and S notation. (15 Hours)

UNIT IV :

Carbohydrates, Oils & Fats

- a) Carbohydrates: Introduction – Classification with example – Monosaccharide – differences between glucose and fructose – configuration of glucose – interconversion of glucose and fructose – ascending and descending of sugar series – mutarotation – epimerization. Disaccharide – Properties and structure elucidation of sucrose and maltose – Polysaccharide - Preparation, properties, structure (elucidation not necessary) and industrial uses of starch and

cellulose.

- b) Oils and fats: Definition- properties-hydrolysis, hydrogenation, hydrogenolysis, drying of oils, rancidification and its types - determination and applications of saponification value, iodine value and acid value - Difference between oils and fats. (15 Hours)

UNIT V :

Quantum Chemistry

Introduction – Black body radiation and Planck’s theory (no derivation) – Compton effect – Photo electric effect – Heisenberg’s uncertainty principle - Dualistic nature of matter – de-Broglie equation – derivation - Postulates of quantum mechanics – derivation of Schrodinger’s wave equation – its significance – Application of SWE to 1-dimensional and 3-dimensional box. (15 Hours)

TEXT BOOKS

1. Satya Prakash, Tuli, G.D. Basu, Madan, R. (2011). *Advanced Inorganic Chemistry*, 1st Edition. New Delhi: S.Chand& Company, Ltd.
2. Arun Bahl & Bahl B.S, (2009) *Advanced Organic Chemistry*, 19th Edition. New Delhi: S.Chand& Company Ltd.
3. Chandra,A.K. (2000). *Introductory Quantum Chemistry*, 3rd Edition. New Delhi: Tata McGraw Hill Publishing Co.
4. Prasad.R.K,(2004). *Quantum Chemistry*,4th Edition.New Delhi: New Age International Publishers.

REFERENCE BOOKS

1. Puri, Sharma, Kalia, (2017). *Principles of Inorganic Chemistry*,33rd Edition.New Delhi: Vishal Publishers.
2. Soni, P.L. (2008). *A Text book of Inorganic Chemistry*, 20th Edition. New Delhi: Sultan Chand & Sons.
3. Madan, R.D. (2018). *Modern Inorganic Chemistry*, 3rd Edition.New Delhi: S.Chand& Company Ltd.
4. Tewari, K.S. & Vishnoi, N.K. (2006). *A Text book of Organic Chemistry*,3rd Edition. New Delhi: Vikas Publishing House Pvt. Ltd.
5. Finar, I.L. (2003).-Volume I, *Organic Chemistry*, 6th Edition. Singapore: Pearson Education Pvt. Ltd.

6. Agarwal, O. P. (2017). *Organic Chemistry Reactions and Reagents*, 22nd Edition. Meerut: GOEL Publishing House.
7. Soni, P.L, (2008). *Text Book of Physical Chemistry*, 2nd Edition. New Delhi: Sultan Chand & Sons.
Negi, A.S. & Anand S.C, (2008). *A text book of Physical Chemistry*, 2nd Edition. New Delhi: New Age International Publishers.
8. Puri, Sharma, Pathania, (2008). *Elements of Physical Chemistry*, 4th Edition. Delhi: Vishal Publishing & Co.
9. Jalandhar, Lee, J.D. (2007). *Concise Inorganic Chemistry*, 4th Edition. Malden USA:
10. Robert Thornton Morrison, Robert Neilson Boyd & Saibal Kanti Bhattacharjee (2013) *Organic Chemistry*, 7th Edition. Pearson.

	PO1		PO2	PO3		PO4		PO5	PO6	PO7
20UCHC41N	PSO 1 a	PSO 1 b	PSO 2	PSO 3 a	PSO 3 b	PSO 4 a	PSO 4 b	PSO 5	PSO 6	PSO 7
CO 1	H	H	L	H	H	H	H	M	L	M
CO 2	H	H	L	H	M	H	M	L	H	H
CO 3	H	H	M	L	L	H	H	M	H	H
CO 4	H	H	H	H	H	H	H	H	M	H
CO 5	H	H	L	L	M	M	H	M	M	H

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VIRUDHUNAGAR - 626 001

B.Sc. CHEMISTRY

(2020-21 onwards)

Semester IV	INORGANIC SEMI MICRO QUALITATIVE ANALYSIS	Hours/Week: 2	
Core Practical - 2		Credits: 2	
Course Code 20UCHC41P		Internal 40	External 60

COURSE OUTCOMES

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

- CO1: apply systematic procedure and find out the non-interfering and interfering anions present in the given mixture. [K3]
- CO2: identify the cations present in the given mixture.[K3]
- CO3: find out a method to eliminate the interfering anions. [K3]
- CO4: interpret the result & record them.[K4]
- CO5: analyse the concentration of unknown solution of Fe(II) & Cu(II) ions and compare the result with the standard solution.[K4]

I. Analysis of a mixture containing two anions of which one is an interfering ion and two cations by semi – micro method.

Anions:

Carbonate, sulphate, nitrate, fluoride, chloride, bromide, iodide, oxalate, borate, phosphate, arsenite, and chromate.

Cations:

Lead, bismuth, copper, cadmium, aluminium, zinc, manganese, cobalt, nickel, barium, strontium, calcium, magnesium and ammonium.

II. Estimation of Fe(III) ions and Cu(II) ions using Colorimeter.

Course Code 20UCHC41P	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1 a	PSO 1 b	PSO 2	PSO 3 a	PSO 3 b	PSO 4 a	PSO 4 b	PSO 5	PSO 6	PSO 7
CO1	L	L	H	M	M	M	L	L	--	M
CO2	L	L	H	M	M	M	L	L	--	M
CO3	M	L	H	M	M	M	L	L	--	M
CO4	M	L	H	M	M	H	L	L	--	M
CO5	H	M	H	M	M	H	L	L	--	M

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Dr.J.Kavitha
Dr.A.Anitha
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VIRUDHUNAGAR - 626 001

B.Sc. CHEMISTRY
 (2020 -2021 onwards)

Semester IV	Optics, Electricity & Electromagnetism and Electronics	Hours/Week:4	
Allied Course		Credits:4	
Course Code 20UPCA41		Internal 25	External 75

COURSE OUTCOMES

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

- CO1: explain the basic concepts inoptics, electricity, electromagnetism and Digital electronics. [K1]
- CO2: derive mathematical relations involved inoptics, electricity, electro magnetism, and digital electronics by applying the relevant concepts.[K2]
- CO3: discuss the experimental methods to determine the physical parameters related to electricity, electromagnetism, optics. [K2]
- CO4: illustrate the applications of electricity, electromagnetism, optics and logicgates.[K3]
- CO5: analyze the series and parallel resonance circuits, applications of spectroscopy, kirchoff's law, applications of half adder and full adder. [K4]

UNIT I

Optics – dispersion through a prism–expression for the dispersive power of the material of a thin prism– Achromatism in prism– deviation without dispersion–dispersion without deviation- Interference– condition for interference-Interference in thin films–Air wedge.-Diffraction-Plane transmission grating– Polarisation of light– Double slit experiment– Nicol prism – Specific Rotatory Power - Half Shade Polarimeter (12 Hours)

UNIT II

Fibre Optics-fibre construction–light propagation in fibre–numerical aperture– Fibre optic communication system–advantages of fibre optic communication system- Spectroscopy: Infrared spectroscopy– properties–sources– detectors.– Raman Effect- Experimental study

of Raman Effect—characteristics of Raman lines—Quantum theory of Raman Effect—Applications— Wave nature of matter—de-Broglie Wavelength—Electron diffraction – G.P. Thomson’s experiment. (12 Hours)

UNIT III

Kirchoff’s laws – application of Wheatstone's network- sensitiveness of bridge- Carey Foster bridge –Measurement of resistance and temperature coefficient of resistance- principle of potentiometer –Calibration of ammeter and voltmeter- low and high range- measurement of resistance using potentiometer. (12 Hours)

UNIT IV

Torque on a current loop -mirror galvanometer, deadbeat and ballistic -current sensitiveness- voltage sensitiveness- B.G.theory –damping correction –experiments for charge sensitiveness – comparison of emf’s and comparison of capacitors-Electromotive force generated in a coil rotating in a uniform magnetic field R.M.S. and mean values-LCR circuit-impedance– Series and parallel resonant circuits-Power factor – Wattless current- Choke. (12 Hours)

UNIT V

Binary number system – reason for using binary numbers- binary. To decimal and decimal to binary conversions –addition and subtraction of binary numbers- Logic circuits – Boolean algebra – DeMorgan's theorem-OR, AND, NOT, NOR and NAND gates-NOR and NAND gates as universal building blocks – XOR gates– Half adder–Full adder–Half subtractor –Full subtractor. (12 Hours)

TEXT BOOK

1. R.Murugesan, R, (2014), *Allied Physics*, Sultan Chand & Company Private Ltd, New Delhi

REFERENCE BOOKS

1. Brijlaland Subramaniam, N, (2013), *Text book of Optics*, Sultan Chand & Company Pvt.Ltd, New Delhi.
2. Ubald Raj, A., & Jose Robin, G, (2016), *Allied Physics–II*, Indira Publications.

Course Code 20UPCA41	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	M	L	-	-	-	M
CO2	H	H	H	L	-	-	-
CO3	H	M	M	M	-	-	-
CO4	H	H	H	M	-	L	-
CO5	H	M	M	M	H	-	-

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VIRUDHUNAGAR - 626 001

B.Sc. CHEMISTRY (2020 -2021 onwards)

Semester III/IV	GENERAL PHYSICS	Hours/Week:2	
Allied Course II Practical		Credits:2	
Course Code 20UPCA41P		Internal 40	External 60

COURSE OUTCOMES

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

- CO1: apply the theoretical concepts in Mechanics and Properties of matter, Optics and electronics related experiments. [K3]
- CO2: draw the circuit diagram /experimental set up with tabular column and use the formula to calculate the necessary physical parameters. [K3]
- CO3: develop technical skills in handling the equipment and components and make required measurements related to the experiment. [K3]
- CO4: work as a team while doing group practical and uphold the truthfulness in all aspects of work by avoiding unethical or misrepresenting data.[K3]
- CO5: analyze and evaluate the accuracy of the results obtained and compare it with the theoretical value. [K4, K5]

List of Experiments:

1. Young's Modulus by uniform bending-pin and microscope.
2. Determination of 'g' using compound pendulum
3. Torsion Pendulum-determination of rigidity modulus.
4. Surface Tension by Drop weight method
5. Co-efficient of viscosity-Stoke's method.

6. Air wedge-Thickness of a wire.
7. Calibration of voltmeter (low range)– Potentiometer.
8. Calibration of ammeter using potentiometer
9. Resistance and resistivity– Potentiometer.
10. Mirror Galvanometer -voltage and current sensitiveness.
11. L.C.R. -Series resonance-determination of L.
12. Verification truth table for AND, OR, NOT gates using ICs
13. Half Adder and Half Subtractor.
14. Comparison of Capacitances-DeSauty's method using head phone.

Course Code 20UPCA41P	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	M	L	M	H	M	M	M
CO2	M	M	M	M	L	L	L
CO3	M	L	M	M	L	M	L
CO4	M	L	M	H	L	M	M
CO5	M	L	M	M	M	M	L

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B.Sc. CHEMISTRY (2020 -2021 onwards)

Semester IV	LEATHER CHEMISTRY	Hours/Week: 2	
Skill Enhancement Course- 3		Credits: 2	
Course Code 20UCHS41		Internal 40	External 60

COURSE OUTCOMES

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

- CO1: know about the history of tanning industry, leather processing, tanning process and pollution due to tanneries. [K1]
- CO2: understand the various steps involved in processing of leather and tanning and treatment of pollutants. [K2]
- CO3: classify the different tannage materials, different methods for tanning process and Types of pollution arise from leather industry. [K2]
- CO4: apply different steps of leather processing, tanning and finishing process to get different types of leather. [K3]
- CO5: analyze the effect of various types of leather processing, tanning and finishing process, pollution due to tanneries and the treatment of tannery effluents. [K4]

UNIT I

History of tanning industry - chief processes involved in leather manufacture – Structure of hide and skin. (6 Hours)

UNIT II

Detailed study of leather processing – Flaying – Curing – Drying – Salt curing - Brine curing-Beam house processes – Soaking – Unhairing – Liming – Fleshing – Deliming – Bating - Pickling. (6 Hours)

UNIT III

Tanning process – Different tannage materials - Methods of tanning – Vegetable tanning – Chrome tanning – one bath method – Two bath method - aldehyde tannage.

(6 Hours)

UNIT IV

Finishing processes after tanning – removal of surplus tan liquor – washing – neutralizing – trimming – removal of excess of water – retanning – dyeing - fat liquoring - drying. (6 Hours)

UNIT V

Pollution due to tanneries –effect of pollutants - Treatment of tannery effluents - primary, secondary and tertiary processes.

(6 Hours)

TEXT BOOKS

JayashreeGhosh, (2013). *Fundamental Concepts of Applied chemistry*, 1st Edition.

New Delhi:S.Chand&Company LTD.

REFERENCE BOOKS

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

Course Code 20UCHS41	PO1		PO2	PO3		PO4		PO6	PO7	
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 6	PSO 7.a	PSO 7.b
CO1	L	L	L	L	L	H	L	M	-	---
CO2	L	L	M	L	L	H	M	M	-	--
CO3	L	L	M	L	L	H	M	M	-	L
CO4	M	H	M	L	L	H	M	H	-	L
CO5	H	M	M	M	L	H	L	H	-	L

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Semester IV	Internship / Field Project (2020 -21 onwards)	Hours/Week: 0
PART IV		Credit: 1
Course Code 20UCHI41G		Internal 100

COURSE OUTCOMES

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

- CO1: relate their theoretical insights with hands-on experience. [K3]
- CO2: develop technical skills to their respective field of study. [K3]
- CO3: demonstrate the attributes such as observational skills, team spirit and interpersonal skills built through site visits. [K3]
- CO4: exhibit the written communication skills acquired through internship/field project. [K3]
- CO5: analyze the observations and results and communicate their academic and technological knowledge appropriately oralmeans. [K4]

GENERAL INSTRUCTIONS:

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

Course Code 20UCHI41G	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	M	M	M	M	H	-
CO2	H	M	M	M	M	H	
CO3	H	M	-	-	-	H	
CO4	H	H	M	M	-	M	H
CO5	H	M	H	H	M	-	

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VIRUDHUNAGAR - 626 001

B.Sc. CHEMISTRY

(For those who join in 2020-2021 and after)

Semester V	ORGANIC CHEMISTRY-II	Hours/Week: 4	
Core Course-7		Credits: 4	
Course Code 20UCHC51		Internal 25	External 75

COURSE OUTCOMES

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

CO1: acquire basic knowledge about aromatic compounds. [K1]

CO2: explain the chemistry of aromatic compounds. [K2]

CO3: make use of aromatic compounds according to the needs of the society. [K3]

CO4: analyse benzenoid and non-benzenoid compounds. [K4]

CO5: compare aromatic and aliphatic compounds and estimate aromatic compounds volumetrically. [K5]

UNIT I

Aromaticity

- i) Aromatic compounds - Introduction – Nomenclature-General characteristics of aromatic compounds – aromaticity and Huckel rule – structure of benzene – MO approach-resonance - condition and effects of resonance- resonance energy-application to benzene
- ii) Mechanism of aromatic electrophilic substitution –Halogenation, nitration, sulphonation & Friedel – Crafts reaction.
- iii) Orientation in mono-substituted-Directive influence of substituents based on electronic effects
- iv) Introduction of a third substituent into the benzene ring- rules. (12 Hours)

UNIT II

Aromatic halogen compounds, phenols, alcohols and ethers

- i) **Aromatic halogen compounds:** Aryl halides-preparation by Hunsdiecker reaction-properties –aromatic nucleophilic substitution reaction-mechanism of bimolecular nucleophilic substitution (S_NAr)-Benzyne mechanism-Preparation and uses of DDT and benzene hexachloride
- ii) **Phenols:** a) Manufacture of phenol from coal tar – Acidity of phenol – effect of substituents on the acidity of phenol – Mechanism of electrophilic substitution reaction – Kolbe’s reaction and Reimer - Tiemann reaction. Miscellaneous reactions - Lederer Manasse reaction & Elb’s persulphate oxidation – estimation of phenol.
b) Preparation, properties & uses of dihydric and trihydric phenols
- iii) **Aromatic alcohols:** Benzyl alcohol-distinction between phenol and benzyl alcohol
- iv) **Aromatic ethers:** Preparation, properties & uses of anisole and phenetole

(12 Hours)

UNIT III

Aromatic aldehydes, ketones and Acids

i) Aromatic aldehydes and ketones

- a) Benzaldehyde – preparation- Sommelet reaction – Benzoin, Cannizzaro, Perkin, Knoevenagel and Claisen reactions with mechanism – uses of benzaldehyde.
- b) Properties & uses of cinnamaldehyde and salicylaldehyde – vanillin – preparation from Eugenol – properties & uses.
- c) Phenolic ketone : phloroacetophenone – preparation by Houben – Hoesch synthesis. Preparation & uses of phenacyl bromide, Michler’s ketone and dypnone

ii) Aromatic Acids:

- a) Effect of substituents on acidic character.
- b) Substituted acids:
Aminobenzoic acid: Anthranilic acid – preparation. Phenolic acid: Salicylic acid-preparation from anthranilic acid – preparation of oil of winter green, salol and aspirin from salicylic acid.

- c) Dicarboxylic acid: Isomerism- Preparation and properties of phthalic acid. Acid derivatives – preparation and properties of phthalic anhydride and phthalimide.
- d) Side chain carboxylic acids: - preparation and properties of phenylacetic acid and mandelic acid . (12 Hours)

UNIT IV

Organosulphur compounds and aromatic nitrogen compounds

- i) **Aromatic sulphonic acids:**Preparation and properties of benzene sulphonic acid- preparation of saccharin, chloramines-T and dichloramine-T
- ii) **Aromatic nitro compounds:**Reduction of nitrobenzene under different conditions– nitrotoluenes-preparation, properties and uses – TNT – Preparation & Uses
- iii) **Aromatic amines:**Aniline –basicity of aniline- effect of substituents on basicity – reactions – carbylamine reaction and diazotization with mechanism – condensation with aldehyde – distinction between aliphatic and aromatic amines-Estimation of aniline- preparation and uses of sulphanilic acid, nitroanilines,toluidines and phenylene diamines
- iv) **Aromatic diazonium salts:** Preparation and synthetic applications of benzene diazonium chloride
- v) **Aromatic amide:** Benzamide –reaction with alkyl halide-hydrolysis (12 Hours)

UNIT V

Polynuclear hydrocarbons and Heterocyclic Compounds:

- i) **Polynuclear hydrocarbons:**
Isolated systems: Preparation and properties of diphenyl, diphenyl methane and stilbene.
Condensed systems: Preparation, properties and uses of naphthalene, naphthylamines, naphthols, naphthaquinones, anthracene, anthraquinone and phenantherene.
- ii) **Heterocyclic Compounds:** Introduction - nomenclature - comparison of aromatic character of furan, thiophene and pyrrole with benzene - comparison of basicities of pyrrole, pyridine and piperidine with amines. Synthesis of quinoline, isoquinoline and

indole with special reference to Skraup, Bischler - Napieralski and Fischer-Indole synthesis respectively – Reactions of quinoline, isoquinoline and indole – Chemistry of imidazole, Oxazole, thiazole, pyrimidine and Purine. (12 Hours)

TEXT BOOKS

1. Arun Bahl & Bahl, B.S. (2012). *Advanced Organic Chemistry*. 19th Edition. New Delhi: S.Chand & Company Ltd.
2. Tewari, K.S. & Vishnoi, N.K. (2006). *A Text book of Organic Chemistry*. 3rd Edition. New Delhi: Vikas Publishing House Pvt. Ltd.

REFERENCE BOOKS

1. Finar, I.L. (2006). *Organic Chemistry*. 6th Edition. Singapore: Pearson Education Pvt. Ltd. Volume –I.
2. Soni, P.L. (2008). *Text Book of Organic Chemistry*. 2nd Edition. New Delhi: SultanChand & Sons.

Course Code 20UCHC51	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1. a	PSO 1. b	PSO 2.	PSO 3. a	PSO 3. b	PSO 4. a	PSO 4. b	PSO 5	PSO 6	PSO 7
CO1	H	H	H	L	L	H	H	H	-	H
CO2	H	H	H	L	L	H	H	M	-	H
CO3	H	H	H	L	L	H	H	H	-	H
CO4	H	H	H	L	L	H	H	H	-	H
CO5	H	H	H	L	L	H	H	H	-	H

Dr.M.Dhanalakshmi
Head of the Department

Mrs.R.Nagasathya
Mrs.A.Prasanna
Course Designer



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VIRUDHUNAGAR - 626 001

B.Sc. CHEMISTRY

(2020 -2021 onwards)

Semester V	INORGANIC CHEMISTRY - II	Hours/Week: 4	
Core Course-8		Credits: 4	
Course Code 20UCHC52		Internal 25	External 75

COURSE OUTCOME

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

CO1: understand the basic concepts of coordination compounds. [K1]

CO2: know the classifications and applications of organometallic and inorganic polymers in industrial level. [K2]

CO3: apply the extraction techniques of inner – transition elements in global level. [K3]

CO4: make use of acid, base and non-aqueous solvents in chemical industries. [K4]

CO5: appreciate the role elements in bioinorganic molecules in human wellbeing. [K5]

UNIT I

Coordination Compounds:

- a. Introduction – Nomenclature – isomerism in complexes – geometrical and optical – Werner's theory – Sidgwick theory – EAN rule – Valence bond theory – low spin and high spin complexes – magnetic properties – limitations of VB theory – Crystal field theory – Octahedral and square planar complexes – colour of coordination complexes – differences between VBT and CFT and application of CFT.
- b. Molecular orbital theory – ligand field theory – stability of complexes – classification of coordinate compounds – complexes of copper silver gold and chromium - Chelates – Chelation – application of chelate formation. (12 Hours)

UNIT II

Organo metallic compounds

- Introduction –definition ,nomenclature, classification based on the nature of metal – carbon bond- ionic organometallic compounds- reactivity of $\text{Na}^+(\text{CH}_2\text{C}_6\text{H}_5)$ and (NaC_6H_5) -Compounds containing metal-carbon sigma bonds- organometallic compounds of group III elements and group V elements –organo metallic compounds with multicentre bonds- $\text{Li}(\text{CH}_3)_4$ -Organometallic compounds with pi bonded ligands- ferrocene- aromatic character. Preparation and applications of Ziegler natta and wilkinson catalysts.
- Metallic carbonyls – bonding and structure of $\text{Ni}(\text{CO})_4$, $\text{Fe}(\text{CO})_5$, $\text{Cr}(\text{CO})_6$, $\text{Fe}_2(\text{CO})_9$ and $\text{Co}_2(\text{CO})_8$. (12 Hours)

UNIT III

Inner – transition elements:

- The lanthanide series** – Occurrence – properties: Electronic configuration, Oxidation states, ionic radii , lanthanide contraction, consequences ,causes – colour, magnetic properties, Oxidation potential, basic character – solubility of compounds, double salts, complexes – extraction of lanthanides from monazite sand – separation of lanthanides: solvent extraction, cation exchange chromatography – uses of lanthanides.
- The actinide series** – Sources , Transuranic elements – preparation – Electronic configuration – properties: Oxidation states – Ionic radii – colour of ions – formation of complexes – comparison of actinides with lanthanides. (12 Hours)

UNIT IV

Acid-Base concepts

- Acids and bases – Bronsted – Lowry concept: Conjugate Acid – Base pairs, relative strengths of acids and bases – Lux – flood concept – limitations – Lowry concept – levelling effect – Usanovich concept – hard and soft acids – classification – HSAB theory – characteristics of hard and soft acids.
- Non – aqueous solvents: Classification of solvents – chemical reactions in liquid ammonia – protolysis – ammonolysis – complex formation – solution of alkali metals in

liquid NH_3 . Reactions in liquid sulphur dioxide – precipitation reactions – complex formation reactions – Redox reactions. (12 Hours)

UNIT V

Bioinorganic chemistry

- Introduction to bioinorganic chemistry -Metalloporphyrins-porphyrins –biological significance of chlorophyll – vitamin B_{12} (Structure not necessary)
- Myoglobin and hemoglobin – Their role in biological systems – Hill constant, cooperativity effect in hemoglobin.
- Metallo enzymes, apoenzymes, Co factors – function in biological systems – carbonic anhydrase – carboxypeptidase – Peroxidases – catalases – cytochrome P – 450
- Role of alkali and alkaline earth metal ions in biological systems – role of Na^+ and K^+ ions – Sodium pump – Role of Mg^{2+} and Ca^{2+} ions.

Biological functions and toxicity of elements – chromium, cadmium, lead, mercury and Arsenic.

(12 Hours)

TEXT BOOKS

- Soni, P.L. (2016). *Coordination Chemistry*. 1st Edition. New Delhi: Ane Books Pvt.Ltd.
- Puri, B.R. Sharma, L.R. & Kalia, K.C.(2014). *Principles of Inorganic Chemistry*, 32nd Edition. Delhi: Milestone Publishers.

REFERENCE BOOKS

- Madan, R.D. (2018). *Modern Inorganic Chemistry*. 1st Edition. New Delhi: S.Chand and Company.Ltd.
- Sathya Prakash, Tuli, G.D., Basu, S.K. & Madan, R.D. (2008). *Advanced Inorganic Chemistry*. 1st Edition. Volume I, New Delhi: S.Chand & Company Ltd.
- Huheey, E. Keitler, A. & Keitler, L. (2006). *Inorganic Chemistry*. 4th Edition. New York: Dorling Kindersley Pvt. Ltd.
- Gopalan, R. & Ramalingam, V. (2003). *Concise Coordination Chemistry*. 1st Edition. New Delhi: Vikas Publishing House Pvt. Ltd.

5. Hussain Reddy, K. (2017) *Bioinorganic Chemistry*, 1st Edition. NewDelhi:New Age International Publishers Pvt. Ltd.

Course Code 20UCHC52	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1. a	PSO 1. b	PSO 2	PSO 3. a	PSO 3. b	PSO 4. a	PSO 4. b	PSO 5	PSO 6	PSO 7
CO1	H	H	H	L	L	H	H	H	-	H
CO2	H	H	H	L	L	H	H	M	-	H
CO3	H	H	H	L	L	H	H	H	-	H
CO4	H	H	H	L	L	H	H	H	-	H
CO5	H	H	H	L	L	H	H	H	-	H

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Head of the Department

Dr.M.Amutha
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VIRUDHUNAGAR - 626 001

B.Sc. CHEMISTRY

(For those who join in 2020-2021 and after)

Semester V	PHYSICAL CHEMISTRY-I	Hours/Week: 4	
Core Course- 9		Credits: 4	
Course Code		Internal	External
20UCHC53		25	75

COURSE OUTCOMES

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

CO1: gain knowledge on the first, second, third law of thermodynamics, concepts of phase rule, chemical kinetics and photochemistry. [K1]

CO2: understand the facts of thermochemistry, Nernst heat theorem, Absolute entropy, Gibb's phase rule, theories of reaction rates and comparative study of thermal and Photochemical reactions. [K2]

CO3: Apply the fundamental concepts of thermodynamics to various systems, phase rule to simple systems, various photochemical processes, reaction rate and rate law. [K3]

CO4: Analyze the physical significance of enthalpy, entropy, partial molar properties, theory of fractional distillation, Nernst distribution law, photophysical processes and various theories of reaction rate. [K4]

CO5: Evaluate variation of enthalpy, entropy with P,V,T, the utility of Gibb's –Helmholtz equation, Maxwell's relations, fugacity, activity, residual entropy, solvent extraction, ARRT and photochemistry. [K5]

UNIT I

Thermodynamics – I:

a) System and surrounding – Isolated, closed and open system – state of the system – Intensive and extensive properties – Thermodynamic processes – reversible, irreversible,

isothermal and adiabatic processes – State and path functions – Exact and Inexact differentials – Work of expansion at constant pressure and free expansion

b) First law of Thermodynamics – Statement – definition of internal energy, Enthalpy and Heat capacity – relation between C_p & C_v – calculation of w , q , dE and dH for expansion of ideal and real gases under isothermal and adiabatic conditions of reversible and irreversible processes – Definition of Joule-Thomson coefficient (μ_{JT}) – Calculation of μ_{JT} for ideal and real gases – inversion temperature

c) Thermochemistry – temperature dependence of heat of reaction – Kirchoff's equation – Hess's law of heat summation – Bond enthalpies – Zeroth law of Thermodynamics and its significance (12 Hours)

UNIT II

Thermodynamics – II:

- a) Need for Second law of Thermodynamics – Different statements of the law – conversion of heat into work – thermodynamic efficiency
- Concept of entropy – Definition and physical significance of entropy – Entropy as a function of P, V and T – Entropy changes during phase changes – Entropy of mixing – Entropy criterion for spontaneous and equilibrium processes in isolated system – Gibbs free energy (G) and Helmholtz free energy (A) – variation of A and G with P, V and T – Gibb's –Helmholtz equation and its applications – Maxwell's relations – ΔG and ΔA criteria for spontaneity and equilibrium (12 Hours)

UNIT III

Thermodynamics – III:

- a) Partial molar quantities – definition and significance of chemical potential – variation of chemical potential with T , P and mole fraction – Gibbs Duhem equation – van't Hoff reaction isotherm – van't Hoff isochore – Clapeyron equation and Clausius-Clapeyron equation – applications
- b) Introduction of real system – fugacity, activity and activity coefficient

- c) Third law of thermodynamics -Nernst heat theorem – Statement of Third law – Evaluation of absolute entropy from heat capacity data – Exception to Third law – Residual entropy(CO,N₂O)

Phase Rule

- a) Gibbs phase rule – definition of terms involved – Derivation of Gibb's phase rule – application of phase rule to one component system (water system) – Two component system: simple eutectic (Pb-Ag) system, compound formation, congruent melting point (Zn-Mg) system, incongruent melting point (Na₂SO₄-H₂O) system.
- b) 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.
- c) Nernst distribution law – mathematical formulation – deviation from distribution law – solvent extraction – principle. (12 Hours)

UNIT IV

Chemical Kinetics:

- a) Introduction – Rate of reaction – rate law and rate constant – order & molecularity of a reaction – Determination of order of reaction – Derivation of rate constant and half-life period for I-order reaction – Pseudo first order reaction.
- b) Definition & derivation of the rate constant for the Second-order reaction (2A → products) – definition, rate equation and example for Third and zero order reactions
- c) Influence of temperature on rate of the reaction – Arrhenius rate equation and its significance – Theory of reaction rate: Bimolecular collision theory – Unimolecular reaction: Lindemann's hypothesis – Absolute reaction rate theory (ARRT) (12 Hours)

UNIT V

Photochemistry

Comparative study of thermal and Photochemical reactions – Laws of Photochemistry: Beer-Lambert's law – Grothus-Draper law – Stark-Einstein's law.

Consequences of light absorption by atoms and molecules – Jablonski diagram – Photophysical processes – fluorescence, Phosphorescence – Photosensitization – chemiluminescence –

bioluminescence - Quantum efficiency –calculation of quantum yield – kinetics of photochemical reaction – Combination of H₂& Cl₂, dye degradation (12 Hours)

TEXT BOOKS

1. Arun Bahl, Bahl, B.S. & Tuli, G.D. (2017). *Essentials of Physical Chemistry*. 2nd Edition. New Delhi: S.Chand & Company Ltd.
2. Soni, P.L. (2008). *Text Book of Physical Chemistry*. 2nd Edition. New Delhi: Sultan Chand & Sons.
3. Rajaram, J. & Kuriakose, J.C. (2003). *Thermodynamics*. 3rd Edition. New Delhi: Chand & Co., Ltd.
4. Glasstone, S. (1998). *Thermodynamics for Chemists*. New Delhi: East-West Press (P) Ltd.

REFERENCE BOOKS

1. Negi, A.S., and Anand, S.C., (1999). *A text Book of Physical Chemistry*. 2nd Edition. New Delhi: New Age International Publishers Pvt. Ltd.
2. Laidler, K.J. (2012). *Chemical Kinetics*. 3rd Edition. London: Harper International Edn.
3. Rohatgi, K.K. and Mukherjee, (2017). *Fundamentals of Photo Chemistry*. 3rd Edition. New Delhi: New Age International Publishers.
4. Bajpai, D.N. (2011). *Advanced Physical Chemistry*. 2nd Edition. New Delhi: S.Chand & Company Ltd.
5. Puri, B.R. Sharma, L.R. Pathania, M.S. (2008). *Elements of Physical Chemistry*. 4th Edition. Jalandhar: Vishal Publishing & Co.

Course Code 20UCHC53	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1. a	PSO 1. b	PSO 2.	PSO 3. a	PSO 3. b	PSO 4. a	PSO 4. b	PSO 5	PSO 6	PSO 7
CO1	H	H	H	H	H	H	M	H	-	M
CO2	H	H	H	L	M	M	M	M	-	M
CO3	H	H	H	L	H	H	H	H	-	M
CO4	H	H	H	H	L	H	H	H	-	M
CO5	H	H	H	H	H	H	H	H	-	M

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Head of the Department

J.Kavitha
A.Anitha
Course Designer



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VIRUDHUNAGAR - 626 001

B.Sc. CHEMISTRY

(For those who join in 2020-2021 and after)

Semester V	Analytical Instrumentation and CHEMDRAW	Hours/Week: 4	
Discipline Specific Elective1(DSEC 1)		Credits: 4	
Course Code 20UCHE51		Internal 25	External 75

COURSE OUTCOMES

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

CO1: understand the basic principles in precipitation and analytical instrumentation. [KI]

CO2: classify the thermo gravimetric and colorimetric methods. [K2]

CO3: appraise the Software tools and the chromatographic techniques. [K3]

CO4: analyse the graphical results and working parts of NMR, UV and IR. [K4]

CO5: calculate the significant figures and measure the structures using software tools. [K5]

UNIT I

Theory of Gravimetric and statistical Analyses

- a. Methods of obtaining the Precipitate - Condition - Choice of Precipitant - merits and demerits of Organic Precipitants - Types - Specific and selective precipitants- Sequestering agents - theory of precipitation - Dendrites - Paneth - Fajans - Hahn law - Coprecipitation - post precipitation -precipitation from homogeneous solution.
- b. Precision - Accuracy - Absolute and relative error – Classification of errors - Confidence Limit - Students Q-test - Rejection of experimental data - Sources and elimination of errors - Significant figures and computation.
- c. Analysis of experimental results- Graphical method - Curve fitting - Method of least squares - Problems involving straight line graphs. (12 Hours)

UNIT II

Instrumental methods of Analysis

a. Colorimetry

Beer-Lamberts Law - Principles of Colorimetric Analysis - Visual Colorimeter Standard Series method - Balancing method - Estimation of Ni^{2+} and Fe^{2+} .

a. Thermo analytical methods

- b. Principle of thermogravimetric analysis and differential thermal analysis –Methods of obtaining thermograms – Derivative thermo Gravimetry –Instrumentation of TGA and DTA - factors affecting TGA and DTA curves –applications – TGA and DTA of calcium oxalate monohydrate. (12 Hours)

UNIT III

Basic principles of Chromatography

a. Column Chromatography - experimental considerations-the column-adsorbent – solvents-separation techniques and applications. Thin layer Chromatography – superiority of TLC- theory of TLC- experimental technics – preparation of the chromate plates – development of chromatogram - R_f values and application - Paper Chromatography – types theory of paper chromatography – experimental techniques – development of chromatogram and application.

b. Ion exchange Chromatography - properties of Ion exchangers – cation exchange resins – anion exchange resins – factors affecting the ion-exchange chromatography – experimental techniques and applications. Gas liquid chromatography - theory of GLC – experimental techniques and applications. (12 Hours)

UNIT IV

Instrumentation of NMR, UV and IR

a. Radiation source- UV and visible sources-Dispersive devices-Monochromators-gratings, slits-samples-detectors-photo voltaic cell, photo multiplier tubes-spectro photometer for use in UV region.

b. IR- sources of IR radiation –Monochromators - detectors techniques- simple beam and double beam spectrophotometers (brief outline only).

c. NMR –Brief outline of the instrumentation (12 Hours)

UNIT V

Computers in Chemistry

- a. Need of Chemdraw– working with document-drawing chemical structures- Chems sketch– basics- drawing chemical structures.
 - b. Theory of Chemdraw- basic - open, save and close a document – applications of main toolbar- importing and exporting from Chemdraw.
 - c. Origin graping-applications of main toolbar – statistics and result analysis using graphs in origin software. Avogadro software in drawing, navigating, and manipulating of molecules.
- (12 Hours)

TEXT BOOKS

1. Gopalan, R. (2016). *Elements of Analytical Chemistry*. 3rd Edition. New Delhi: Sultan Chand & Sons.
2. Skoog, D.A. West, D.M. and Hollar, F.J., (2014). *Fundamentals of Analytical Chemistry*. 9th Edition. U.K: Harcourt College Publishers.
3. Usharani, S. (2000). *Analytical Chemistry*. 1st Edition. Chennai: Macmillan India Ltd.
4. Srivastava, A.K & Jain, P.C. (2009). *Instrumental Approach to Chemical Analysis*. 4th Edition. New Delhi: S.Chand & Company Ltd.
5. <https://library.columbia.edu>>
6. <https://www.acdlabs.com>> docs
7. Origin and Avogadro Software by addinsoft 2019.

REFERENCE BOOKS

1. Sharma, B.K. (2015). *Instrumental Methods of Chemical Analysis*. 30th Edition. New Delhi: KrishnaPrakashan Media Pvt.Ltd.
2. http://www.cambridgesoft.com/support/DesktopSupport/documentation/manuals/files/che_mbiobdraw.pdf
3. www.chem.uzh.ch>gpc> files
4. www.chemteach.ac.nz>misc
5. Origin and Avogadro Google free version Software

Course Code 20UCHE51	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1. a	PSO 1. b	PSO 2.	PSO 3. a	PSO 3. b	PSO 4. a	PSO 4. b	PSO 5	PSO 6	PSO 7
CO1	H	H	H	H	H	H	M	H	-	M
CO2	H	H	H	L	M	M	M	M	-	M
CO3	H	H	H	L	H	H	H	H	-	M
CO4	H	H	H	H	L	H	H	H	-	M
CO5	H	H	H	H	H	H	H	H	-	M

Dr.M.Dhanalakshmi
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Dr.M.Amutha
Course Designers



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VIRUDHUNAGAR - 626 001

B.Sc. CHEMISTRY

(2020 -2021 onwards)

Semester V	NANO SCIENCE	Hours/Week: 4	
DSEC-1		Credits: 4	
Course Code 20UPHE52		Internal 25	External 75

COURSE OUTCOMES

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

- CO1 : explain the fundamentals in related to bulk materials, preparation and characterization of nanomaterials. [K1]
- CO2 : discuss the techniques involved in preparation, characterization properties and applications of nanomaterials. [K2]
- CO3 : apply the learned concepts to synthesize and characterize the nanomaterials. [K3]
- CO4 : analyze the different structures of nanomaterials. [K4]
- CO5 : Justify the impact of nanomaterials in the field of medicine, sensors, energy storage devices and commercial products. [K5]

UNIT I

Nanomaterials:

Solid materials and their strength - perspective of length - nanoscience and nanotechnology - nanostructures in nature-quantum structures - quantum confinement- surface effects of nanomaterials - prime materials - carbon nanostructures - oxides. (12 Hours)

UNIT II

Preparation methods:

Nanomaterials synthesis - physical approaches - laser ablation - high-energy ball milling (Mechanical alloying method) - chemical vapor deposition – plasma synthesis method – Electro-

deposition – chemical approaches - hydrothermal synthesis – reverse micellar/micro-emulsion method - sol-gel synthesis - microwave method – sonochemical process - co-precipitation.

(12 Hours)

UNIT III

Characterization Techniques:

Principles of electron Microscopy - Scanning Electron Microscope (SEM) – strength and limitation of Scanning Electron Microscopy - Energy dispersive X-ray analysis (EDX) – Transmission Electron Microscope (TEM) – Scanning Tunneling Microscope - Atomic Force Microscope (AFM) - powder method - grain size /crystallite size using Scherrer's Formula – crystallite size distribution using X-ray line shape analysis – photoluminescence - Fourier transform infrared spectroscopy – Raman spectroscopy.

(12 Hours)

UNIT IV

Properties:

Mechanical behavior- mechanical properties of nanomaterials - elastic properties- hardness and strength - ductility and toughness – superplastic behavior – optical properties - optical properties of nanomaterials - surface plasmon resonance - quantum size effects- applications of optical properties of nanomaterials - electrical properties - magnetic properties - magnetic properties of nanomaterials – superparamagnetism – electrochemical properties – chemical sensing properties.

(12 Hours)

UNIT IV

Sectors influenced by Nanomaterials:

Energy - applications of nanomaterials in energy sector – nanomaterials for hydrogen production and conversion – thermoelectric and piezoelectrics – nanomaterials in energy storage – Environment - nanomaterials for pollution abatement.

(12 Hours)

TEXT BOOKS

1. Shah Tokeer Ahmad. M.A, (2010), *Principles of Nano science and Nanotechnology*. New Delhi:Narosa Publishing House.
2. Viswanathan,B. (2014). *Nanomaterials*. New Delhi: Narosa Publishing House.

BOOK 1

UNIT I- Chapter 1-Section: 1.1-1.11

UNIT II- Chapter 2-Section: 2.1-2.3, 2.3.2, 2.3.5-2.3.8, 2.4, 2.4.2-2.4.4, 2.4.6, 2.4.7

UNIT III- Chapter 3 –Section: 3.1-3.3-3.8

Chapter 4- Section: 4.1, 4.6, 4.6.1, 4.6.2

Chapter 5 – Section: 5.6-5.8

UNIT IV- Chapter6 - Section: 6.1-6.4, 6.6-6.8

BOOK 2

UNIT V- Chapter 5 - Section: 5.1 – 5.6

Chapter 6 - Section: 6.1, 6.2

REFERENCE BOOKS

1. Chattopadhyay, K.K., & Banerjee, A.N. (2012). *Introduction to Nanoscience and Nanotechnology*. NewDelhiPHI Learning Private Limited.
2. Poole,Jr., Charles P., Owens., Frank J., & John, A. (2006). *Introduction to Nanotechnology*. New Jersey: Wiley Sons. Inc., Publication.
3. Pradeep, T. (2007). *Nano: The Essentials: Understanding Nanoscience and Nano Technology*. New Delhi: McGraw Hill Education Pvt. Ltd.

Course Code 20UPHE52	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	H	-	H	H	-	M	H	H	-	M
CO2	H	H	M	M	-	M	H	M	-	M
CO3	H	H	M	L	L	H	H	-M	-	-
CO4	H	M	M	M	L	H	H	M	-	-
CO5	H	H	M	M	L	H	H	M	M	M

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B.Sc. CHEMISTRY

(For those who join in 2020-2021 and after)

Semester V	TEXTILE CHEMISTRY	Hours/Week: 4	
Discipline Specific Elective1 (DSEC 3)		Credits: 4	
Course Code 20UCHE53		Internal 25	External 75

COURSE OUTCOMES

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

- CO1 : understand the classification of natural fibres and their physical and chemical properties. [K1]
- CO2 : know about different synthetic fibres, their manufacture and properties. [K2]
- CO3 : acquire knowledge about scouring and desizing processes. [K3]
- CO4 : clear idea about bleaching technique. [K4]
- CO5 : acquire knowledge about principles of dyeing, synthesis of dyestuffs and fastness properties. Students should be able to dye different fibres and test various fastness properties. [K5]

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 (12 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. (12 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 Na₂CO₃ – Precautions to be taken before scouring. Desizing using 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. (12 Hours)

UNIT IV

PRINCIPLES OF BLEACHING

Principles of wetting and mechanism of detergency – synthetic detergents – surface active agents – bleaching processes – bleaching agents – H₂O₂, NaOCl, bleaching powder and biobleaching and their properties – bleaching of cotton, rayon, wool and synthetic fibres. (12 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. (12 Hours)

TEXT BOOKS

1. Sharma, B.K.(2008). *Industrial Chemistry*. 1st Edition. Meerut: GOEL Publishing House.
2. BagavathiSundari. K,(2006). *Applied Chemistry*. 1st Edition. Chennai: MJP Publishers.
3. 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). *A Text Book of Applied Chemistry for Home Science and Allied Sciences*. 1st Edition. New Delhi: The Macmillan Company of India Ltd.
3. Jain, P.C. & Monika Jain, (2013). *Engineering Chemistry*. 1st Edition.New Delhi: Dhanpat Rai Publishing Company Pvt.Ltd.

Course Code 20UCHE53	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1. a	PSO 1. b	PSO 2.	PSO 3. a	PSO 3. b	PSO 4. a	PSO 4. b	PSO 5.a	PSO 6	PSO 7
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CO3	H	H	H	L	H	H	H	H	-	M
CO4	H	H	H	H	L	H	H	H	-	M
CO5	H	H	H	H	H	H	H	H	-	M

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(Belonging to Virudhunagar Hindu Nadars)

An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai

Re-accredited with 'A' Grade (3rd Cycle) by NAAC

VIRUDHUNAGAR - 626 001

B.Sc. CHEMISTRY

(For those who join in 2020-2021 and after)

Semester VI	PROJECT	Hours/Week: 0
Core Course-10		Credits: 1
Course Code 20UCHC5PR		Internal 100 Marks

COURSE OUTCOMES

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

CO1: apply the learned concepts to select projects in Organic, Inorganic and Physical chemistry. [K3]

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

CO3: execute the technical skills in handling the equipment, apparatus and exhibit written communication skill acquired in related projects. [K3]

CO4: analyze the significance of spectroscopic data and elucidate the technological knowledge orally. [K4]

CO5: assess the project to meet the challenges to fulfill the global needs and satisfy the greener environment. [K5]

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 20UCHC5PR	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	H	H	H	H	H	H	H	M	H	H
CO2	H	H	M	H	H	M	H	M	M	M
CO3	H	H	M	M	M	H	H	M	H	M
CO4	H	H	H	M	M	H	H	M	H	M
CO5	H	H	M	M	M	H	H	M	H	M

Dr.M.Dhanalakshmi
 Head of the Department

Dr.M.Amutha
 Course Designer



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B.Sc. CHEMISTRY

(For those who join in 2020-2021 and after)

Semester V	ANALYSIS OF OILS/FATS AND WATER	Hours/Week: 1T+1P	
Skill Enhancement Course- 4		Credits: 2	
Course Code 20UCHS51P		Internal 40	External 60

COURSE OUTCOMES

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

CO1: experiment with various oils/fats and water samples. [K3]

CO2: choose the specific primary standard for different titrations. [K3]

CO3: make use of physical properties of oil to identify them. [K3]

CO4: organise water samples as soft and hard. [K3]

CO5: analyse the quality of water and oil. [K4]

Analysis of Oils/Fats

Determination of Specific gravity, Surface tension, Viscosity, Iodine value, saponification value, % of free fatty acid.

Adulteration Tests: Baudouin test, Halphen's test

Analysis of Water

Determination of hardness, salinity and alkalinity.

Course Code 20UCHS51P	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	H	H	M	M	H	L	L	H	M
CO2	H	H	H	M	M	H	L	L	H	M
CO3	H	H	H	M	M	H	L	L	H	M
CO4	H	H	H	M	M	H	L	L	H	M
CO5	H	H	H	M	M	H	L	L	H	M

Dr .M.Dhanalakshmi

Head of the Department

Mrs.R.Nagasathya

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B.Sc. CHEMISTRY

(For those who join in 2020-2021 and after)

Semester V	SOIL CHEMISTRY	Hours/Week: 2	
SEC (SEC 5)		Credits: 2	
Course Code 20UCHS52		Internal 40	External 60

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. [K4]

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. (6 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. (6 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. (6 Hours)

UNIT IV

BIO FERTILIZER

The efficient use of Bio fertilizers – integrated nutrient management biofertilizers – rhizobium, azospirillum, azotobacter – Blue green algae and azolla production and quality control of bio-fertilizers. Microbial interrelationship in soil – microbes in pest and disease management – Bio-conversion of agricultural wastes. (6 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 (6 Hours)

TEXT BOOKS

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

REFERENCE BOOKS

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

Course Code 20UCHS52	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5.a	PSO 6	PSO 7
CO1	H	H	H	H	H	H	M	H	-	M
CO2	H	H	H	L	M	M	M	M	-	M
CO3	H	H	H	L	H	H	H	H	-	M
CO4	H	H	H	H	L	H	H	H	-	M
CO5	H	H	H	H	H	H	H	H	-	M

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B.Sc. CHEMISTRY

(For those who join in 2020-2021 and after)

Semester V	Laboratory Skills and Safety Measures	Hours/Week: 0
Extra credit Course-1		Credits: 2
Course Code 20UCHO51		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

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

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.

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B.Sc. CHEMISTRY

(2023-2024 Onwards)

Semester V	Laboratory Practices and Safety Measures	Hours/Week: 0
Extra credit Course-1		Credits: 2
Course Code 22UCHO51		External 100

COURSE OUTCOMES

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

- CO1: recognize the Laboratory hygiene and waste disposal
- CO2: summarize the concentration terms of chemicals
- CO3: relate the chemicals and skills to be applied in different stages of reactions
- CO4: categorize the purification techniques
- CO5: appraise the methods of equivalent weight, problems dealing with the Preparation of reagents.

Unit-I

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-II

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

Unit-III

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. Equival

17th Academic Council Meeting 31.01.2023

Unit-IV

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

Unit-V

Purification techniques of organic compounds – Crystallization- Sublimation – Distillation – Fractional Distillation – Distillation under reduced pressure- Steam distillation. Solvent Extraction

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.
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B.Sc. CHEMISTRY

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Semester VI	ORGANIC CHEMISTRY-III	Hours/Week: 5	
Core Course-10		Credits: 4	
Course Code 20UCHC61		Internal 25	External 75

COURSE OUTCOMES

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

CO1: know the basic concepts of spectroscopy, natural products, biomolecules and molecular rearrangements. [K1]

CO2: outline the spectroscopic principles, classify natural products, biomolecules, molecular rearrangements and dyes. [K2]

CO3: identify spectrums, alkaloids and terpenoids in plants, biomolecules present in human body and choose reagents for synthesis. [K3]

CO4: analyse the significance of spectroscopy, natural products, biomolecules, molecular rearrangements and dyes. [K4]

CO5: interpret spectrums and elucidate structures to meet up global needs, value biomolecules and perceive the benefit of the reagents, rearrangements and dyes in accomplishing a greener environment. [K5]

UNIT I

UV-Visible Spectroscopy and Organic photochemistry

UV-Visible Spectroscopy : Introduction to electromagnetic radiation – Theory of electronicspectroscopy – Types of electronic transitions – bathochromic shift and hypsochromic shift – hyperchromic effect – hypochromic effect – Woodward-Fischer rules – calculation of λ_{\max} for dienes and α,β -unsaturated carbonyl compounds.

Organic photochemistry: Introduction – photolysis – types of photochemical reactions – definition with an example – elimination, reduction, oxidation, isomerisation, rearrangement, cyclisation and intermolecular cycloadditions. (15 Hours)

UNIT II

IR, NMR and Mass Spectroscopy

a) **IR Spectroscopy:** Principle – different modes of Vibration - Hookes law – factors affecting vibrational frequency – Electronic effect and Hydrogen bonding – Finger print region. Application of IR spectroscopy in the identification of cis-trans isomers , aldehydes and ketones and inter and intra molecular hydrogen bonding.

b) **NMR Spectroscopy:** Principle – Number of signals chemical shift – shielding and deshielding effects – Anisotropy in alkenes, alkynes and benzene – hydrogen bonding – peak area and proton counting – splitting of the signals – spin-spin coupling – coupling constant – spectrum of ethanol,benzene and toluene.

c) **Mass spectrometry:** Principle – molecular or parent ion peak - mass spectrum – base peak – modes of fragmentation – McLafferty rearrangement (brief study) - metastable peak.

(15 Hours)

UNIT III

Alkaloids and Terpenoids:

i) **Alkaloids** - classification –occurrence-general characteristics -general procedure for determining the structure- structural elucidation of coniine, nicotine and piperine.

ii) **Terpenes:** Classification –occurrence- isolation –general properties - isoprene rule – general procedure for determining the structure- structural elucidation of citral, menthol and camphor. (15 Hours)

UNIT IV

Biomolecules

i) **Amino acids:** Classification-Gabriel’s phthalimide and Strecker’s synthesis- properties.

ii) **Proteins:** Classification - Primary, Secondary, tertiary and quaternary structures of protein - denaturation - colour reactions of proteins.

- iii) **Nucleic acids:** Nucleosides - nucleotides - RNA and DNA – Structure and their functions.
- iv) **Vitamins:** Vitamins and their biological importance structure of vitamin A, B₆, C and K(structure only)
- v) **Hormones:** Thyroxine, Testosterone, progesterone and estrone – structure (elucidation not necessary) and biological importance. (15 Hours)

UNIT V

Reagents in Organic synthesis, Molecular rearrangement and Dyes

i) Reagents in Organic synthesis

Oxidation reaction involving SeO_2 and lead tetraacetate with mechanism

Reduction reactions: Birch reduction, Wolf-Kishner and Clemmenson reduction with mechanism

ii) **Molecular rearrangement:** Detailed Mechanism of the following: Pinacol – Pinacolone, Hofmann, Beckmann and Claisen rearrangements

iii) **Dyes:** Definition-theory of colour and constitution-classification of dyes according to structure and application.

a) Azo dyes: Preparation and uses of methyl orange and bismark brown.

b) Triphenylmethane dyes: Preparation and uses of rosaniline and crystal violet.

c) Phthalein dyes: Preparation and uses of phenolphthalein

d) Xanthene dyes: Preparation and uses of fluorescein and eosin.

e) Indigoid dyes: Preparation and uses of indigo.

f) Anthraquinoid dyes: Preparation and uses of alizarin. (15 Hours)

TEXT BOOKS

1. Arun Bahl & Bahl, B.S. (2012). *Advanced Organic Chemistry*. 19th Edition. New Delhi: S.Chand & Company Ltd.
2. Tewari, K.S. & Vishnoi, N.K. (2006). *A Text book of Organic Chemistry*. 3rd Edition. New Delhi: Vikas Publishing House Pvt. Ltd.
3. Sharma, Y.R. (2018). *Elementary Organic Spectroscopy*. 5th Edition. New Delhi: S Chand Company(P) Ltd.

4. Sanyal, S.N. (2018). *Reactions, Rearrangement and Reagents*. 4th Edition. Patna: Bharati Bhawan.

REFERENCE BOOKS

1. Finar, I.L. (2006). *Organic Chemistry*. Vol –I. 6th Edition. Singapore: Pearson Education Pvt. Ltd .
2. Soni, P.L. (2008). *Text Book of Organic Chemistry*. 2nd Edition. New Delhi: Sultan Chand & Sons.
3. Finar, I.L. (2003). *Organic Chemistry*. Vol.II, 5th Edition. Singapore: Pearson education.
4. Ahluwalia, V.K. (2015). *Organic Reaction Mechanism*. 4th Edition. New Delhi: Narosa Publishing House.

Course Code 20UCHC61	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1. a	PSO 1. b	PSO 2.	PSO 3. a	PSO 3. b	PSO 4 .a	PSO 4. b	PSO 5.a	PSO 6	PSO 7
CO1	H	H	M	M	H	H	M	M	-	M
CO2	H	H	M	M	H	H	M	M	-	M
CO3	H	H	L	L	H	H	H	H	-	H
CO4	H	H	H	H	H	H	H	H	-	H
CO5	H	H	L	M	M	H	H	H	-	H

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B.Sc. CHEMISTRY

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Semester VI	PHYSICAL CHEMISTRY-II	Hours/Week: 5	
Core Course- 11		Credits: 4	
Course Code 20UCHC62		Internal 25	External 75

COURSE OUTCOMES

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

CO1: recall the fundamental concepts of electrochemistry and principles of spectroscopic techniques like microwave, IR, Raman and UV visible spectroscopy. [K1]

CO2: understand the theories of electrochemical cells and spectroscopic techniques such as IR, Raman, microwave and UV visible. [K2]

CO3: Apply the theory and applications of electrochemical principles and spectroscopic techniques such as IR, UV visible, Raman and microwave. [K3]

CO4: Analyze the conductivity, emf measurement and Compare IR and Raman spectroscopy and their applications. [K4]

CO5: Interpret the physical concepts of electrochemistry spectroscopy. [K5]

UNIT I

Electrochemistry – I:

a) Conductance – definition and determination of specific, equivalent and molar conductance – weak and strong electrolytes according to Arrhenius theory - Ostwald's dilution law – applications and limitation – variation of equivalent conductance with concentration

b) Migration of ion – ionic mobility – Kohlrausch’s law – its applications – elementary treatment of Debye-Huckel-Onsager equation for strong electrolytes – Transport number and Hittorf’s rule – determination of transport number by Hittorf’s method.

c) Applications of conductivity measurement – determination of solubility product of a sparingly soluble salt and conductometric titration – common ion effect – Buffer solution – definition – Henderson equation (derivation not required) and its applications (15 Hours)

UNIT II

Electrochemical cells :

a) Concepts of electrochemical cell – cell diagram and terminology – conventions regarding signs of cell emf – calculation of cell emf from single electrode potential – standard emf of the cell – Nernst equation

b) Reversible and irreversible cells – thermodynamics and electromotive force – calculation of ΔG , ΔH , ΔS and K_{eq} for cell reaction

c) Single electrode potentials and emf measurement - electrochemical series and its applications – types of electrodes – reference electrode (SHE, Calomel electrode, Ag-AgCl electrode) – standard electrode potential –experimental determination of cell emf – Weston cadmium cell

d) Determination of pH using hydrogen electrode, glass electrode and quinhydrone electrode- determination of I, II, III order dissociation constant of H_3PO_4 by pH measurement – Potentiometric and conductometric titrations (15 Hours)

UNIT III

Types of electrochemical cells:

a) Chemical cells with and without transference – examples – liquid junction potential – salt bridge

b) Concentration cells – definition – types of concentration cells – examples – emf of electrolyte concentration cells with and without transference

c) Commercial cells: Primary and secondary cells – dry cell – lead storage cell – fuel cell – Hydrogen-Oxygen fuel cell (15 Hours)

UNIT IV

Spectroscopy – I:

a) Electromagnetic spectrum – Regions of various types of spectra - Microwave spectroscopy – Rotational spectra of diatomic molecule treated as rigid rotator – conditions for a molecule to be microwave active – rotational constant (B) – selection rule for rotational transition – frequency of spectral lines – calculation of inter-nuclear distance in diatomic molecules

b) UV Visible spectroscopy - conditions for a molecule to be UV active – Theory of electronic spectroscopy – types of electronic transitions – Franck-Condon principle – pre-dissociation (15 Hours)

UNIT V

Spectroscopy – II:

a) IR spectroscopy: Vibrations of diatomic molecules – Harmonic and anharmonic oscillators – zero point energy – dissociation energy and force constant – condition for a molecule to be active in IR region – vibrational modes of CO₂ and H₂O – selection rule for vibrational transition – fundamental bands, overtones and hot bands – diatomic vibrating rotator – P,Q,R branches – Determination of force constant.

b) Raman spectroscopy: Raleigh scattering and Raman scattering – stokes and antistokes lines in Raman spectra – Raman frequency – condition for a molecule to be Raman active – comparison of Raman and IR spectra (15 Hours)

TEXT BOOKS

1. Puri, B.R. Sharma, L.R. Pathania, B.K.(2017). *Elements of Physical Chemistry*. 2nd Edition. Jalandhar: Vishal Publishing Company.
2. Soni, P.L. Dharmarha, O.P. Dash, U.N. (2015). *Text book of Physical Chemistry*. 4th Edition. New Delhi: Sultan Chand & Sons.
3. Banwell, C.N. (2011), *Molecular spectroscopy*. 2nd Edition. New Delhi: Mcgraw Hill.
4. Sharma, Y.R. (2011). *Elementary Organic spectroscopy-Principles and Chemical Applications*. 3rd Edition. New Delhi: S.Chand& Company Limited.
5. Negi, A.S.&Anand,S.C. (1998). *A Text Book of Physical Chemistry*. 2nd Edition. New Delhi: New Age International Publishers.

REFERENCE BOOKS

1. Kundu, N. Jain, S.N.(1999).*Physical Chemistry*. 2nd Edition. New Delhi: S.Chand& Co.
2. Glasstone, S. (1998). *A Text Book of Physical Chemistry*. 1st Edition. New Delhi: East-West Press.
3. Yadav, L.D.S.(2001). *Organic Spectroscopy*. 3rd Edition. London: Palgrave Publication:
4. Chang, R.(2004). *Basic Principles of Spectroscopy*. 1st Edition. New Delhi: McGraw Hill.
5. Silverstein, B.M. Bassler, G.C. Morrill, T.C.(2004).*Spectrometric identification of Organic Compounds*. 6th Edition. New Jersey:John-Wiley& Sons.
6. Kemp.(2009). *Elementary Organic Spectroscopy*. 3rd Edition.London: Palgrave Publication.
7. Glasstone, S.(1997). *Introduction to Electrochemistry*, 1st Edition. New York: Van Nostrand Company Ltd.

Course Code 20UCHC62	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	H	H	H	L	H	L	M	L	-	M
CO2	H	H	H	M	M	H	M	M	-	M
CO3	H	H	H	M	H	H	M	M	-	M
CO4	H	H	H	L	L	H	H	M	-	M
CO5	H	H	H	L	L	M	M	M	-	M

Dr.M.Dhanalakshmi

Head of the Department

Dr. A. Anitha

Dr. J. Kavitha

Course Designer



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B.Sc. CHEMISTRY

(For those who join in 2020-2021 and after)

Semester VI	APPLIED CHEMISTRY	Hours/Week: 5	
Core Course- 12		Credits: 4	
Course Code 20UCHC63		Internal 25	External 75

COURSE OUTCOMES

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

CO1: understand the nutrients in fertilizers and raw chemical materials for industries. [K1]

CO2: summarize the processes involved in fertilizers, fireworks, petrochemicals and paper industry. [K2]

CO3: prepare the paints, wine, Beer and power alcohol. [K3]

CO4: classify the explosives, fuels, corrosion and prevention. [K4]

CO5: appraise the cement, glass and ceramic industries. [K5]

UNIT I

Fertilizers and Petro chemicals

a. Fertilizers: Nutrients for plants – role of various elements in plant growth – natural and chemical fertilizers – classification of chemical fertilizers – Urea, super phosphate and potassium nitrate mixed fertilizers – fertilizer industry in India.

b. Petro chemicals: (Elementary study) definition – origin – composition – chemicals from natural gas, petroleum, light naphtha and kerosene – synthetic gasoline. (15 Hours)

UNIT II

Fireworks, explosives and fuels

- a. **Match industry** – safety matches – raw materials and their function – Chemistry of lighting a match stick.
- b. **Pyrotechny** - raw materials – coloured smokes – uses.
- c. **Explosives** – Definition - classification – primary, low and high explosives – example - Composition and uses of gun powder, gun cotton, cordite, TNT and RDX.
- d. **Fuels** –Types of fuels, composition and applications of fuels with examples – liquid fuels – gaseous fuels- nuclear fuels (15 Hours)

UNIT III

Corrosion and its control

Definition –classification- chemistry of corrosion-factors influencing on corrosion – corrosion monitoring techniques -Corrosion control – corrosion inhibitors- protective coatings, galvanizing, tinning – electroplating and electrochemical passivation. (15 Hours)

UNIT IV

Alcoholic beverages and Paper Industry

- a. Alcoholic beverages: Introduction –types–manufacture of spirit,wine, beer
- b. Paper Industry: Introduction – preparation of different kinds of raw material used- sulphite pulp, soda pulp and rag pulp- processes involved in paper industry – beating, refining, filling, sizing and coloring – manufacture of paper, calendering and its uses. (15 Hours)

UNIT V

Silicate industry, Paints and lacquers

- a. Silicate industry- Manufacture of cement- theory of setting of cement-manufacture of glass and ceramics.
- b. Paints and lacquers: Ingredients in paint manufacture – lacquers – varnish (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.

- Puri, B.R. Sharma, L.R. & Kalia, K.C.(2008). *Principles of Inorganic Chemistry*. 2nd Edition. Jalandhar: Milestone Publishers.
- Soni, P.L. (2008). *A Text book of Inorganic Chemistry*. 2nd Edition. New Delhi: Sultan Chand & Sons.

REFERENCE BOOKS

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

Course Code 20UCHC63	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	H	H	H	L	H	L	M	L	-	M
CO2	H	H	H	M	M	H	M	M	-	M
CO3	H	H	H	M	H	H	M	M	-	M
CO4	H	H	H	L	L	H	H	M	-	M
CO5	H	H	H	L	L	M	M	M	-	M

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V.V.VANNIAPERUMAL COLLEGE FOR WOMEN

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Re-accredited with 'A' Grade (3rd Cycle) by NAAC

VIRUDHUNAGAR - 626 001

B.Sc. CHEMISTRY

(For those who join in 2020-2021 and after)

Semester V/VI	GRAVIMETRIC ANALYSIS AND ORGANIC PREPARATION	Hours/Week: 3	
Core Practical – 3		Credits: 3	
Course Code 20UCHC61P		Internal 40	External 60

COURSE OUTCOMES

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

CO1: apply the theoretical concepts of gravimetric analysis in lead, barium, copper and nickel by gravimetric estimation. [K3]

CO2: make use of the principles of chromatography to separate carbohydrates, lipids and amino acids. [K3]

CO3: prepare organic compounds on applying simple reaction mechanism. [K3]

CO4: analyse the metal ions by gravimetric method. [K3]

CO5: to differentiate carbohydrates, lipids and amino acids from the given mixture. [K4]

I. GRAVIMETRIC ANALYSIS

1. Estimation of lead as lead chromate
2. Estimation of barium as barium chromate
3. Estimation of copper as cuprous thiocyanate
4. Estimation of nickel as nickel dimethyl glyoxime.

II. ORGANIC PREPARATION

1. **Nitration:** Picric acid from phenol
2. **Bromination:** p-bromoacetanilide from acetanilide
3. **Hydrolysis:** Aromatic acid from (a) an ester (b) an amide

4. **Oxidation:** Benzoic acid from benzaldehyde.
5. **Benzoylation:** (a) Amine (b) phenols
6. **Acetylation:** (a) Amine (b) phenols

III. CHROMATOGRAPHIC SEPARATION

1. Chromatographic separation of KMnO_4 & $\text{K}_2\text{Cr}_2\text{O}_7$
2. Chromatographic separation of amino acids
3. Chromatographic separation of lipids
4. Chromatographic separation of carbohydrates

Course Code 20UCHC61P	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1 a	PSO 1 b	PSO 2	PSO 3 a	PSO 3 b	PSO 4 a	PSO 4 b	PSO 5	PSO 6	PSO 7
CO1	H	H	H	M	M	H	L	L	H	M
CO2	H	H	H	M	M	H	L	L	H	M
CO3	H	H	H	M	M	H	L	L	H	M
CO4	H	H	H	M	M	H	L	L	H	M
CO5	H	H	H	M	M	H	L	L	H	M

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B.Sc. CHEMISTRY

(For those who join in 2020-2021 and after)

Semester VI	ORGANIC ANALYSIS AND ESTIMATION	Hours/Week: 3	
Core Practical - 4		Credits: 3	
Course Code 20UCHC62P		Internal 40	External 60

COURSE OUTCOMES

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

CO1: apply the theoretical concepts of organic chemistry in qualitative and quantitative analyses of organic compounds. [K3]

CO2: write the systematic procedure for the analysis of organic Compounds. [K3]

CO3: develop the laboratory skills in handling the reagents and chemicals required for analysing organic compounds. [K3]

CO4: Discriminate the various organic compounds based on functional group. [K3]

CO5: Characterise the organic compounds using IR Spectrometer. [K4]

I. ORGANIC ANALYSIS

Analysis of an organic compound containing one or two functional groups and confirmation by the preparation of a solid derivative - acids, phenols, aldehydes, ketones, esters, nitrocompounds, amines (primary, secondary and tertiary), amides, aliphatic diamide and monosaccharides.

II. ORGANIC ESTIMATION

- 1) Estimation of phenol
- 2) Estimation of aniline

III. CHARACTERISATION OF ORGANIC COMPOUNDS USING IR SPECTROMETER

Course Code	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO									
	1 a	1 b	2	3 a	3 b	4 a	4 b	5	6	7
20UCHC62P										
CO1	H	H	H	M	M	H	L	L	H	M
CO2	H	H	H	M	M	H	L	L	H	M
CO3	H	H	H	M	M	H	L	L	H	M
CO4	H	H	H	M	M	H	L	L	H	M
CO5	H	H	H	M	M	H	L	L	H	M

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VIRUDHUNAGAR - 626 001

B.Sc. CHEMISTRY

(For those who join in 2020-2021 and after)

Semester VI	PHYSICAL CHEMISTRY EXPERIMENTS	Hours/Week: 2	
Core Practical - 5		Credits: 2	
Course Code 20UCHC63P		Internal 40	External 60

COURSE OUTCOMES

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

CO1: Apply standard procedure to carryout the various types of conductometric and potentiometric titrations. [K3]

CO2: Apply standard procedure to carryout the various types of reactions using pHmeter, UV photo reactor. [K3]

CO3: Develop analytical skill to perform kinetics and phase rule experiments. [K3]

CO4: Examine the metal ions such as Cu^{2+} , Fe^{2+} and Ni^{2+} ions by spectrophotometric Techniques and compare their strengths with the standard solution. [K3]

CO5: Interpret the results obtained from partition coefficient and Nernst distribution law. [K4]

1. Determination of I, II, III order dissociation constant of H_3PO_4 by pH measurement.

2. Phase diagram involving

- a. Simple eutectic and
- b. Compound formation

3. Critical solution temperature

Determination of CST of phenol - water system and effect of impurity on CST -strength of sodium chloride

4. Thermochemistry

Heat of solution - Ammonium oxalate – water system

5. Partition co-efficient experiments:

a. (i) Study of the equilibrium constant for the reaction

$KI + I_2 \rightarrow KI_3$ by determining the partition co-efficient of iodine
between water and carbon tetrachloride

(ii) Determination of strength of given KI

b. Determination of association factor of benzoic acid in benzene.

6. Kinetics:

a) Determination of relative strength of acids by

i) Acid catalysed hydrolysis of ester.

ii) dye degradation using UV photoreactor

7. Electrochemistry

a) Conductometric Titrations:

i) Conductometric titration between an acid and a base (HCl Vs NaOH)

ii) Conductometric titration between $BaCl_2 - K_2SO_4$

b) Potentiometric titrations

1. $KMnO_4$ Vs $FeSO_4$

2. $K_2Cr_2O_7$ Vs FAS

8. Verification of Beer-Lambert's law by Spectrophotometry

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

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Dr. J. Kavitha
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B.Sc. CHEMISTRY

(For those who join in 2020-2021 and after)

Semester VI	DAIRY CHEMISTRY	Hours/Week:5	
DSEC -2		Credits: 4	
Course Code 20UCHE61		Internal 25	External 75

COURSE OUTCOMES

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

- CO1: understand the chemical composition of milk. [K1]
- CO2: know the techniques of milk processing. [K2]
- CO3: acquire knowledge about various milk products. [K3]
- CO4: understand about different types of special milk. [K4]
- CO5: comprehend techniques of fermentation of milk and various milk products. [K5]

UNIT I

COMPOSITION OF MILK

Milk – definition – general composition of milk – constituents of milk – lipids, proteins, carbohydrate, vitamins and minerals – physical properties of milk – colour, odour, acidity, specific gravity, viscosity and conductivity – Rennet effect effect – factors affecting the composition of milk – adulterants, preservatives and neutralizer – examples and their detection – estimation of fat, acidity and total solids in milk. (15 Hours)

UNIT II

PROCESSING OF MILK

Microbiology milk – destruction of microorganisms in milk – physico – chemical changes taking place in milk due to processing – boiling, pasteurization – types of pasteurization – Bottle, Batch and HTST (High Temperature Short Time) – Vacuum pasteurization – Ultra High Temperature Pasteurization. (15 Hours)

UNIT III

MAJOR MILK PRODUCTS

Cream – definition – composition – chemistry of creaming process – gravitational and centrifugal methods of separation cream – estimation of fat in cream. Butter – definition – composition – theory of churning – desibutter – salted butter – estimation of acidity and moisture content in butter. Ghee – major constituents – common adulterants added to ghee and their detection – rancidity – definition – prevention – antioxidants and synergists – natural and synthetic. (15 Hours)

UNIT IV

SPECIAL MILK

Standardised milk – definition – merits – reconstituted milk – definition – flow diagram of manufacture – Homogenised milk – flavoured milk – vitaminised milk – toned milk – Incitation milk – vegetable toned milk – humanized milk – condensed milk – definition composition and nutritive value. (15 Hours)

UNIT V

FERMENTED AND OTHER MILK PRODUCTS

Fermented milk products – fermentation of milk – definition, condition, cultured milk – definition of culture examples, conditions – cultured cream – cultured butter milk – Bulgaxious milk – acidophilous milk – YoheerIndigeneour products -Khoa and chchana definition – preparation of khoa and chchana sweets – Gulabjamun, chana sweet, Rasogolla. Ice cream – definition – percentage composition types – Ingredients – manufacture of ice-cream stabilizers – emulsifiers and their role milk powder – definition – need for making milk powder – drying process – types of drying dairy detergents – characteristics – classification – washing procedure

– sterilization – chloramine T and hypochlorite solution. Visit to a pasteurization factory / Milk product company and submission of a report. (15 Hours)

TEXT BOOKS

1. JayaShree Ghosh, (2013). *Fundamental Concepts of Applied Chemistry*. 1st Edition. New Delhi: S.Chand& Company Ltd.
2. BagavathiSundari. K,(2006). *Applied Chemistry*. 1st Edition. Chennai: MJP Publishers.
3. Sukumar De. (2000). *Outlines of Dairy Technology*. 1st Edition. New Delhi: Oxford University Press.

REFERENCE BOOK

1. Wong,N.P.Jenness,R. Keenay,M.& Matrh,E.H. (1998), *Fundamentals of Dairy Chemistry*. 1st Edition. New Delhi: CBS Publishers & Distributors Pvt.Ltd.

Course Code 20UCHE61	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	H	H	H	L	H	L	M	L	-	M
CO2	H	H	H	M	M	H	M	M	-	M
CO3	H	H	H	M	H	H	M	M	-	M
CO4	H	H	H	L	L	H	H	M	-	M
CO5	H	H	H	L	L	M	M	M	-	M

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Mrs.M.Amutha
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B.Sc. CHEMISTRY

(2020 -2021 onwards)

Semester VI	MEDICAL PHYSICS	Hours/Week: 5	
DSEC-2		Credits: 4	
Course Code 20UPHE62		Internal 25	External 75

COURSE OUTCOMES

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

- CO1 : explain bio potential, transducers, biomedical recorders, radio therapy, medical and safety instrumentation. [K1]
- CO2 : describe the principle of bio electrodes, active & passive transducers, biomedical recorders, X-ray, Laser and safety instrumentation. [K2]
- CO3 : apply the theories to calculate the relevant physical parameters for medical devices/instrumentation. [K3]
- CO4 : examine the structure and mechanism of cells, transducers, biomedical recorders, medical and safety instrumentation. [K4]
- CO5 : justify the Medical Instrumentation techniques based on their safety level. [K5]

UNIT I

Bio Medical Electrodes

Cells and their structure-transport of ions through cell membrane-resting and action potentials-bio electric potentials-design of medical instruments-components of tile bio medical instrument system- electrodes, micro electrodes, depth & needle electrodes and surface electrodes. Transducers and types. (15 Hours)

UNIT II

Bio Potential Recorders

Electrocardiography(ECG)-origin of Cardiac Action Potential-ECG lead configurations- ECG recording set up- Practical considerations for ECG recording-analysis of ECG signals – Electroencephalography(EEG)-origin of EEG- brain waves-placement of electrodes-recording setup-Analysis of EEG – Electromyography(EMG)-recording setup-determination of conduction velocities in nerve motors-Electroretinography and Electrooculography. (15 Hours)

UNIT III

Radio therapy & Laser Applications

Teletherapy units-x-rays for therapy- physical components of LINAC- sources used for Brachytherapy – Brachytherapy-sources and methods-remote after loading effects- medical applications of Laser in ophthalmology and dermatology. (15 Hours)

UNIT IV

Medical Instrumentation

Physics of x-ray production – properties-medical uses of x-rays- x-ray units- direct Fluoroscopy-CT scanners- primary radiological image formation – MRI-difference between CT and MRI-mammography units

Blood cell counter-photometers and calorimeters-filter photometer- spectrophotometer - flame photometer-filter fluorometer – chromatography-digital thermometer. (15 Hours)

UNIT V

Safety Instrumentation

Introduction- radiation safety Instrumentation – effects of radiation exposure- radiation monitoring instruments – micro shock and macro shock – micro shock hazards – electrical accidents in hospitals - macro shock hazards – devices to protect against electrical hazards.

(15 Hours)

TEXT BOOKS

1. Arumugam, M. (2014).*Bio medical Instrumentation*. 14th Reprint. Tamil Nadu: Anuradha Publications.
2. Faiz M. Khan, John P. Gibbons (2014), *The Physics of Radiation Therapy*, China: Library of Congress Cataloging-in-Publication Data.

Unit I - Chapter 1 – Sections: 1.4-1.6

Chapter 2 – Sections: 2.2 - 2.4(2.4.1-2.4.7), 2.5, 2.5.1-2.5.8

Unit II - Chapter 4 – Sections:4.3 (4.3.1 to 4.3.5), 4.4 (4.4.1 to 4.4.5), 4.5 (4.5.1 to 4.5.2),
4.6

Unit IV- Chapter 7 – Sections: 7.2,7.5,7.5.1,7.5.2,7.5.3,7.5.4,7.5.5,7.6

Unit V- Chapter 9 – Sections: 9.1,9.2,9.2.1,9.2.2,9.4,9.5,9.5.1,9.5.2,9.6

Unit III & IV – Study material prepared by Department of Physics (Book 2)

REFERENCE BOOKS

1. Mandeep Singh. (2010). *Introduction to Biomedical Instrumentation*. New Delhi: PHI Learning Private Limited.
2. Chatterjee Shakti. (2008). *Biomedical Instrumentation Systems*. India: Thomson Press Ltd.
3. Sawhney, G. S. (2012). *Biomedical Electronics and Instrumentation Made Easy*. New Delhi: I.K. International Pvt. Ltd.
4. John G Webster (2010). *Medical Instrumentation – Application and Design*, John Wiley and Sons.

Course Code 20UPHE62	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	-	M	-	-	L	-	M	-	H
CO2	H	L	M	L	-	L	-	M	-	M
CO3	H	-	-	-	M	L	L	H	-	-
CO4	H	L	L	-	-	M	L	H	-	L
CO5	H	-	L	-	-	M	M	H	L	L

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VIRUDHUNAGAR - 626 001

B.Sc. CHEMISTRY

(For those who join in 2020-2021 and after)

Semester VI	MEDICINAL CHEMISTRY	Hours/Week:5	
DSEC -2		Credits: 4	
Course Code 20UCHE63		Internal 25	External 75

COURSE OUTCOMES

On completion of the course, students will be able to

CO1: recall common diseases, poisons and sources of drugs. [K1]

CO2: classify important pharmacy terminologies, drugs and their actions. [K2]

CO3: use first aid box, Paracetamol, aspirin and inorganic compounds for sufferings. [K3]

CO4: explain routes of administration and biological responses of drugs for major diseases. [K4]

CO5: summarize the treatment, mechanism, assay and side effects of drugs for diseases. [K5]

UNIT I

Introduction

Sources of drugs – Terminologies – Pharmacy – Pharmacology – Molecular pharmacology – pharmacodynamics – Pharmacokinetics – Pharmacophore – Antimetabolites – Mutation – Chemotherapy – Pharmacognosy – Classification of drugs – Mechanism of drug action – Action at cellular & extracellular sites – Drug receptors and biological responses.

(15 Hours)

UNIT II

Metabolism of drugs

Different types of drug action- Absorption of drugs – Routes of administration of drugs – factors affecting absorption – Assay of Drugs – Drug Dosage–Metabolism of drugs – Chemical pathways of drug metabolism. (15 Hours)

UNIT III

Analgesics, Anaesthetics , Common poisons and antidotes

1. Analgesics – Definition – Types – Narcotic analgesics - Action of morphine – Synthetic analgesics –preparation of pethidine – Non - narcotic analgesics – Preparation of Aspirin and paracetamol
2. Anaesthetics – Characteristics – Classification – Advantages and Disadvantages of ether chloroform – Local Anaesthetics – Cocaine.
3. Common poisons and antidotes - Acid poisoning, Alkali poisoning, poisoning by disinfectants, Alcohol poisoning, Mercury poisoning, and Salicylate poisoning. (15 Hours)

UNIT IV

Medicinal uses and Biological role of Inorganic compounds

1. Inorganic compounds and their medicinal uses – Compounds of Aluminium, Phosphorus, Iron, Platinum and Mercury.
2. Biological role of Inorganic compounds – Sodium, Potassium, Calcium, Iodine, Copper and Zinc. (15 Hours)

UNIT V

Common Diseases,Diabetes, Cancer and First aid for accidents

1. Common diseases and their treatment – Malaria, Common cold, Plague, Diphtheria, tuberculosis, cholera, typhoid, dysentery, jaundice, asthma & epilepsy.
2. Diabetes – Types – Control – hypoglycemic drug – insulin
3. Cancer – Types – Common causes of cancer – spread of cancer – treatment of cancer – cytotoxic agents - Melphalan
4. First aid for accidents – Important rules of first aid – First aid box – First aid for Bleeding, Fractures, Burns, Fainting and poisonous bites. (15 hours)

TEXT BOOKS

1. Jayashree Ghosh. (2014)..*A TextBook of Pharmaceutical Chemistry*. 3rd Edition. New Delhi: S.Chand& Company Ltd.
2. Ashutosh Kar. (2010). *Medicinal Chemistry*.5th Edition. New Delhi: New Age International Publishers.
3. Ilango, K.&Valentina, P. (2007). *TextBook of Medicinal Chemistry*.1st Edition. Chennai: Keerthi Publishers.

REFERENCE BOOKS

1. Parimoo, P. (2011). *A TextBook of Medicinal Chemistry*.1st Edition. New Delhi: CBS Publishers & Distributors Pvt.Ltd.
2. Delgado,J.N.&Remers, W.A.(1998).*Text book of Organic,Medicinal & Pharmaceutical Chemistry*. 9th Edition.Philadelphia: J.B. Lippincott Company.

Course Code 20UCHE63	PO1		PO2	PO3		PO4		PO5		PO6	PO7
	PSO 1. a	PSO 1. b	PSO 2.	PSO 3. a	PSO 3. b	PSO 4 .a	PSO 4. b	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	H	H	M	M	H	H	M	H	M	-	M
CO2	H	H	M	M	H	H	M	H	M	-	M
CO3	H	H	H	H	H	H	H	H	H	-	H
CO4	H	H	H	H	M	H	M	M	M	-	H
CO5	H	H	H	M	M	M	M	H	M	-	H

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VIRUDHUNAGAR - 626 001

B.Sc. CHEMISTRY

(For those who join in 2020-2021 and after)

Semester VI	GREEN CHEMISTRY	Hours/Week: 2	
Skill Enhancement Course-6		Credits: 2	
Course Code 20UCHS61		Internal 40	External 60

COURSE OUTCOMES

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

CO1: understand the need and the principles of green chemistry. [K1]

CO2: summarize the concept of atom economy and selectivity. [K2]

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

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

CO5: construct the green synthesis using ultra sound assisted reactions. [K4]

UNIT I

Introduction-Need for green chemistry-Goals of green chemistry-Twelve principles of green chemistry. (6 Hours)

UNIT II

Concept of atom economy -substitution, elimination, rearrangement, addition reactions-concept of selectivity- chemoselectivity, regioselectivity, enantioselectivity and diastereoselectivity-green solvents-super critical CO₂, ionic liquids, water-solventless processes.

(6 Hours)

UNIT III

Designing a green synthesis- choice of starting materials, choice of reagents, choice of catalysts, choice of solvents. (6 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. (6 Hours)

UNIT V

Sonochemical technology- Theory- Ultra sound assisted reactions-Esterification, saponification, substitution reactions, alkylation, oxidation, reduction, coupling, cannizzaro, Strecker and Reformatsky reactions. (6 Hours)

TEXT BOOK

1. Kumar.V.(2015).*AnIntroduction to Green Chemistry*. 1st Edition.Jalandhar: Vishal Publishing Co.

REFERENCE BOOK

1. Ahluvalia, V.K.&Kidwai.(2007).*New Trends in Green Chemistry*.2ndEdition. New Delhi: Anamaya Publishers.

Course Code 20UCHS61	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	H	H	H	L	H	L	M	L	-	M
CO2	H	H	H	M	M	H	M	M	-	M
CO3	H	H	H	M	H	H	M	M	-	M
CO4	H	H	H	L	L	H	H	M	-	M
CO5	H	H	H	L	L	M	M	M	-	M

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