

# VIVEKANANDHA

## COLLEGE OF ARTS AND SCIENCES FOR WOMEN

[AUTONOMOUS]

An ISO 9001:2015 Certified Institution,  
Affiliated to Periyar University, Salem,  
(Approved by AICTE and Re-Accredited with 'A' Grade by NAAC,  
Recognized Under 2(f) and 12(b) of UGC Act, 1956).  
Elayampalayam, Tiruchengode - 637 205, Namakkal Dt., Tamilnadu, INDIA.

## DEPARTMENT OF CHEMISTRY

### BACHELOR OF SCIENCE (B.Sc.)

### B.Sc., CHEMISTRY REGULATIONS AND SYLLABUS

*(Modified)*

[FOR CANDIDATES ADMITTED FROM 2023-26 ONWARDS UNDER  
AUTONOMOUS – CHOICE BASED CREDIT SYSTEM (CBCS) & OUTCOME  
BASED EDUCATION (OBE) PATTERN]



**SPONSORED BY**

**ANGAMMAL EDUCATIONAL TRUST**

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## **About the College**

Vivekanandha College of Arts and Sciences for Women (Autonomous) was established and hailed into Women's Educational Service in the Year 1995. Angammal Educational Trust Chaired by the great Educationalist 'Vidhya Rathna' Prof. Dr. M. KARUNANITHI, B.Pharm., M.S., Ph.D., D.Litt., sponsors this college and other institutions under the name of the great Saint Vivekanandha. Our institutions are situated on either side of Tiruchengode-Namakkal Main Road at Elayampalayam, 6 kms away from Tiruchengode. This is biggest women's college in India with more than 7500 girl students and more than 18 departments. The strength of the college was just 65 at the time of its establishment. With the dedication, work, sacrifice and long vision of the chairman, this institution has grown into a Himalaya stage. As a result of which UGC, New Delhi, awarded 2f and 12b, extended Autonomous status for second cycle. The National Assessment and Accreditation Council reaccredited with grade 'A<sup>+</sup>' for its successful performance.

As an Autonomous Institution, academic professionals of the college framed Curriculum and Syllabi in consultation with all its stakeholders to cater the needs of the young women to fulfill the women empowerment and present Industrial needs to the local benefits. The students are empowering with confidence and required skills to face the society.

## **Quality Policy**

To provide professional training by establishing a high level center of learning that provides quality education at par with the international standards and Provide excellence education with well equipped infrastructure to all the rural women.

## **Our Vision**

To be an academic institution exclusively for women, in dynamic equilibrium with the social and economic environment, strive continuously for excellence in education, research and technological service to the nation.

## **Our Mission**

The mission of our institution is to discover, teach and apply knowledge for the intellectual, cultural, ethical, social and economic growth of women students.

# REGULATIONS

## I. SCOPE OF THE COURSE

The uniqueness of the B.Sc. (Chemistry) program is its content and topic coverage, the teaching methodology and the faculty. The program expects a serious commitment of the students to take up challenging study schedules and assignments. The course involves a blend of theoretical education and practical training which run concurrently for a period of three years and equips a student with knowledge, ability, skills and other qualities.

The teaching methodologies include classroom lectures, industrial visits, orientation and internship. The new syllabus may help the students to understand the newer aspects of chemistry and apply the same to the real life situations. Thus the students turn more relevant and resourceful to the society. It may enable the young minds think differently and forms a link between old ideas and new ideas in chemistry and gives comprehensive approaches to the very learning process and the learners. To have academic flexibility we have chosen and implemented Choice Based Credit System (CBCS) in our syllabus. To enhance the quality of students from 2018-2019, we have implemented Outcome Based Education (OBE) education system for I UG, II UG and III UG students.

## II. SALIENT FEATURES

- ✓ Course is specially designed for a higher level career placement.
- ✓ Special guest lectures from industrialists will be arranged.
- ✓ Exclusively caters to students interested in pursuing higher studies.
- ✓ Special industry orientations and training are parts of the degree course.

## III. OBJECTIVES

The new syllabus throws light on the recent and emerging areas of chemistry.

- ✓ Enable the students to understand chemistry and make them more relevant to the society.
- ✓ Develop the analytical ability in students so that they themselves prepared in solving problems.
- ✓ Help the students to learn practical skills in a better way.

- ✓ Inculcate research aptitude among the students.
- ✓ Enable the students to go to higher levels of learning chemistry.
- ✓ Improve the employability of the students.
- ✓ Inspire the students to apply their knowledge gained for the development of society in general and individuals in particular.

#### **IV. ELIGIBILITY FOR ADMISSION**

A candidate who has passed Higher secondary examination of Tamil nadu Higher secondary board or an examination of some other board accepted by the syndicate as equivalent there to with Chemistry and Physics and any one of the subjects namely Maths, Botany, Zoology or Biology, Home science shall be eligible for admission into B.Sc., course in chemistry.

#### **V. DURATION OF THE COURSE**

- The course shall extend over a period of three academic years consisting of six semesters. Each academic year will be divided into two semesters. The first semester will consist of the period from July to November and the second semester from December to April.
- The subjects of the study shall be in accordance with the syllabus prescribed from time to time by the Board of Studies of Vivekanandha College of Arts and Sciences for Women (Autonomous), Tiruchengode with the approval of Periyar University, Salem.
- Each subject will have required hours of lecture per week apart from practical training.

#### **VI. ASSESSMENT**

Assessment of the students would be made through Continuous Internal Assessment (CIA) and External Assessment (EA) for passing each subject both theory and practical papers.

A candidate would be permitted to appear for the External Examination only on earning 75 % of attendance and only when her conduct has been satisfactory. It shall be open to grant exemption to a candidate for valid reasons subject to conditions prescribed.

## CONTINUOUS INTERNAL ASSESSMENT (CIA)

The performance of the students will be assessed continuously by the teacher concern and the Internal Assessment Marks will be as follows:

### Distribution Of Continuous Assesment Marks (Theory-25/Practical-40)

Activity (Theory)	Period (WD)	Marks (25)	Activity (Practicals)	Marks (40)
Attendance	90	5	Attendance	5
CA Test I	30 to 35	2.5	Review I	5
CA Test II	60 to 65	2.5	Review II	5
Model	After 90	10	Model practical Examination	10
Assignment	15 to 20	1	Observation note	10
Poster	30 to 35	1	Results in lab/Work	5
PowerPoint	45 to 50	1		
Skit	60 to 65	1		
Groupdiscussion	65 to 70	1		
<b>Total</b>		<b>25</b>		<b>40</b>

### Distribution of attendance mark

S. No.	Percentage	Marks	
		Theory	Practical
1	76-80	1	2
2	81-85	2	4
3	86-90	3	6
4	91-95	4	8
5	96-100	5	10

## A. EXTERNAL ASSESSMENT (EA)

The performance of the students would be assessed by examination at the end of each semester with a written test for theory for three hours and practical examination at the end of even semesters for six hours. Question papers would be set by the selected external examiners in the prescribed format and valuated by the external examiners with the help of the teacher concern.

The pattern of assessment is as follows:

Distribution of Final Assessment Marks (75/60)

Section	Activity	Marks (75)	Activity	Marks (60)
A	One mark (10)	10	Record work	05
B	Seven marks (Either or)(5)	35	Viva Voce	05
C	Ten marks (3/5)	30	Spotter	20
			Major (Performance)	05
			Major (Result)	05
			Major (Writeup)	10
			Minor (Performance)	02
			Minor (Result)	03
			Minor (Writeup)	05
<b>Total</b>		<b>75</b>	<b>Total</b>	<b>60</b>

## VII. PASSING MINIMUM

### INTERNAL

There is no passing minimum for CIA

### EXTERNAL

In the End Semester Examinations, the passing minimum shall be 30 out of 75 Marks for theory (40 %) and 24 out of 60 marks for practical (40 %).

## VIII. CLASSIFICATION OF SUCCESSFUL CANDIDATES

- Successful candidates passing the examination of core and allied papers and securing
  - 75 % and above shall be declared to have passed the examination in first class with distinction provided they pass all the examinations prescribed for the course at first appearance itself.
  - 60% and above shall be declared to have passed the examinations in first class.
  - 50% and above but below 60% shall be declared to have passed the examinations in second class.
- All the remaining successful candidates shall be declared to have passed the examinations in third class.
- Candidates who pass all the examinations prescribed for the course at the first appearance itself and within a period of three consecutive academic years from the year of admission only will be eligible for ranking purpose.

## **IX. ELIGIBILITY FOR AWARD OF THE DEGREE**

A candidate shall be eligible for the award of the degree only if she has undergone the above degree for a period of not less than three academic years comprising of six semesters and passed the examinations prescribed and fulfilled the conditions prescribed.

## **X. PROCEDURE IN THE EVENT OF FAILURE**

If a candidate fails in a particular subject, she may reappear for the End Semester Examination in the concerned subject in subsequent semesters and shall pass the examination.

## **XI. COMMENCEMENT OF THESE REGULATIONS**

These regulations shall take effect from the academic year 2023-24.

## XII. COURSE PATTERN

### SYLLABUS FRAME WORK

Credit Distribution for UG Programme in Chemistry - 2023 onwards

#### SEMESTER - I

Part	Code	List of Courses	Credit	Hours per week (L/T/P)	Internal	External	Total marks
Part-I	23U1LT01	Foundation Tamil - I	3	6	25	75	100
Part-II	23U1LE01	English - I	3	4	25	75	100
Part-III	23U1CHC01	CC1- Atomic Structure, Chemical bonding and Electronic effects	4	5	25	75	100
	23U1CHCP01	CC2 Quantitative Inorganic estimation and Inorganic Preparations	2	3	40	60	100
	23U1MAGE04/ 23U1BOGE01	EC1 Allied Mathematics-I / Allied Botany	3	4	25	75	100
	23U1MAGEP1 23U1BOGEP1	Allied Mathematics Practical-I / Allied Botany Practical-I	2	2	40	60	100
Part-IV	23U1VE01	Health, Human Values and Yoga	2	2	25	75	100
	23U1CHS01	Foundation Chemistry	2	2	25	75	100
	23U1ENAC01	AECC – Soft Skills for effective communication	2	2	25	75	100
<b>Total</b>			<b>23</b>	<b>30</b>	<b>255</b>	<b>645</b>	<b>900</b>

#### SEMESTER - II

Part	Code	List of Courses	Credit	Hours per week (L/T/P)	Internal	External	Total marks
Part-I	23U2LT02	Foundation Tamil - II	3	6	25	75	100
Part-II	23U2LE02	English – II	3	4	25	75	100
Part-III	23U2CHC02	CC3- Periodic properties of S & P block elements and hydrocarbons	4	6	25	75	100
	23U2CHCP02	CC4 Qualitative Organic Analysis and preparation of Organic Compounds	2	3	40	60	100
	23U2MAGE06/ 23U2BOGE02	Allied Mathematics - II / Allied Botany - II	3	4	25	75	100
	23U2MAGEP2 23U2BOGEP2	Allied Mathematics Practical-II Allied Botany Practical-II	2	3	40	60	100
Part-IV	23U2EVS01	EVS	2	2	25	75	100
	23U2CSAC02	AECC – Office Automation	2	2	25	75	100
<b>Total</b>			<b>21</b>	<b>30</b>	<b>230</b>	<b>570</b>	<b>800</b>



**SEMESTER – III**

Part	Code	List of Courses	Credit	Hours per week (L/T/P)	Internal	External	Total marks
Part-I	23U3LT03	Foundation Tamil - III	3	6	25	75	100
Part-II	23U3LE03	English - III	3	4	25	75	100
Part-III	23U3CHC03	CC5 Properties of solids, liquids and gases & alcohols	4	5	25	75	100
	23U3CHCP03	CC6 Qualitative Inorganic Analysis	2	3	40	60	100
	23U3PHGE01	Allied Physics - I	3	4	25	75	100
	23U3PHGEP1	Allied Physics practical -I	2	3	40	60	100
	23U3CHDE01	EC1–Instrumental methods of Chemical Analysis	3	3	25	75	100
Part -IV	23U3CHN01/ 23U3CHN02	NMEC - 1 Food Chemistry / Role of Chemistry in daily life	2	2	25	75	100
<b>Total</b>			<b>22</b>	<b>30</b>	230	570	800

**SEMESTER – IV**

Part	Code	List of Courses	Credit	Hours per week (L/T/P)	Internal	External	Total marks
Part-I	23U4LT04	Foundation Tamil - IV	3	6	25	75	100
Part-II	23U4LE04	English – IV	3	4	25	75	100
Part-III	23U4CHC04	CC7 Thermodynamics, Transition elements and Carbonyl compounds	4	5	25	75	100
	23U4CHCP04	CC8 Physical Chemistry Practical – I	2	3	40	60	100
	23U4PHGE02	EC4 Allied Physics -II	3	4	25	75	100
	23U4PHGEP2	Allied Physics Practical -II	2	3	40	60	100
	23U4CHDE02	EC2 - Industrial chemistry	3	3	25	75	100
Part -IV		NMEC -2 Human Rights / Universal Human Values / Indian Knowledge System/Aptitude & logical reasoning for competitive Exams	2	2	25	75	100
<b>Total</b>			<b>22</b>	<b>30</b>	230	570	800

**SEMESTER – V**

Part	Code	List of Courses	Credit	Hours per week (L/T/P)	Internal	External	Total marks
Part-III	23U5CHC05	CC9 Organic Chemistry-I	4	5	25	75	100
	23U5CHC06	CC10 Inorganic Chemistry-I	4	5	25	75	100
	23U5CHC07	CC11 Physical Chemistry-I	4	5	25	75	100
	23U5CHPR01	CC12 Project with viva-voce	4	5	40	60	100
	23U5CHCP05	CC13 Gravimetric analysis and Organic preparation	3	4	40	60	100
	23U5CHDE03/ 23U5CHDE04	EC3 Analytical Chemistry/EC4Biochemistry	4	4	25	75	100
Part - IV		SBEC- 1 Cyber security and Ethical Hacking / Professional Ethics	2	2	25	75	100
	23U6CHIN01	Internship (Carried out during summer vacation)	2	-	-	-	-
<b>Total</b>			<b>27</b>	<b>30</b>	205	495	700

**SEMESTER – VI**

Part	Code	List of Courses	Credit	Hours per week (L/T/P)	Internal	External	Total marks
Part-III	23U6CHC08	CC14 Organic Chemistry-II	4	6	25	75	100
	23U6CHC09	CC15 Inorganic Chemistry-II	4	6	25	75	100
	23U6CHC10	CC16 Physical Chemistry- II	4	5	25	75	100
	23U6CHCP05	CC17 Physical Chemistry Practical -II	2	3	40	60	100
	23U6CHDE05	EC5 Fundamentals of Spectroscopy	4	4	25	75	100
	23U6CHDE06	EC6 Polymer science	4	4	25	75	100
Part -IV		SBEC- 2 Academic Writing and Academic portfolio	2	2	25	75	100
Part- V	23U6CHEX01	Extension Activity	1	-	-	-	-
<b>Total</b>			<b>25</b>	<b>30</b>	190	510	700

### Allied papers Code

Semester	Allied (Theory & Papers)	Code
I/III	Chemistry for Biological Sciences I (Biochemistry / Nutrition and Dietetics / Botany / Zoology)	23U1CHGE01/ 24U1CHGE01/ 23U3CHGE01
I/III	Chemistry for Physical Sciences I (Physics / Mathematics)	23U3CHGE03
II/IV	Chemistry for Biological Sciences II (Biochemistry / Nutrition and Dietetics / Botany / Zoology)	23U2CHGE02 / 24U2CHGE02/ 23U4CHGE02
II/IV	Chemistry for Physical Sciences II (Physics / Mathematics)	23U4CHGE04
I/III	Chemistry Practical for Physical and Biological Sciences - I	23U1CHGEP1 / 23U3CHGEP1
II/IV	Chemistry Practical for Physical and Biological Sciences - II	23U2CHGEP2 / 23U4CHGEP2

### XII. BLOOM'S TAXONOMY BASED ASSESSMENT PATTERN

**K1**-Remember; **K2**- Understanding; **K3**- Apply; **K4**-Analyze; **K5**- Evaluate

#### 1. Theory: 75 Marks

##### (i) Test - I & II and ESE

Knowledge Level	Section	Marks	Description	Total
<b>K1</b>	A (Answer all)	10 x 01=10	MCQ/Define	75
<b>K2</b>	B (Either or pattern)	05 x 07=35	Short Answers	
<b>K3&amp; K4</b>	C (Answer 3 out of 5)	03 x 10=30	Descriptive/ Detailed	

### B.Sc. Chemistry

#### Programme Outcome, Programme Specific Outcome and Course Outcome

Chemistry is the study of composition and transformation of matter. A science that is central to energy production, healthcare, new material development for electronics and other applied fields and environmental protection. Bachelor's degree in Chemistry is the culmination of in-depth knowledge of Inorganic, Organic and Physical chemistry and specialized courses such as Pharmaceutical Chemistry, spectroscopy, Nanoscience, Forensic Science, Cosmetics & Personal Grooming, Food chemistry, Dairy Chemistry and so on.

Thus, this programme helps learners in building a solid foundation for higher studies in Chemistry. The hands on experience the students gain in Practicals enable them to apply theory to solve problems in everyday life, think critically and innovatively. An aptitude for research is instilled through project work and industrial internship.

Students completing this programme will be able to present the concepts of Chemistry clearly and precisely. They can find a solution to pressing problems that mankind is facing today. They can interpret data and present their findings to both scientific community and laymen and have ability to work as a team and evolve to become an entrepreneur.



Completion of this programme will also enable the learners to join teaching profession, conducting research in Industry and Government run research labs. A B.Sc chemistry student has the option to diversify to other branches such as Biochemistry, Biotechnology, and Forensic Science etc. They have employability opportunities in public and private sector jobs in energy, pharmaceutical, Food, cosmetic industries etc.

#### **PROGRAMME OUTCOMES (PO) OF B.SC DEGREE PROGRAMME IN CHEMISTRY**

- Students will possess basic subject knowledge required for higher studies, professional and applied courses.
- Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the science & humanities stream.
- Students will develop scientific aptitude Integrate skills of analysis, critiquing, application and creativity.
- Students will employ appropriate digital tools and techniques necessary in analyzing data and creative design.
- Students will gain competence to pursue higher learning, research and careers or will be able to opt for entrepreneurship
- Students will interact meaningfully with others displaying leadership and coordination in executing projects.
- Students will demonstrate responsibility as citizens committed to national development through community outreach, wellness of self and a sustainable environment.

## **PROGRAMME SPECIFIC OUTCOMES**

- PSO1:** Students acquire in depth knowledge of the fundamental concepts in all disciplines of chemistry.
- PSO2:** Students can disseminate the basics of chemistry and advanced topics and analytical skills inorganic, inorganic and physical chemistry.
- PSO3:** Students will be able to develop creativity in academics and research.
- PSO4:** Students will be able to apply digital tools to collect, analyse and interpret data and present scientific findings.
- PSO5:** Gain competence to pursue higher education and career opportunities in chemistry and allied fields.
- PSO6:** Exhibit leadership qualities to work individually and within a team in organizing curricular, co-curricular and extracurricular activities.
- PSO7:** apply the concepts of chemistry to solve problems in the community, entrepreneurial and research pursuits.
- PSO8:** Exhibit competence in educational, industrial and research pursuits that contribute towards the holistic development of self and community.

		<b>VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN</b> <b>(AUTONOMOUS)</b> Elayampalayam, Tiruchengode-637 205						
Programme	<b>B. Sc.</b>	Programme Code	<b>UCH</b>			Regulations	<b>2023-2026</b>	
Department	<b>Chemistry</b>			Semester			<b>1</b>	
Course Code	Course Name	Hours per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
<b>23U1CHC01</b>	<b>Core Course - I: Atomic Structure, Chemical bonding and Electronic effects</b>	4	1	0	4	25	75	100
<b>COURSE OBJECTIVES</b>	The course aims at giving an overall view of the <ol style="list-style-type: none"> <li>1 various atomic models and atomic structure</li> <li>2 wave particle duality of matter</li> <li>3 periodic table, periodicity in properties and its application in explaining the chemical behaviour</li> <li>4 nature of chemical bonding, and</li> <li>5 fundamental concepts of organic chemistry.</li> </ol>							

<b>Content of the Syllabus</b>			
<b>Unit - I</b>	<b>Atomic structure and Periodic trends</b>	Hours	12
	History of atom (J.J. Thomson, Rutherford); Moseley's Experiment and Atomic number, Atomic Spectra; Black-Body Radiation and Planck's quantum theory - Bohr's model of atom; Photoelectric effect, Compton effect; Dual nature of Matter- De- Broglie wavelength-Davisson and Germer experiment Heisenberg's Uncertainty Principle; Electronic Configuration of Atoms and ions- Hund's rule, Pauli's exclusion principle and Aufbau principle;		
<b>Unit - II</b>	<b>Introduction to Quantum mechanics</b>	Hours	12
	Classical mechanics, Wave mechanical model of atom, distinction between a Bohr orbit and orbital; Postulates of quantum mechanics; probability interpretation of wave functions, Formulation of Schrodinger wave equation - Probability and electron density-visualizing the orbitals -Probability density and significance of $\Psi$ and $\Psi^2$ .  <b>Modern Periodic Table</b> Periodic table-Introduction-periodic properties- Ionisation energy, Electron affinity, Electronegativity and their variations along the period and groups, electronegativity scales, applications of electronegativity. Problems involving the core concepts		
	<b>UNIT-III: Structure and bonding - I</b>	Hours	12

<p><b>Unit - III</b></p>	<p><b>Ionic bond</b> Lewis dot structure of ionic compounds; properties of ionic compounds; Energy involved in ionic compounds; Born Haber cycle – lattice energies, Madelung constant; relative effect of lattice energy and solvation energy; Ion polarization – polarising power and polarizability; Fajans’ rules - effects of polarisation on properties of compounds; problems involving the core concepts.</p> <p><b>Covalent bond</b> Hybridization and geometry of BeCl<sub>2</sub>, BF<sub>3</sub>, CH<sub>4</sub>, PCl<sub>5</sub>, IF<sub>7</sub> and SF<sub>6</sub>. VSEPR Theory. Covalent Bond- Shapes of orbitals, overlap of orbitals – <math>\sigma</math> and <math>\Pi</math> bonds; directed valency - hybridization; VSEPR theory - shapes of molecules of the type AB<sub>2</sub>, AB<sub>3</sub>, AB<sub>4</sub>, AB<sub>5</sub>, AB<sub>6</sub> and AB<sub>7</sub>. Percentage ionic character- numerical problems based on calculation of percentage ionic character.</p>		
<p><b>Unit - IV</b></p>	<p><b>Structure and bonding - II</b></p>	<p>Hours</p>	<p>12</p>
	<p>VB theory – application to hydrogen molecule; concept of resonance - resonance structures of some inorganic species – CO<sub>2</sub>, NO<sub>2</sub>, CO<sub>3</sub><sup>2-</sup>, NO<sub>3</sub><sup>-</sup>; limitations of VBT; Molecular orbital theory-application to molecules such as H<sub>2</sub><sup>+</sup>, He<sub>2</sub>, F<sub>2</sub>, O<sub>2</sub>, N<sub>2</sub>, CO and NO. MO theory - bonding, antibonding and nonbonding orbitals, bond order; O<sub>2</sub>, O<sub>2</sub><sup>+</sup>, O<sub>2</sub><sup>2-</sup>, N<sub>2</sub>, NO, CO; magnetic characteristics, comparison of VB and MO theories.</p> <p>Coordinate bond: Definition, Formation of BF<sub>3</sub>, NH<sub>3</sub>, NH<sub>4</sub><sup>+</sup>, H<sub>3</sub>O<sup>+</sup> properties</p> <p>Metallic bond-electron sea model, VB model; Band theory-mechanism of conduction in solids; conductors, insulator, semiconductor – types, applications of semiconductors</p> <p>Weak Chemical Forces - Vander Waals forces, ion-dipole forces, dipole-dipole interactions, Repulsive forces; Hydrogen bonding – Types, special properties of water, ice, H-bonding in DNA Effects of chemical force, melting and boiling points.</p>		
<p>Extended Professional Component (is a part of internal</p>	<p><b>Basic concepts in Organic Chemistry and Electronic effects</b></p>	<p>Hours</p>	<p>12</p>
<p><b>Unit - V</b></p>	<p>Types of bond cleavage – heterolytic and homolytic; arrow pushing in organic reactions; reagents and substrates; types of reagents - electrophiles, nucleophiles, free radicals; reaction intermediates – carbanions, carbocations, carbenes, arynes and nitrynes.</p> <p>Inductive effect - reactivity of alkyl halides, acidity of halo acids- formic, acetic, chloro acetic and dichloro acetic acid, basicity of amines- methyl, ethyl and benzyl amine; inductomeric and electromeric effects.</p> <p>Resonance – resonance energy, conditions for resonance - acidity of phenols, basicity of aromatic amines, stability of carbonium ions, carbanions and free radicals, reactivity of vinyl chloride, dipole moment of vinyl chloride and nitrobenzene, bond lengths; steric inhibition to resonance.</p> <p>Hyperconjugation - stability of alkenes, bond length, Types of organic reactions-addition, substitution, elimination and rearrangements.</p>		
	<p>Questions related to the above topics, from various competitive examinations UPSC/JAM /TNPSC and others to be solved (To be discussed during the Tutorial hours)</p>		

component only, Not to be included in the external examination question paper)	
<b>Total Hours</b>	
<b>60</b>	
<b>Text Books</b>	
1	Madan, R. D. and Sathya Prakash, <i>Modern Inorganic Chemistry</i> , 2 <sup>nd</sup> ed.; S.Chand and Company: New Delhi, 2003.
2	Rao, C.N. R. <i>University General Chemistry</i> , Macmillan Publication: NewDelhi, 2000.
3	Puri, B. R. and Sharma, L. R. <i>Principles of Physical Chemistry</i> , 38 <sup>th</sup> ed.; Vishal Publishing Company: Jalandhar, 2002.
4	Bruce, P. Y. and PrasadK. J. R. <i>Essential Organic Chemistry</i> , PearsonEducation: New Delhi, 2008.
5	Dash UN, Dharmarha OP, Soni P.L. <i>Textbook of Physical Chemistry</i> , Sultan Chand & Sons: New Delhi, 2016
<b>References</b>	
1	Maron, S. H. and Prutton C. P. <i>Principles of Physical Chemistry</i> , 4 <sup>th</sup> ed.; The Macmillan Company: Newyork, 1972.
2	Lee, J. D. <i>Concise Inorganic Chemistry</i> , 4th ed.; ELBS WilliamHeinemann: London, 1991.
3	Gurudeep Raj, <i>Advanced Inorganic Chemistry</i> , 26 <sup>th</sup> ed.; Goel PublishingHouse: Meerut, 2001.
4	Atkins, P.W. & Paula, J. <i>Physical Chemistry</i> , 10th ed.; Oxford UniversityPress:New York, 2014.
5	Huheey, J. E. <i>Inorganic Chemistry: Principles of Structure and Reactivity</i> , 4 <sup>th</sup> ed .; Addison, Wesley Publishing Company: India, 1993.
<b>E-References</b>	
1	<a href="https://onlinecourses.nptel.ac.in">https://onlinecourses.nptel.ac.in</a>
2	<a href="http://www.mikeblaber.org/oldwine/chm1045/notes_m.htm">http://www.mikeblaber.org/oldwine/chm1045/notes_m.htm</a>
3	<a href="http://www.ias.ac.in/initiat/sci_ed/resources/chemistry/Inorganic.html">http://www.ias.ac.in/initiat/sci_ed/resources/chemistry/Inorganic.html</a>
4	<a href="https://swayam.gov.in/course/64-atomic-structure-and-chemical-bonding">https://swayam.gov.in/course/64-atomic-structure-and-chemical-bonding</a>
5	<a href="https://www.chemtube3d.com/">https://www.chemtube3d.com/</a>
<b>POs</b>	<b>PROGRAMME OUTCOME</b>
PO 1	Students will possess basic subject knowledge required for higher studies, professional and applied courses
PO 2	Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the science & humanities stream.
PO 3	Students will develop scientific aptitude Integrate skills of analysis, critiquing, application and creativity.





PO 4	Students will employ appropriate digital tools and techniques necessary in analysing data and creative design.
PO 5	Students will gain competence to pursue higher learning, research and careers or will be able to opt for entrepreneurship.
PO 6	Students will interact meaningfully with others displaying leadership and coordination in executing projects.
PO 7	Students will demonstrate responsibility as citizens committed to national development through community outreach, wellness of self and a sustainable environment.

COs	COURSE OUTCOME
CO 1	Explain the atomic structure, wave particle duality of matter, periodic properties bonding, and properties of compounds.
CO 2	Classify the elements in the periodic table, types of bonds, reaction intermediates electronic effects in organic compounds, types of reagents.
CO 3	apply the theories of atomic structure, bonding, to calculate energy of a spectral transition, $\Delta x$ , $\Delta p$ electronegativity, percentage ionic character and bond order.
CO 4	evaluate the relationship existing between electronic configuration, bonding, geometry of molecules and reactions; structure reactivity and electronic effects
CO 5	construct MO diagrams, predict trends in periodic properties, assess the properties of elements, and explain hybridization in molecules, nature of H – bonding and organic reaction mechanisms.
Pre-requisites	Higher secondary chemistry

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
<b>Weightage</b>	15	15	15	15	15
<b>Weighted percentage of Course Contribution to Pos</b>	3.0	3.0	3.0	3.0	3.0

Signature of BOS Chairman

	<b>VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN</b> <b>(AUTONOMOUS)</b> Elayampalayam, Tiruchengode-637 205										
	Programme	<b>B. Sc.</b>	Programme Code	<b>UCH</b>	Regulations	<b>2023-2026</b>					
Department	<b>Chemistry</b>			Semester			<b>1</b>				
Course Code	Course Name			Hours per Week			Credit		Maximum Marks		
				L	T	P	C	CA	ESE	Total	
<b>23U1CHS01</b>	<b>Foundation Chemistry</b>			2	0	0	2	25	75	100	
<b>COURSE OBJECTIVES</b>	The course aims at giving an overall view of the The Course aims to make the students to 1. Understand the lab safety measures 2. Outline the basic concepts of organic chemistry 3. Describe the importance of periodic table 4. Explain the fundamentals of physical properties 5. Understand the importance of redox chemistry										

<b>Content of the Syllabus</b>			
<b>Unit - I</b>	<b>Chemistry Lab-General Awareness and First Aid Techniques</b>	Hours	6
	Safety in chemistry lab- introduction to laboratory glass wares-storage and handling of chemicals-carcinogenic chemicals - handling of ethers – toxic and poisonous chemicals. Burns and damages due to organic substances- acids, alkalies - burns in the eye-inhalation of toxic vapours-hazardous chemicals-dealing with bromine, phenol and hot objects.		
<b>Unit - II</b>	<b>Introduction to Organic Chemistry</b>	Hours	6
	Catenation-Classification - Homologous Series - General Molecular Formula- Functional Groups - General and IUPAC Nomenclature - Modern concept of bonding in organic molecules, sp <sup>3</sup> , sp <sup>2</sup> and sp hybridization in carbon by taking methane, ethane and benzene as examples.		
<b>Unit - III</b>	<b>Introduction to Inorganic Chemistry</b>	Hours	6
	Atomic orbitals and concept of atomic orbitals-shape of s,p and d orbitals- periodic table and the classification of elements - Electronic configuration of elements up to atomic number 30, Types of Chemical bonds - Schematic Illustration of bonds.		
<b>Unit - IV</b>	<b>Introduction to Physical Chemistry</b>	Hours	6
	Units - fundamental units - derived units and SI Units - Significant Figures- Mathematical Functions (logarithmic, exponential and trigonometric function)-drawing straight line-Slope and Intercept – Extrapolation - Coordinate System-Spherical Polar System. States of matter – types - properties of solids, liquids and gases - solid state - types of solids - amorphous and crystalline solids.		
<b>Unit - V</b>	<b>Basic concepts of redox chemistry</b>	Hours	6
	Definition - oxidation and reduction reactions-calculation of oxidation numbers-Equivalent weight-definition-calculation of equivalent weight of acids, bases and salts. Reduction potential and electrochemical series.		

Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/JAM /TNPSC and others to be solved (To be discussed during the Tutorial hours)
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**Total Hours**

**30**

**References Books**

1	B.R. Puri, L.R. Sharma and K.C. Kalia, Principles of Inorganic Chemistry, 33 <sup>rd</sup> Edition, Milestone Publishers and Distributors, New Delhi, India (2020)
2	Arub Bahl, B.S. Bahl, A Text Book of Organic Chemistry, 22 <sup>nd</sup> Edition, S. Chand & Co (2019).
3	B.R. Puri, L.R. Sharma & M.S. Pathania, Principles of Physical Chemistry, 48 <sup>th</sup> Edition, Vishal Publishing Co (2020).

**POs**

**PROGRAMME OUTCOME**

PO 1	Students will possess basic subject knowledge required for higher studies, professional and applied courses
PO 2	Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the science & humanities stream.
PO 3	Students will develop scientific aptitude Integrate skills of analysis, critiquing, application and creativity.
PO 4	Students will employ appropriate digital tools and techniques necessary in analysing data and creative design.
PO 5	Students will gain competence to pursue higher learning, research and careers or will be able to opt for entrepreneurship.
PO 6	Students will interact meaningfully with others displaying leadership and coordination in executing projects.
PO 7	Students will demonstrate responsibility as citizens committed to national development through community outreach, wellness of self and a sustainable environment.

**COs**

**COURSE OUTCOME**



CO 1	Explain the atomic structure, wave particle duality of matter, periodic properties bonding,
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	and properties of compounds.
CO 2	Classify the elements in the periodic table, types of bonds, reaction intermediates electronic effects in organic compounds, types of reagents.
CO 3	Read the nomenclature of organic compounds and effect of affecting covalent bond
CO 4	evaluate the states of matter of gases and concept of system
CO 5	have an idea about the pharmaceutical drugs analgesics , antibiotics and cleaning agents
Pre-requisites	Higher secondary chemistry

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
<b>CO1</b>	S	S	S	S	S	S	S	M	S	M
<b>CO2</b>	M	S	S	S	M	S	S	M	M	M
<b>CO3</b>	S	S	S	M	S	S	S	M	S	M
<b>CO4</b>	S	S	S	S	S	S	S	M	M	M
<b>CO5</b>	S	M	S	S	S	S	S	M	M	S

<b>CO /PSO</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	3	3	3	3	3
<b>CO2</b>	3	3	3	3	3
<b>CO3</b>	3	3	3	3	3
<b>CO4</b>	3	3	3	3	3
<b>CO5</b>	3	3	3	3	3
<b>Weightage</b>	15	15	15	15	15
<b>Weighted percentage of Course Contribution to Pos</b>	3.0	3.0	3.0	3.0	3.0

Signature of BOS Chairman

	<b>VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN</b> <b>(AUTONOMOUS)</b> Elayampalayam, Tiruchengode-637 205.								
	Programme	<b>B.Sc</b>	Programme Code	<b>UCH</b>		Regulations	<b>2023-2026</b>		
Department	<b>Chemistry</b>		Semester		<b>1</b>				
Course Code	Course Name		Hours per Week		Credit		Maximum Marks		
			L	T	P	C	CA	ESE	Total
<b>23U1CHCP01</b>	<b>Core course II -Quantitative Inorganic Estimation (titrimetry) and Inorganic Preparations</b>				3	2	40	60	100
<b>COURSE OBJECTIVES</b>	This course aims at providing knowledge on <ul style="list-style-type: none"> <li>laboratory safety</li> <li>handling glass wares</li> <li>Quantitative estimation preparation of inorganic compounds</li> </ul>								

Content of the Syllabus			
<b>Unit - I</b>	<b>Chemical Laboratory Safety in Academic Institutions</b>	Hours	06
	<p>Introduction - importance of safety education for students, common laboratory hazards, assessment and minimization of the risk of the hazards, prepare for emergencies from uncontrolled hazards; concept of MSDS; importance and care of PPE; proper use and operation of chemical hoods and ventilation system; fire extinguishers-types and uses of fire extinguishers, demonstration of operation; chemical waste and safe disposal.</p> <p><b>Common Apparatus Used in Quantitative Estimation (Volumetric)</b></p> <p>Description and use of burette, pipette, standard flask, measuring cylinder, conical flask, beaker, funnel, dropper, clamp, stand, wash bottle, watch glass, wire gauge and tripod stand.</p> <p><b>Principle of Quantitative Estimation (Volumetric)</b></p> <p>Equivalent weight of an acid, base, salt, reducing agent, oxidizing agent; concept of mole, molality, molarity, normality; primary and secondary standards, preparation of standard solutions; theories of acid-base, redox, complexometric, iodimetric and iodometric titrations; indicators – types, theory of acid–base, redox, metal ion and adsorption indicators, choice of indicators.</p>		
<b>Unit - II</b>		Hours	15
	<p><b>Quantitative Estimation (Volumetric)</b></p> <p>Preparation of standard solution, dilution from stock solution</p> <p><b>Permanganometry</b></p> <p>Estimation of sodium oxalate using standard ferrous ammonium sulphate.</p> <p><b>Dichrometry</b></p> <p>Estimation of ferric alum using standard dichromate (external indicator)            Estimation of ferric alum using standard dichromate (internal indicator)</p> <p><b>Iodometry</b></p> <p>Estimation of copper in copper sulphate using standard dichromate</p>		

	<b>Argentometry</b> Estimation of chloride in barium chloride using standard sodium chloride/Estimation of chloride in sodium chloride (Volhard's method)		
<b>Unit - III</b>		Hours	15
	<b>Complexometry</b> Estimation of hardness of water using EDTA. <b>Estimations</b> Estimation of iron in iron tablets Estimation of ascorbic acid. <b>Preparation of Inorganic compounds</b> Potash alum Tetraammine copper (II) sulphate Hexamminecobalt (III) chloride Mohr's Salt		
	<b>Total Hours</b>		<b>36</b>
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.		

<b>Text Books</b>	
1	Venkateswaran, V.; Veeraswamy, R.; Kulandivelu, A.R. <i>Basic Principles of Practical Chemistry</i> , 2 <sup>nd</sup> ed.; Sultan Chand & Sons: New Delhi, 1997.
2	Nad, A. K.; Mahapatra, B.; Ghoshal, A.; <i>An advanced course in Practical Chemistry</i> , 3 <sup>rd</sup> ed.; New Central Book Agency: Kolkata, 2007
<b>References</b>	
1	Mendham, J.; Denney, R. C.; Barnes, J. D.; Thomas, M.; Sivasankar, B.; <i>Vogel's Textbook of Quantitative Chemical Analysis</i> , 6 <sup>th</sup> ed.; Pearson Education Ltd: New Delhi, 2000.
<b>E-References</b>	
1	<a href="http://www.federica.unina.it/agraria/analytical-chemistry/volumetric-analysis">http://www.federica.unina.it/agraria/analytical-chemistry/volumetric-analysis</a>
2	<a href="https://chemdictionary.org/titration-indicator/">https://chemdictionary.org/titration-indicator/</a>

<b>POs</b>	<b>PROGRAMME OUTCOME</b>
PO 1	Students will possess basic subject knowledge required for higher studies, professional and applied courses
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PO 3	Students will develop scientific aptitude Integrate skills of analysis, critiquing, application and creativity.
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PO 7	Students will demonstrate responsibility as citizens committed to national development through community outreach, wellness of self and a sustainable environment.



<b>COs</b>	<b>COURSE OUTCOME</b>
CO 1	Explain the atomic structure, wave particle duality of matter, periodic properties bonding, and properties of compounds.

CO 2	Classify the elements in the periodic table, types of bonds, reaction intermediates electronic effects in organic compounds, types of reagents.
CO 3	apply the theories of atomic structure, bonding, to calculate energy of a spectral transition, $\Delta x$ , $\Delta p$ electronegativity, percentage ionic character and bond order.
CO 4	evaluate the relationship existing between electronic configuration, bonding, geometry of molecules and reactions; structure reactivity and electronic effects
CO 5	construct MO diagrams, predict trends in periodic properties, assess the properties of elements, and explain hybridization in molecules, nature of H – bonding and organic reaction mechanisms.
Pre-requisites	Higher secondary chemistry

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Signature of BOS Chairman

	<b>VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN</b> <b>(AUTONOMOUS)</b> Elayampalayam, Tiruchengode-637 205.							
	Programme	<b>B. Sc.</b>	Programme Code	<b>UCH</b>		Regulations	<b>2023-2026</b>	
Department	<b>Chemistry</b>		Semester		<b>2</b>			
Course Code	Course Name	Hours per Week		Credit	Maximum Marks			
		L	T	P	C	CA	ESE	Total
<b>23U2CHC02</b>	<b>Core Course -III</b> <b>Periodic properties of S &amp; P block elements and hydrocarbons</b>	6	0	0	4	25	75	100
<b>COURSE OBJECTIVES</b>	This course aims at providing an overall view of the 1 chemistry of acids, bases and ionic equilibrium 2 properties of s and p-block elements 3 chemistry of hydrocarbons 4 applications of acids and bases compounds of main block elements and hydrocarbons							

Content of the Syllabus			
<b>Unit - I</b>	<b>Acids, bases and Ionic equilibria</b>	Hours	12
	Concepts of Acids and Bases - Arrhenius concept, Bronsted-Lowry concept, Lewis concept; Relative strengths of acids, bases and dissociation constant; ionic product of water, pH scale, pH of solutions; Degree of dissociation, common ion effect, factors affecting degree of dissociation; acid base indicators, theory of acid base indicators – action of phenolphthalein and methyl orange, titration curves - use of acid base indicators;  Buffer solutions – types, mechanism of buffer action in acid and basic buffer, Henderson-Hasselbalch equation; Salt hydrolysis - salts of weak acids and strong bases, weak bases and strong acids, weak acids and weak bases - hydrolysis constant, degree of hydrolysis and relation between hydrolysis constant and degree of hydrolysis;		
<b>Unit - II</b>	<b>Chemistry of s - Block Elements</b>	Hours	12
	Hydrogen: Position of hydrogen in the periodic table. Alkali metals: Comparative study of the elements with respect to oxides, hydroxides, halides, carbonates and bicarbonates. Diagonal relationship of Li with Mg. Preparation, properties and uses of NaOH, Na <sub>2</sub> CO <sub>3</sub> , KBr, KClO <sub>3</sub> alkaline earth metals. Anomalous behaviour of Be.  <b>Chemistry of p- Block Elements (Group 13 &amp; 14)</b> Preparation and structure of diborane and borazine. Chemistry of borax. Extraction of Al and its uses. Alloys of Al. Carbon-di-sulphide – Preparation, properties, structure and uses. Percarbonates, per monocarbonates and per dicarbonates.		



	<b>Chemistry of p- Block Elements (Group 15-18)</b>	Hours	12
<b>Unit - III</b>	<p>General characteristics of elements of Group 15; chemistry of <math>\text{H}_2\text{N-NH}_2</math>, <math>\text{NH}_2\text{OH}</math>, <math>\text{HN}_3</math> and <math>\text{HNO}_3</math>. Chemistry of <math>\text{PH}_3</math>, <math>\text{PCl}_3</math>, <math>\text{PCl}_5</math>, <math>\text{POCl}_3</math>, <math>\text{P}_2\text{O}_5</math> and oxy acids of phosphorous (<math>\text{H}_3\text{PO}_3</math> and <math>\text{H}_3\text{PO}_4</math>).</p> <p>General properties of elements of group 16 - Structure and allotropy of elements - chemistry of ozone - Classification and properties of oxides - oxides of sulphur and selenium – Oxy acids of sulphur (Caro's and Marshall's acids).</p> <p>Chemistry of Halogens: General characteristics of halogen with reference to electro-negativity, electron affinity, oxidation states and oxidizing power. Peculiarities of fluorine. Halogen acids (<math>\text{HF}</math>, <math>\text{HCl}</math>, <math>\text{HBr}</math> and <math>\text{HI}</math>), oxides and oxy acids (<math>\text{HClO}_4</math>). Inter-halogen compounds (<math>\text{ICl}</math>, <math>\text{ClF}_3</math>, <math>\text{BrF}_5</math> and <math>\text{IF}_7</math>), pseudo halogens [<math>(\text{CN})_2</math> and <math>(\text{SCN})_2</math>] and basic nature of Iodine.</p> <p>Noble gases: Position in the periodic table. Preparation, properties and structure of <math>\text{XeF}_2</math>, <math>\text{XeF}_4</math>, and <math>\text{XeOF}_4</math>; uses of noble gases - clathrate compounds.</p>		
	<b>Hydrocarbon Chemistry-I</b>	Hours	12
<b>Unit - IV</b>	<p><b>Alkanes</b>-Nomenclature, general methods of preparation</p> <p><b>Cycloalkanes</b>: Nomenclature, Preparation of cycloalkanes, Physical Properties and chemical properties of cycloalkanes, Relative stability of cycloalkanes, Bayer's strain theory and its limitations.</p> <p><b>Alkenes</b>-Nomenclature, general methods of preparation – Mechanism of <math>\beta</math>- elimination reactions – <math>\text{E}_1</math> and <math>\text{E}_2</math> mechanism - factors influencing – stereochemistry – orientation – Hofmann and Saytzeff rules. Reactions of alkenes – addition reactions – mechanisms – Markownikoff's rule, oxidation reactions – hydroxylation, oxidative degradation, epoxidation, ozonolysis; polymerization.</p> <p><b>Alkadienes</b>: Nomenclature - classification – isolated, conjugated and cumulated dienes; stability of conjugated dienes; mechanism of electrophilic addition to conjugated dienes - 1, 2 and 1, 4 additions; polyisoprene (natural rubber), vulcanization.</p> <p><b>Alkynes</b>: Nomenclature; general methods of preparation, properties and reactions; acidic nature of terminal alkynes and acetylene.</p>		
	<b>Hydrocarbon Chemistry - II</b>	Hours	12
<b>Unit - V</b>	<p><b>Benzene</b>: Source, structure of benzene, stability of benzene ring, molecular orbital picture of benzene, aromaticity, Huckel's <math>(4n+2)</math> rule and its applications. Electrophilic substitution reactions - General mechanism of aromatic electrophilic substitution - nitration, sulphonation, halogenation, Friedel-Craft's alkylation and acylation. Mono substituted and disubstituted benzene - Effect of substituent – orientation and reactivity.</p> <p><b>Polynuclear Aromatic hydrocarbons</b>: Naphthalene – nomenclature, Haworth synthesis; physical properties, reactions – electrophilic substitution reaction, nitration, sulphonation, halogenation, Friedel – Crafts acylation &amp; alkylation, preferential substitution at <math>\square</math> - position– uses.</p> <p>Anthracene – synthesis by Elbs reaction, Diels – Alder reaction and Haworth synthesis; physical properties; reactions - Diels-Alder reaction, preferential substitution at C-9 and C-10; uses.</p>		
<b>Total Periods</b>			<b>60</b>

**Text Books**

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

#### References

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

#### E-References

1	<a href="https://onlinecourses.nptel.ac.in/http://cactus.dixie.edu/smblack/chem1010/lecture_notes/4B.html">https://onlinecourses.nptel.ac.in/http://cactus.dixie.edu/smblack/chem1010/lecture_notes/4B.html</a>
2	<a href="http://www.auburn.edu/~deruija/pdareson.pdf">http://www.auburn.edu/~deruija/pdareson.pdf</a> <a href="https://swayam.gov.in/course/64-atoms-structure-and-chemical-bonding">https://swayam.gov.in/course/64-atoms-structure-and-chemical-bonding</a>
3	<b>MOOC components</b> <a href="http://nptel.ac.in/courses/104101090/">http://nptel.ac.in/courses/104101090/</a>
4	Lecture 1: Classification of elements and periodic properties <a href="http://nptel.ac.in/courses/104101090/">http://nptel.ac.in/courses/104101090/</a>
5	<a href="http://nptel.ac.in/courses/104103069/15">http://nptel.ac.in/courses/104103069/15</a>

POs	PROGRAMME OUTCOME
PO 1	Students will possess basic subject knowledge required for higher studies, professional and applied courses
PO 2	Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the science & humanities stream.



PO 3	Students will develop scientific aptitude Integrate skills of analysis, critiquing, application and creativity.
PO 4	Students will employ appropriate digital tools and techniques necessary in analysing data and creative design.
PO 5	Students will gain competence to pursue higher learning, research and careers or will be able to opt for entrepreneurship.
PO 6	Students will interact meaningfully with others displaying leadership and coordination in executing projects.
PO 7	Students will demonstrate responsibility as citizens committed to national development through community outreach, wellness of self and a sustainable environment.

COs	COURSE OUTCOME
CO 1	explain the concept of acids, bases and ionic equilibria; periodic properties of s and p block elements, preparation and properties of aliphatic and aromatic hydrocarbons
CO 2	discuss the periodic properties of sand p- block elements, reactions of aliphatic and aromatic hydrocarbons and strength of acids
CO 3	classify hydrocarbons, types of reactions, acids and bases, examine the properties s and p-block elements, reaction mechanisms of aliphatic and aromatic hydrocarbons
CO 4	explain theories of acids, bases and indicators, buffer action and important compounds of s-block elements.
CO 5	assess the application of hard and soft acids indicators, buffers, compounds of s and p- block elements and hydrocarbons
Pre-requisites	General Chemistry I

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
<b>Weightage</b>	15	15	15	15	15
<b>Weighted percentage of Course Contribution to Pos</b>	3.0	3.0	3.0	3.0	3.0

**Signature of BOS Chairman**

	<b>VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN</b> <b>(AUTONOMOUS)</b> Elayampalayam, Tiruchengode-637 205.								
	Programme	<b>B.Sc</b>	Programme Code	<b>UCH</b>	Regulations	<b>2023-2026</b>			
Department	<b>Chemistry</b>		Semester			<b>2</b>			
Course Code	Course Name		Hours per Week		Credit	Maximum Marks			
			L	T	P	C	CA	ESE	Total
<b>23U2CHCP02</b>	<b>Core Course IV - Qualitative Organic Analysis and Preparation of Organic Compounds</b>				3	2	40	60	100
<b>COURSE OBJECTIVES</b>	This course aims at providing knowledge on <ul style="list-style-type: none"> <li>laboratory safety</li> <li>handling glass wares</li> <li>analysis of organic compounds</li> <li>preparation of organic compounds</li> </ul>								

Content of the Syllabus			
<b>Unit - I</b>		Hours	03
	Safety rules, symbols and first-aid in chemistry laboratory. Basic ideas about Bunsen burner, its operation and parts of the flame. Chemistry laboratory glassware –basis information and uses		
<b>Unit - II</b>	<b>Qualitative Organic Analysis</b>	Hours	21
	Preliminary examination, detection of special elements - nitrogen, sulphur and halogens Aromatic and aliphatic nature, Test for saturation and unsaturation, identification of functional groups using solubility tests Confirmation of functional groups <ul style="list-style-type: none"> <li>monocarboxylic acid, dicarboxylic acid</li> <li>monohydric phenol, polyhydric phenol</li> <li>aldehyde, ketone, ester</li> <li>carbohydrate (reducing and non-reducing sugars)</li> <li>primary, secondary, tertiary amine</li> <li>monoamide, diamide, thioamide</li> <li>anilide, nitro compound</li> </ul> Preparation of derivatives for functional groups		
<b>Unit - III</b>	<b>Preparation of Organic Compounds</b>	Hours	21
	i. Nitration - picric acid from Phenol ii. Halogenation - p-bromo acetanilide from acetanilide iii. Oxidation - benzoic acid from Benzaldehyde iv. Microwave assisted reactions in water: v. Methyl benzoate to Benzoic acid vi. Salicylic acid from Methyl Salicylate		

	<p>vii. Rearrangement - Benzil to Benzilic Acid viii. Hydrolysis of benzamide to Benzoic Acid</p> <p><b>Separation and Purification Techniques (Not for Examination)</b></p> <p>1. Purification of organic compounds by crystallization (from water / alcohol) and distillation 2. Determination of melting and boiling points of organic compounds. 3. <b>Steam distillation</b> - Extraction of essential oil from citrus fruits/eucalyptus leaves.</p> <p><b>4. Chromatography (any one) (Group experiment)</b></p> <p>(i) Separation of amino acids by Paper Chromatography (ii) Thin Layer Chromatography - mixture of sugars / plant pigments / permanganate dichromate. (iii) Column Chromatography - extraction of carotene, chlorophyll and xanthophyll from leaves / separation of anthracene - anthracene picrate.</p> <p>5. <b>Electrophoresis</b> – Separation of amino acids and proteins. <b>(Demonstration)</b> Isolation of casein from milk/Determination of saponification value of oil or fat/Estimation of acetic acid from commercial vinegar. (Any one Group experiment) (4,5 &amp; 6 – not for ESE)</p>	
	<b>Total Hours</b>	<b>45</b>

<b>Text Books</b>	
<b>References</b>	
1	Venkateswaran, V.; Veeraswamy, R.; Kulandaivelu, A.R. <i>Basic Principles of Practical Chemistry</i> , 2 <sup>nd</sup> ed.; Sultan Chand: New Delhi, 2012.
2	Manna, A.K. <i>Practical Organic Chemistry</i> , Books and Allied: India, 2018.
3	Gurtu, J. N.; Kapoor, R. <i>Advanced Experimental Chemistry (Organic)</i> , Sultan Chand: New Delhi, 1987.
4	Furniss, B. S.; Hannaford, A. J.; Smith, P. W. G.; Tatchell, A.R. <i>Vogel's Textbook of Practical Organic Chemistry</i> , 5 <sup>th</sup> ed.; Pearson: India, 1989.
<b>E-References</b>	
1	<a href="https://www.vlab.co.in/broad-area-chemical-sciences">https://www.vlab.co.in/broad-area-chemical-sciences</a>



POs	PROGRAMME OUTCOME
PO 1	Students will possess basic subject knowledge required for higher studies, professional and applied courses
PO 2	Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the science & humanities stream.
PO 3	Students will develop scientific aptitude Integrate skills of analysis, critiquing, application and creativity.
PO 4	Students will employ appropriate digital tools and techniques necessary in analysing data and creative design.
PO 5	Students will gain competence to pursue higher learning, research and careers or will be able to opt for entrepreneurship.
PO 6	Students will interact meaningfully with others displaying leadership and coordination in executing projects.
PO 7	Students will demonstrate responsibility as citizens committed to national development through community outreach, wellness of self and a sustainable environment.

COs	COURSE OUTCOME
CO 1	Observe the physical state, odour, colour and solubility of the given organic compound.
CO 2	Identify the presence of special elements and functional group in an unknown organic compound performing a systematic analysis.
CO 3	Compare mono and dicarboxylic acids, primary, secondary and tertiary amines, mono and diamides, mono and polyhydric phenols, aldehyde and ketone, reducing and non- reducing sugars and explain the reactions behind it.
CO 4	Exhibit a solid derivative with respect to the identified functional group.
Pre-requisites	General Chemistry II

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
<b>Weightage</b>	12	12	12	12	12
<b>Weighted percentage of Course Contribution to Pos</b>	3.0	3.0	3.0	3.0	3.0

Signature of BOS Chairman

		<b>VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN</b> <b>(AUTONOMOUS)</b> Elayampalayam, Tiruchengode-637 205.						
Programme	<b>B.Sc.</b>	Programme Code	<b>UCH</b>	Regulations	<b>2023-2026</b>			
Department	<b>Chemistry</b>		Semester		<b>3</b>			
Course Code	Course Name	Hours per week		Credit	Maximum Marks			
		L	T	P	C	CA	ESE	Total
<b>23U3CHC03</b>	<b>Core Course –V</b> <b>Properties of solids, liquids and gases &amp; alcohols</b>	5	1	0	4	25	75	100
<b>COURSE OBJECTIVES</b>	This course aims to provide a comprehensive knowledge on 1 the physical properties of gases, liquids, solids and X-ray diffraction of solids. 2 fundamentals of nuclear chemistry and nuclear waste management. 3 applications of nuclear energy 4 basic chemistry of halo-organic compounds, phenol and other aromatic alcohols. 5 preparation and properties of phenols and alcohols							

Content of the Syllabus			
<b>Unit - I</b>	<b>Gaseous state</b>	Hours	12
	<p><b>General characteristics of gases- parameters of a gas</b> - Kinetic molecular model of a gas: postulates and derivation from the kinetic gas equation; The Maxwell –Boltzmann distribution of speed of molecules- average, root mean square and most probable velocity and average kinetic energy, law of equipartition of energy, degrees of freedom and molecular basis of heat capacities. Collision frequency; collision diameter; mean free path and viscosity of gases.</p> <p>Real gases: Deviations from ideal gas behaviour compressibility factor, Z, and its variation with pressure for different gases. equations of states for real gases-van der Waal's equation Boyle temperature; Numerical problems based on equations of states for real gases, isotherms of real gases – critical phenomena –Andrews isotherms of CO<sub>2</sub> - law of corresponding states-liquefaction of gases; numerical problems involving the core concepts.</p>		
<b>Unit - II</b>	<b>Liquid and Solid State</b>	Hours	12
	<p><b>Liquid crystals</b> – classification, Properties of Liquids- Surface tension, viscosity and their applications. Crystalline and amorphous – differences - geometry, isotropy and anisotropy, melting point; isomorphism, polymorphism.</p> <p><b>Solid State</b> - Crystals –size and shape; laws of crystallography; Symmetry elements – plane, centre and axis; Miller indices, unit cells and space lattices; classification of crystal systems; Bravais lattices; X – ray diffraction – Bragg's equation.</p> <p>Packing in atomic solids – simple cubic, body centered cubic, face centered and hexagonal close packing; Classification of crystals on the basis of bonds - Co-ordination number in typical structures - NaCl, CsCl; comparison of structure and properties of diamond and graphite; numerical problems involving core concepts</p> <p>Defects in solids - stoichiometric and nonstoichiometric defects.</p>		
<b>Unit - III</b>	<b>Nuclear Chemistry</b>	Hours	12



	<p>Natural radioactivity - <math>\alpha</math>, <math>\beta</math> and <math>\gamma</math> rays; half-life period; Fajan–Soddy group displacement law; Geiger–Nattal rule; isotopes, isobars, isotones, mirror nuclei, iso diaphers; nuclear isomerism; radioactive decay series; magic numbers; units – Curie, Rutherford, Roentgen; nuclear stability - neutron- proton ratio; binding energy; packing fraction; mass defect. Simple calculations involving mass defect and B.E., decay constant and <math>t_{1/2}</math> and radioactive series.</p> <p>Isotopes – uses – tracers – determination of age of rocks by radiocarbon dating. (Problems to be worked out)</p> <p>Nuclear energy; nuclear fission and fusion – major nuclear reactors in India; radiation hazards, disposal of radioactive waste and safety measures.</p>		
<b>Unit - IV</b>	<b>Halogen derivatives</b>	Hours	12
	<p><b>Aliphatic halogen derivatives</b> Nomenclature and classes of alkyl halides – isomerism, physical properties, Chemical reactions. Nucleophilic substitution reactions – <math>S_N1</math>, <math>S_N2</math> and <math>S_Ni</math> mechanisms with stereochemical aspects and effect of solvent.</p> <p><b>Di, Tri &amp; Tetra Halogen derivatives:</b> Nomenclature, classification, preparation, properties and applications.</p> <p><b>Aromatic halogen compounds</b> Nomenclature, preparation, properties and uses Mechanism of nucleophilic aromatic substitution – benzyne intermediate</p> <p><b>Aryl alkyl halides</b> Nomenclature, benzyl chloride – preparation – preparation properties and uses</p>		
<b>Unit - V</b>	<b>Alcohols</b>	Hours	12
	<p>Nomenclature, classification, preparation, properties, use; conversions – ascent and descent of series; test for hydroxyl groups. Oxidation of diols by periodic acid and lead tetraacetate.</p> <p><b>Phenols-</b> Nomenclature; classification, Preparation from diazonium salts, cumene, Dow’s process, Raching process; properties – acidic character and effect of substitution on acidity. Reactions – Fries, claisen rearrangement, Electrophilic substitution reactions, Reimer - Teimen, Kolbe, Schmidt, Gatermann synthesis, Libermann, nitro reaction, phthalein reaction.</p> <p>Resorcinol, quinol, picric acid – preparation, properties and uses.</p> <p><b>Aromatic alcohols</b> Nomenclature, benzyl alcohol – methods of preparation – hydrolysis, reduction of benzaldehyde, Cannizzaro reaction, Grignard synthesis, physical properties, reactions – reaction with sodium, phosphorus pentachloride, thionyl chloride, acetic anhydride, hydrogen iodide, oxidation – substitution on the benzene nucleus, uses.</p> <p>Thiols: Nomenclature, structure, preparation and properties.</p>		

Extended Professional Component (is apart of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
<b>Total Hours</b>	
<b>60</b>	

<b>Text Books</b>	
1	B.R. Puri, L.R. Sharma, M.S. Pathania; <i>Principles of Physical Chemistry</i> , 46 <sup>th</sup> edition, Vishal Publishing, 2020.
2	B.R. Puri, L.R. Sharma and K.C. Kalia, <i>Principles of Inorganic Chemistry</i> , Milestone Publishers and Distributors, New Delhi, thirtieth edition, 2009.
3	P.L. Soni and Mohan Katyal, <i>Textbook of Inorganic Chemistry</i> , Sultan Chand & Sons, twentieth edition, 2006.
4.	M. K. Jain, S. C. Sharma, <i>Modern Organic Chemistry</i> , Vishal Publishing, fourth reprint, 2003.
5.	S.M. Mukherji, and S.P. Singh, <i>Reaction Mechanism in Organic Chemistry</i> , Macmillan India Ltd., third edition, 1994.
<b>References</b>	
1	T. W. Graham Solomons, <i>Organic Chemistry</i> , John Wiley & Sons, fifth edition, 1992.
2	A. Carey Francis, <i>Organic Chemistry</i> , Tata McGraw-Hill Education Pvt., Ltd., New Delhi, seventh edition, 2009.
3	I. L. Finar, <i>Organic Chemistry</i> , Wesley Longman Ltd, England, sixth edition, 1996.
4	P. L. Soni, and H. M. Chawla - <i>Text Book of Organic Chemistry</i> , New Delhi, Sultan Chand & Sons, twenty ninth edition, 2007.
5	J.D. Lee, <i>Concise Inorganic Chemistry</i> , Blackwell Science, fifth edition, 2005.
<b>Website and e-learning source</b>	
1	<b>MOOC components</b> <a href="https://nptel.ac.in/courses/104104101">https://nptel.ac.in/courses/104104101</a> Solid state chemistry
2	<a href="https://nptel.ac.in/courses/103106071">https://nptel.ac.in/courses/103106071</a> Nuclear industries and safety
3	<a href="https://nptel.ac.in/courses/104106119">https://nptel.ac.in/courses/104106119</a> s Introduction to organic chemistry



POs	PROGRAMME OUTCOME
PO 1	Students will possess basic subject knowledge required for higher studies, professional and applied courses
PO 2	Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the science & humanities stream.
PO 3	Students will develop scientific aptitude Integrate skills of analysis, critiquing, application and creativity.
PO 4	Students will employ appropriate digital tools and techniques necessary in analysing data and creative design.
PO 5	Students will gain competence to pursue higher learning, research and careers or will be able to opt for entrepreneurship.
PO 6	Students will interact meaningfully with others displaying leadership and coordination in executing projects.
PO 7	Students will demonstrate responsibility as citizens committed to national development through community outreach, wellness of self and a sustainable environment.

COs	COURSE OUTCOME
CO 1	Explain the kinetic properties of gases by using mathematical concepts.
CO 2	Describe the physical properties of liquid and solids; identify various types of crystals with respect to its packing and apply the XRD method for crystal structure determinations.
CO 3	Investigate the radioactivity, nuclear energy and its production, also the nuclear waste management.
CO 4	Write the nomenclature, physical & chemical properties and basic mechanisms of haloorganic compounds and alcohols.
CO 5	Investigate the named organic reactions related to phenol; explain the preparation and properties of aromatic alcohol including thiol.
Pre-requisites	General Chemistry – I and II

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Signature of BOS Chairman

		<b>VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN</b> <b>(AUTONOMOUS)</b> Elayampalayam, Tiruchengode-637 205.							
Programme	<b>B.Sc</b>	Programme Code	<b>UCH</b>		Regulations	<b>2023-2026</b>			
Department	<b>Chemistry</b>		Semester			<b>3</b>			
Course Code	Course Name	Hours per Week		Credit	Maximum Marks				
		L	T	P	C	CA	ESE	Total	
<b>23U3CHCP03</b>	<b>Core course – VI</b> <b>Qualitative Inorganic Analysis</b>				3	2	40	60	100
<b>COURSE OBJECTIVES</b>	<ul style="list-style-type: none"> <li>To develop the skill on systematic analysis of simple inorganic salts and mixture of salts.</li> </ul>								

Content of the Syllabus				
	<b>Semi - Micro Qualitative Analysis</b>		Hours	36
	1. Analysis of simple acid radicals: Carbonate, sulphide, sulphate, thiosulphite, chloride, bromide, iodide, nitrate 2. Analysis of interfering acid radicals: Fluoride, oxalate, borate, phosphate, arsenate, arsenite. 3. Elimination of interfering acid radicals and Identifying the group of basic radicals 4. Analysis of basic radicals (group wise): Lead, copper, bismuth, cadmium, tin, antimony, iron, aluminium, arsenic, zinc, manganese, nickel, cobalt, calcium, strontium, barium, magnesium, ammonium 5. Analysis of a mixture - I to VIII containing two cations and two anions (of which one is interfering type)			
	<b>Total Hours</b>			<b>36</b>
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.			

Recommended Text	
1	<b>Reference Books:</b> V. Venkateswaran, R. Veeraswamy and A. R. Kulandivelu, Basic Principles of Practical Chemistry, Sultan Chand & Sons, New Delhi, second edition, 1997.
Website and e-learning source	
1	<a href="https://www.vlab.co.in/broad-area-chemical-sciences">https://www.vlab.co.in/broad-area-chemical-sciences</a>



<b>POs</b>	<b>PROGRAMME OUTCOME</b>
PO 1	Students will possess basic subject knowledge required for higher studies, professional and applied courses
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PO 3	Students will develop scientific aptitude Integrate skills of analysis, critiquing, application and creativity.
PO 4	Students will employ appropriate digital tools and techniques necessary in analysing data and creative design.
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PO 7	Students will demonstrate responsibility as citizens committed to national development through community outreach, wellness of self and a sustainable environment.

<b>COs</b>	<b>COURSE OUTCOME</b>
CO 1	Acquire knowledge on the systematic analysis of Mixture of salts.
CO2	Identify the cations and anions in the unknown substance.
CO 3	Identify the cations and anions in the soil and water and to test the quality of water.
CO 4	assess the role of common ion effect and solubility product
Pre-requisites	General chemistry

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>
<b>CO1</b>	S	S	S	S	S	S	S	M	S	M
<b>CO2</b>	M	S	S	S	M	S	S	M	M	M
<b>CO3</b>	S	S	S	M	S	S	S	M	S	M
<b>CO4</b>	S	S	S	S	S	S	S	M	M	M

<b>CO /PSO</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	3	3	3	3	3
<b>CO2</b>	3	3	3	3	3
<b>CO3</b>	3	3	3	3	3
<b>CO4</b>	3	3	3	3	3
<b>Weightage</b>	12	12	12	12	12
<b>Weighted percentage of Course Contribution to Pos</b>	3.0	3.0	3.0	3.0	3.0

**Signature of BOS Chairman**

	<b>VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)</b> Elayampalayam, Tiruchengode-637 205.									
	Programme	<b>B.Sc</b>	Programme Code	<b>UCH</b>		Regulations	<b>2023-2026</b>			
Department	<b>Chemistry</b>		Semester		<b>3</b>					
Course Code	Course Name		Hours per Week			Credit		Maximum Marks		
			L	T	P	C	CA	ESE	Total	
<b>23U3CHDE01</b>	<b>EC-I Instrumental Methods of Chemical Analysis</b>		3			3	25	75	100	
Course Objectives	<p>The course aims at providing an overall view of the</p> <ol style="list-style-type: none"> <li>1. Operation and troubleshooting of chemical instruments</li> <li>2. Fundamentals of analytical techniques and its application in the characterization of compounds</li> <li>3. Theory of chromatographic separation and</li> <li>4. Theory of thermo / electro analytical techniques</li> <li>5. Stoichiometry and the related concentration terms</li> </ol>									

<b>Content of the Syllabus</b>			
<b>Unit – I</b>	<b>Qualitative and Quantitative Aspects of Analysis</b>	Hours	9
	S.I Units, Distinction between Mass and Weight. Moles, Millimoles, Milli equivalence, Molality, Molarity, Normality, Percentage by Weight and Volume, ppm, ppb. Density and Specific Gravity of Liquids. Stoichiometry Calculations Sampling, evaluation of analytical data, Errors – Types of Errors, Accuracy, Precision, Minimization of Errors. Significant Figures. Methods of Expressing Precision: Mean, Median, Average Deviation, Standard Deviation, Coefficient of Variation, Confidence Limits, Q-test, F-test, T-test. The Least Square Method for Deriving Calibration plots.		
<b>Unit - II</b>	<b>Atomic Absorption Spectroscopy</b>	Hours	9
	Basic principles of instrumentation (choice of source, monochromator, detector, choice of flame and Burner designs. Techniques of atomization and sample introduction; Method of background correction, sources of chemical interferences and their method of removal. Techniques for the quantitative estimation of trace level of metal ions from water samples.		
<b>Unit - III</b>	<b>UV-Visible and IR Spectroscopy</b>	Hours	9
	Origin of spectra, interaction of radiation with matter, fundamental laws of spectroscopy and selection rules, validity of Beer-Lambert's law. <b>UV-Visible Spectrometry:</b> Basic principles, instrumentation (choice of source, monochromator and detector) for single and double beam instrument; Basic principles of quantitative analysis: estimation of metal ions from aqueous solution, geometrical isomers, keto-enol tautomers. <b>Infrared Spectroscopy:</b> Basic principles of instrumentation (choice of source, monochromator & detector) for single and double beam instrument; sampling techniques, Applications of IR spectroscopy.		
<b>Unit - IV</b>	<b>Thermal and Electro-analytical Methods of Analysis</b>	Hours	9
	TGA and DTA- Principle, Instrumentation, methods of obtaining Thermograms, factors affecting TGA/DTA, Thermal analysis of silver nitrate, calcium oxalate and calcium acetate DSC- Principle, Instrumentation and applications. Electro analytical methods: polarography - principle, instrumentation and applications. Derivative		

	polarography- Cyclic Voltammetry -principle.		
<b>Unit - V</b>	<b>Separation and purification techniques</b>	Hours	9
	Classification, principle, Factors affecting - Solvent Extraction – Liquid - Liquid Extraction, Chromatography: Column, TLC, Paper, Gas, HPLC and Electrophoresis, Principle, Classification, Choice of Adsorbents, Solvents, Preparation of Column, Elution Mechanism of separation: adsorption, partition & ion exchange. Development of chromatograms and Rf value.		
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)		
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.		
<b>Total Hours</b>			45

<b>Text Books</b>	
1	Vogel, Arthur I: A Test book of Quantitative Inorganic Analysis (Rev. by G.H. Jeffery and others) 5th Ed., The English Language Book Society of Longman.
2	R. Gopalan, P. S. Subramanian and K. Rengarajan, Elements of Analytical Chemistry, Sultan Chand, New Delhi, 2007
3	Skoog, Holler and Crouch, Principles of Instrumental Analysis, Cengage Learning, 6th Indian Reprint (2017).
4	R. Speyer, Thermal Analysis of Materials, CRC Press, 1993.
5	R.A. Day and A.L. Underwood, Quantitative Analysis, 6 <sup>th</sup> edn., Prentice Hall of India Private Ltd., New Delhi, 1993
<b>References</b>	
1	D. A. Skoog, D. M. West and F. J. Holler, Analytical Chemistry: An Introduction, 5th edn., Saunders college publishing, Philadelphia, 1998.
2	Dash U N, Analytical Chemistry; Theory and Practice, Sultan Chand and sons Educational Publishers, New Delhi, 2011.
3	Christian, Gary D; Analytical Chemistry, 6th Ed., John Wiley & Sons, New York, 2004.
4	Mikes, O. & Chalmes, R.A. Laboratory Handbook of Chromatographic & Allied Methods, Elles Harwood Ltd. London
5	G.H. Jeffery, J. Bassett, J. Mendham and R.C. Denney, Vogel's Textbook of Quantitative Chemical Analysis, sixth edition Pearson Education, 2000
<b>Website and e-learning source</b>	
1	<a href="http://www.epa.gov/rpdweb00/docs/marlap/402-b-04-001b-14- final.pdf">http://www.epa.gov/rpdweb00/docs/marlap/402-b-04-001b-14- final.pdf</a>
2	<a href="http://eric.ed.gov/?id=EJ386287">http://eric.ed.gov/?id=EJ386287</a>
3	<a href="http://www.sjsu.edu/faculty/watkins/diamag.htm">http://www.sjsu.edu/faculty/watkins/diamag.htm</a>
4	<a href="http://www.britannica.com/EBchecked/topic/108875/separation14">http://www.britannica.com/EBchecked/topic/108875/separation14</a> and-purification

5	<a href="http://www.chemistry.co.nz/stoichiometry.htm">http://www.chemistry.co.nz/stoichiometry.htm</a>
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POs	PROGRAMME OUTCOME
PO 1	Students will possess basic subject knowledge required for higher studies, professional and applied courses
PO 2	Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the science & humanities stream.
PO 3	Students will develop scientific aptitude Integrate skills of analysis, critiquing, application and creativity.
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PO 7	Students will demonstrate responsibility as citizens committed to national development through community outreach, wellness of self and a sustainable environment.

COs	COURSE OUTCOME
CO 1	Apply error analysis in the calibration and use of analytical instruments, explain theory, instrumentation and application of flame photometry and Atomic Absorption spectrometry
CO 2	Explain theory, instrumentation and application of UV visible and Infrared spectroscopy.
CO 3	Able to discuss instrumentation, theory and applications of thermal and electrochemical techniques
CO 4	Explain the use of chromatographic techniques in the separation and identification of mixtures
CO 5	Explain preparation of solutions, stoichiometric calculations

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
<b>Weightage</b>	15	15	15	15	15
<b>Weighted percentage of Course Contribution to Pos</b>	3.0	3.0	3.0	3.0	3.0



**Signature of BOS Chairman**



**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN  
(AUTONOMOUS)**

Elayampalayam, Tiruchengode-637 205.



Programme	<b>B. Sc.</b>	Programme Code	<b>UCH</b>			Regulations	<b>2023-2026</b>		
Department	<b>Chemistry</b>			Semester			<b>3</b>		
Course Code	Course Name	Hours per week			Credit	Maximum Marks			
		L	T	P	C	CA	ESE	Total	
<b>23U3CHN01</b>	<b>SEC – I (NMEC) Food Chemistry</b>	2	0	0	2	25	75	100	
<b>COURSE OBJECTIVES</b>	This course aims at giving an overall view of the <ul style="list-style-type: none"> <li>❖ Types of food</li> <li>❖ Food adulteration and poisons</li> <li>❖ Food additives and preservation</li> </ul>								

<b>Content of the Syllabus</b>			
<b>Unit - I</b>	<b>Food Adulteration</b>	Hours	6
	Sources of food, types, advantages and disadvantages. Food adulteration - contamination of wheat, rice, milk, butter etc. with clay stones, water and toxic chemicals -Common adulterants, Ghee adulterants and their detection. Detection of adulterated foods by simple analytical techniques.		
<b>Unit - II</b>	<b>Food Poison</b>	Hours	6
	Food poisons - natural poisons (alkaloids - nephrotoxin) - pesticides, (DDT, BHC, Malathion) -Chemical poisons - First aid for poison consumed victims.		
<b>Unit - III</b>	<b>Food Additives</b>	Hours	6
	Food additives -artificial sweeteners – Saccharin - Cyclamate and Aspartate Food flavours esters, aldehydes and heterocyclic compounds – Food colours – Emulsifying agents – preservatives -leavening agents. Baking powder – yeast – tastemakers – MSG - vinegar.		
<b>Unit - IV</b>	<b>Beverages</b>	Hours	6
	Beverages-softdrinks-soda-fruitjuices-alcoholicbeverages-examples. Carbonation-addiction to alcohol– diseases of liver and social problems.		
<b>Unit - V</b>	<b>Edible Oils</b>	Hours	6
	Fats and oils - Sources of oils - production of refined vegetable oils - preservation. Saturated and unsaturated fats - iodine value - role of MUFA and PUFA in preventing heart diseases-determination of iodine value, RM value, saponification values and their significance.		
<b>Total Hours</b>			<b>30</b>

<b>Text Books</b>	
1	Food chemistry, H. K. Chopra, P. S. Panesar, Narosa publishing house, 2010.
2	Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, S. Chand & Co. Publishers, second edition, 2006.
3	Food chemistry, H. K. Chopra, P. S. Panesar, Narosa publishing house, 2010.
4	Food Chemistry, Dr. L. Rakesh Sharma, Evincepub publishing, 2022.
5	Food processing and preservation, G. Subbulakshmi, Shobha A Udipi, Padmini S Ghugre, New age international publishers, second edition, 2021.
<b>References</b>	
1	H.-D. Belitz, Werner Grosch, Food Chemistry Springer Science & Business Media, 4 <sup>th</sup> Edition, 2009.
2	M. Swaminathan, Food Science and Experimental Foods, Ganesh and Company, 1979.
3	Hasenhuettl, Gerard. L.; Hartel, Richard. W. Food Emulsifiers and their applications Springer New York 2nd ed. 2008.
4	Food Chemistry, H.-D. Belitz, W. Grosch, P. Schieberle, Springer, fourth revised and extended edition, 2009.
5	Principles of food chemistry, John M. deMan, John W. Finley, W. Jefferey Hurst, Chang Yong Lee, Springer, Fourth edition, 2018
<b>E-References</b>	



<b>POs</b>	<b>PROGRAMME OUTCOME</b>
PO 1	Students will possess basic subject knowledge required for higher studies, professional and applied courses
PO 2	Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the science & humanities stream.
PO 3	Students will develop scientific aptitude Integrate skills of analysis, critiquing, application and creativity.
PO 4	Students will employ appropriate digital tools and techniques necessary in analysing data and creative design.
PO 5	Students will gain competence to pursue higher learning, research and careers or will be able to opt for entrepreneurship.
PO 6	Students will interact meaningfully with others displaying leadership and coordination in executing projects.
PO 7	Students will demonstrate responsibility as citizens committed to national development through community outreach, wellness of self and a sustainable environment.

<b>COs</b>	<b>COURSE OUTCOME</b>
CO 1	learn about Food adulteration - contamination of Wheat, Rice, Milk, Butter.
CO 2	get an awareness about food poisons like natural poisons (alkaloids - nephrotoxin) pesticides, DDT, BHC, Malathion.
CO 3	get an exposure on food additives, artificial sweeteners, Saccharin, Cyclamate and Aspartate in the food industries.
CO 4	acquire knowledge on beverages, soft drinks, soda, fruit juices and alcoholic beverages examples.
CO 5	study about fats and oils - Sources of oils - production of refined vegetable oils - preservation. Saturated and unsaturated fats –MUFA and PUFA
Pre-requisites	Higher secondary Chemistry

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>
<b>CO1</b>	S	S	S	S	S	S	S	M	S	M
<b>CO2</b>	M	S	S	S	M	S	S	M	M	M
<b>CO3</b>	S	S	S	M	S	S	S	M	S	M
<b>CO4</b>	S	S	S	S	S	S	S	M	M	M
<b>CO5</b>	S	M	S	S	S	S	S	M	M	S

<b>CO /PSO</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	3	3	3	3	3
<b>CO2</b>	3	3	3	3	3
<b>CO3</b>	3	3	3	3	3
<b>CO4</b>	3	3	3	3	3
<b>CO5</b>	3	3	3	3	3
<b>Weightage</b>	15	15	15	15	15
<b>Weighted percentage of Course Contribution to Pos</b>	3.0	3.0	3.0	3.0	3.0

**Signature of BOS Chairman**

	<b>VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN</b> <b>(AUTONOMOUS)</b> Elayampalayam, Tiruchengode-637 205.									
	Programme	<b>B. Sc.</b>	Programme Code	<b>UCH</b>		Regulations	<b>2023-2026</b>			
Department	<b>Chemistry</b>			Semester		<b>3</b>				
Course Code	Course Name	Hours per week			Credit	Maximum Marks				
		L	T	P	C	CA	ESE	Total		
<b>21U3CHN02</b>	<b>SEC -I (NME) ROLE OF CHEMISTRY IN DAILY LIFE</b>			2	0	0	2	25	75	100
<b>COURSE OBJECTIVES</b>	This course aims at giving an overall view of the <ul style="list-style-type: none"> <li>❖ importance of Chemistry in everyday life</li> <li>❖ chemistry of building materials and food</li> <li>❖ chemistry of Drugs and pharmaceuticals</li> </ul>									

<b>Content of the Syllabus</b>			
<b>Unit - I</b>		Hours	6
	General survey of chemicals used in everyday life. Air - components and their importance; photosynthetic reaction, air pollution, green - house effect and the impact on our life style. Water - Sources of water, qualities of potable water, soft and hard water, methods of removal of hardness-water pollution.		
<b>Unit - II</b>		Hours	6
	Building materials - cement, ceramics, glass and refractories - definition, composition and application only. Plastics - polythene, PVC, bakelite, polyesters, melamine-formaldehyde resins -preparation and uses only.		
<b>Unit - III</b>		Hours	6
	Food and Nutrition - Carbohydrates, Proteins, Fats - definition and their importance as food constituents – balanced diet – Calories minerals and vitamins (sources and their physiological importance). Cosmetics – tooth paste, face powder, soaps and detergents, shampoos, nail polish, perfumes - general formulation and preparations - possible hazards of cosmetic use.		
<b>Unit - IV</b>		Hours	6
	Chemicals in food production – fertilizers - need, natural sources; urea,NPK fertilizers and super phosphate. Fuel – classification - solid, liquid and gaseous; nuclear fuel examples and uses.		
<b>Unit - V</b>		Hours	6
	Pharmaceutical drugs - analgesics and antipyretics - paracetamol and aspirin. Colour chemicals - pigments and dyes - examples and applications. Explosives - classification and examples.		
<b>Total Hours</b>			<b>30</b>

<b>Text Books</b>	
1	Food chemistry, H. K. Chopra, P. S. Panesar, Narosa publishing house, 2010.
2	A textbook of pharmaceutical chemistry by Jayashree Ghosh, S Chand publishing, 2012.
3	S. Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur, 2006.
4	B. K, Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014. Introduction to forensic chemistry, Kelly M. Elkins, CRC Press Taylor & Francis Group, 2019.
5	Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, S. Chand & Co. Publishers, second edition, 2006.
<b>References</b>	
1	Randolph. Norris Shreve, Chemical Process Industries, McGraw-Hill, Texas, fourth edition, 1977.
2	W.A. Poucher, Joseph A. Brink, Jr. Perfumes, Cosmetics and Soaps, Springer, 2000.
3	A.K. De, Environmental Chemistry, New Age International Public Co., 1990.
<b>E-References</b>	



<b>POs</b>	<b>PROGRAMME OUTCOME</b>
PO 1	Students will possess basic subject knowledge required for higher studies, professional and applied courses
PO 2	Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the science & humanities stream.
PO 3	Students will develop scientific aptitude Integrate skills of analysis, critiquing, application and creativity.
PO 4	Students will employ appropriate digital tools and techniques necessary in analysing data and creative design.
PO 5	Students will gain competence to pursue higher learning, research and careers or will be able to opt for entrepreneurship.
PO 6	Students will interact meaningfully with others displaying leadership and coordination in executing projects.
PO 7	Students will demonstrate responsibility as citizens committed to national development through community outreach, wellness of self and a sustainable environment.

<b>COs</b>	<b>COURSE OUTCOME</b>
CO 1	learn about the chemicals used in everyday life as well as air pollution and water pollution.
CO 2	get knowledge on building materials cement, ceramics, glass and plastics, polythene, PVC bakelite, polyesters.
CO 3	acquire information about Food and Nutrition. Carbohydrates, Proteins, Fats Also have an awareness about Cosmetics Tooth pastes, face powder, soaps and detergents.
CO 4	discuss about the fertilizers like urea, NPK fertilizers and super phosphate. Fuel classification solid, liquid and gaseous; nuclear fuel - examples and uses
CO 5	have an idea about the pharmaceutical drugs analgesics and antipyretics like paracetamol and aspirin and also about pigments and dyes and its applications.
Pre-requisites	Higher secondary Chemistry

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>
<b>CO1</b>	S	S	S	S	S	S	S	M	S	M
<b>CO2</b>	M	S	S	S	M	S	S	M	M	M
<b>CO3</b>	S	S	S	M	S	S	S	M	S	M
<b>CO4</b>	S	S	S	S	S	S	S	M	M	M
<b>CO5</b>	S	M	S	S	S	S	S	M	M	S

<b>CO /PSO</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	3	3	3	3	3
<b>CO2</b>	3	3	3	3	3
<b>CO3</b>	3	3	3	3	3
<b>CO4</b>	3	3	3	3	3
<b>CO5</b>	3	3	3	3	3
<b>Weightage</b>	15	15	15	15	15
<b>Weighted percentage of Course Contribution to Pos</b>	3.0	3.0	3.0	3.0	3.0

**Signature of BOS Chairman**

	<b>VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)</b> Elayampalayam, Tiruchengode-637 205.							
Programme	<b>B.Sc</b>	Programme Code	<b>UCH</b>		Regulations	<b>2023-2026</b>		
Department	<b>Chemistry</b>		Semester		<b>4</b>			
Course Code	Course Name	Hours per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
<b>23U4CHC04</b>	<b>Core Course - VII Thermodynamics, Transition elements and Carbonyl compounds</b>	5	0	0	4	25	75	100
Course Objectives	<p>This course aims to provide a comprehensive knowledge on</p> <ol style="list-style-type: none"> <li>1. Thermodynamic concepts on chemical processes and applied aspects.</li> <li>2. Thermo chemical calculations</li> <li>3. Transition elements with reference to periodic properties and group study of transition metals.</li> <li>4. The organic chemistry of ethers, aldehydes and ketones</li> <li>5. The organic chemistry of carboxylic acids</li> </ol>							

<b>Content of the Syllabus</b>			
<b>Unit - I</b>	<b>Thermodynamics I</b>	Hours	12
	<p>Terminology – Intensive, extensive variables, state, path functions; isolated, closed and open systems; isothermal, adiabatic, isobaric, isochoric, cyclic, reversible and irreversible processes; First law of thermodynamics – Concept and significance of heat (q), work (w), internal energy (E), enthalpy (H); calculations of q, w, E and H for reversible, irreversible expansion of ideal and real gases under isothermal and adiabatic conditions; relation between heat capacities (C<sub>p</sub> &amp; C<sub>v</sub>); Joule Thomson effect- inversion temperature.</p> <p>Thermochemistry - relationship between enthalpy of reaction at constant volume (q<sub>v</sub>) and at constant pressure (q<sub>p</sub>) – temperature dependence of heat of reaction – Kirchoff's equation – bond energy and its calculation from thermo chemical data - integral and differential heats of solutions and dilution. Zeroth law of thermodynamics-Absolute Temperature scale.</p>		
<b>Unit - II</b>	<b>Thermodynamics II</b>	Hours	12
	<p>Second Law of thermodynamics - Limitations of first law, spontaneity and randomness; Carnot's cycle; Concept of entropy, entropy change for reversible and irreversible processes, entropy of mixing, calculation of entropy changes of an ideal gas and a van der Waals gas with changes in temperature, volume and pressure, entropy and disorder.</p> <p>Free energy and work functions - Need for free energy functions, Gibbs free energy, Helmholtz free energy - their variation with temperature, pressure and volume, criteria for spontaneity; Gibbs-Helmholtz equation – derivations and applications; Maxwell relationships, thermodynamic equations of state; Thermodynamics of mixing of ideal gases, Ellingham</p>		



	Diagram-application.  Third law of thermodynamics - Nernst heat theorem; Applications of third law - evaluation of absolute entropies from heat capacity measurements, exceptions to third law.		
<b>Unit - III</b>	<b>General Characteristics of d-block elements Transition Elements</b>	Hours	12
	Electronic configuration - General periodic trend variable valency, oxidation states, stability of oxidation states, colour, magnetic properties, catalytic properties and tendency to form complexes. Comparative study of transition elements and non transition elements – comparison of II and III transition series with I transition series. Group study of Titanium, Vanadium, Chromium, Manganese, Iron, Cobalt, Nickel and Zinc groups.		
<b>Unit - IV</b>	<b>Ethers, Thio ethers and Epoxides</b>	Hours	12
	Nomenclature, isomerism, general methods of preparations, reactions involving cleavage of C-O linkages, alkyl group and ethereal oxygen. Reactions of epoxides with alcohols, ammonia derivatives and LiAlH <sub>4</sub> Thioethers - nomenclature, structure, preparation, properties and uses. <b>Aldehydes and Ketones</b> Nomenclature, structure and reactivity of aliphatic and aromatic aldehydes and ketones; general methods of preparation and physical properties. Nucleophilic addition reactions, base catalysed reactions with mechanism- Aldol, Cannizzaro's reaction, Perkin reaction, Benzoin condensation, Haloform reaction, Knoevenagel reaction. Oxidation of aldehydes. Baeyer - Villiger oxidation of ketones. Reduction: Clemmensen reduction, Wolf - Kishner reduction, Meerwein – Ponder Verley reduction, reduction with LiAlH <sub>4</sub> and NaBH <sub>4</sub> . Addition reactions of unsaturated carbonyl compounds: Michael addition.		
<b>Unit - V</b>	<b>Carboxylic Acids and its Derivatives:</b>	Hours	12
	<b>Carboxylic Acids:</b> Nomenclature, structure, preparation and reactions of aliphatic and aromatic monocarboxylic acids. Physical properties, acidic nature, effect of substituent on acidic strength. HVZ reaction, Claisen ester condensation, Bouveault Blanc reduction, decarboxylation, Hunsdiecker reaction. Formic acid-reducing property. Reactions of dicarboxylic acids, hydroxy acids and unsaturated acids. <b>Carboxylic acid Derivatives:</b> Preparations of aliphatic and aromatic acid chlorides, esters, amides and anhydrides. Nucleophilic substitution reaction at the acyl carbon of acyl halide, anhydride, ester, amide. Schottan- Baumann reaction. Claisen condensation, Dieckmann and Reformatsky reactions, Hofmann bromamide degradation and Curtius rearrangement. <b>Active methylene compounds:</b> Preparation and synthetic applications of diethyl malonate and ethyl acetoacetate <b>Hydroxy acids</b> – nomenclature; preparation from halo, amino, aldehydic and ketonic acids, ethylene glycol, aldol acetaldehyde; reactions – action of heat on $\alpha$ , $\beta$ and $\gamma$ hydroxy acids.		
Extended Professional Component (is a part of internal component only, Not to be included in the external	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)		

examination question paper)	
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
<b>Total Hours</b>	
	60

<b>Text Books</b>	
1	B.R. Puri and L.R. Sharma, Principles of Physical Chemistry, Shoban Lal Nagin Chand and Co., thirty three edition, 1992.
2	K. L. Kapoor, A Textbook of Physical chemistry, (volume-2 and 3), Macmillan, India Ltd, third edition, 2009.
3	P.L. Soni and Mohan Katyal, Textbook of Inorganic Chemistry, Sultan Chand & Sons, twentieth edition, 2006.
4	M. K. Jain, S. C. Sharma, Modern Organic Chemistry, Vishal Publishing, fourth reprint, 2003.
5	S.M. Mukherji, and S.P. Singh, Reaction Mechanism in Organic Chemistry, Macmillan India Ltd., third edition, 1994.
<b>References</b>	
1	Maron, S. H. and Prutton C. P. Principles of Physical Chemistry, 4 <sup>th</sup> ed.; The Macmillan Company: Newyork, 1972.
2	Lee, J. D. Concise Inorganic Chemistry, 4th ed.; ELBS William Heinemann: London, 1991.
3	Gurudeep Raj, Advanced Inorganic Chemistry, 26 <sup>th</sup> ed.; Goel Publishing House: Meerut, 2001.
4	Atkins, P.W. & Paula, J. Physical Chemistry, 10 <sup>th</sup> ed.; Oxford University Press: New York, 2014.
5	Huheey, J. E. Inorganic Chemistry: Principles of Structure and Reactivity, 4 <sup>th</sup> ed; Addison Wesley Publishing Company: India, 1993.
<b>Website and e-learning source</b>	
1	<a href="https://nptel.ac.in/courses/112102255">https://nptel.ac.in/courses/112102255</a>
2	Thermodynamics
3	<a href="https://nptel.ac.in/courses/104101136">https://nptel.ac.in/courses/104101136</a>
4	Advanced transition metal chemistry

<b>POs</b>	<b>PROGRAMME OUTCOME</b>
PO 1	Students will possess basic subject knowledge required for higher studies, professional and applied courses
PO 2	Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the science & humanities stream.
PO 3	Students will develop scientific aptitude Integrate skills of analysis, critiquing, application and creativity.



PO 4	Students will employ appropriate digital tools and techniques necessary in analysing data and creative design.
PO 5	Students will gain competence to pursue higher learning, research and careers or will be able to opt for entrepreneurship.
PO 6	Students will interact meaningfully with others displaying leadership and coordination in executing projects.
PO 7	Students will demonstrate responsibility as citizens committed to national development through community outreach, wellness of self and a sustainable environment.

COs	COURSE OUTCOME
CO 1	Explain the terms and processes in thermodynamics; discuss the various laws of thermodynamics and thermo chemical calculations.
CO 2	Discuss the second law of thermodynamics and its application to heat engine; discuss third law and its application on heat capacity measurement.
CO 3	Investigate the chemistry of transition elements with respect to various periodic properties and group wise discussions.
CO 4	Discuss the fundamental organic chemistry of ethers, epoxides and carbonyl compounds including named organic reactions.
CO 5	Discuss the chemistry and named reactions related to carboxylic acids and their derivatives; discuss chemistry of active methylene compounds, halogen substituted acids and hydroxyl acids.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
<b>Weightage</b>	15	15	15	15	15
<b>Weighted percentage of Course Contribution to Pos</b>	3.0	3.0	3.0	3.0	3.0

Signature of BOS Chairman

	<b>VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)</b> Elayampalayam, Tiruchengode-637 205.									
	Programme	<b>B.Sc</b>	Programme Code	<b>UCH</b>	Regulations	<b>2023-2026</b>				
Department	<b>Chemistry</b>			Semester		<b>4</b>				
Course Code	Course Name			Hours per Week		Credit	Maximum Marks			
				L	T	P	C	CA	ESE	Total
<b>23U4CHCP04</b>	<b>Core Course- VIII PHYSICAL CHEMISTRY PRACTICAL-I</b>					3	2	40	60	100
Course Objectives	The course aims at providing an understanding of 1. The laboratory experiments in order to understand the concepts of physical changes in chemistry 2. The rates of chemical reactions 3. Colligative properties and adsorption isotherm									

Content of the Syllabus				
<b>Unit - I</b>	<b>Chemical kinetics</b>		Hours	15
	1. Determination of rate constant of acid catalysed hydrolysis of an ester (methyl acetate). 2. Determination of order of reaction between iodide and persulphate (initial rate method). 3. Polarimetry: Determination of rate constant of acid catalysed inversion of cane sugar. <b>Thermochemistry</b> 4. Determination of heat of neutralisation of a strong acid by a strong base. 5. Determination of heat of hydration of copper sulphate.			
<b>Unit - II</b>	<b>Electrochemistry – Conductance measurements</b>		Hours	15
	6. Determination of cell constant 7. Determination of molar conductance of strong electrolyte 8. Determination of dissociation constant of acetic acid <b>Colorimetry</b> 9. Determination of concentration of copper sulphate solution			
<b>Unit - III</b>	<b>Colligative property &amp; Adsorption</b>		Hours	06
	<b>Colligative property</b> 10. Determination of molecular weight of an organic compound by Rast method using naphthalene or diphenyl as solvent <b>Adsorption</b> 11. Construction of Freundlich isotherm for the adsorption of acetic acid on activated charcoal.			
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)			
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.			

<b>Total Hours</b>		36
<b>References</b>		
1	Sindhu, P.S. Practicals in Physical Chemistry, Macmillan India : New Delhi, 2005.	
2	Khosla, B. D. Garg, V. C.; Gulati, A. Senior Practical Physical Chemistry, R. Chand : New Delhi, 2011.	
3	Gupta, Renu, Practical Physical Chemistry, 1 <sup>st</sup> Ed.; New Age International : New Delhi, 2017.	
<b>Website and e-learning source</b>		
1	<a href="https://www.vlab.co.in/broad-area-chemical-sciences">https://www.vlab.co.in/broad-area-chemical-sciences</a>	



POs	PROGRAMME OUTCOME
PO 1	Students will possess basic subject knowledge required for higher studies, professional and applied courses
PO 2	Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the science & humanities stream.
PO 3	Students will develop scientific aptitude Integrate skills of analysis, critiquing, application and creativity.
PO 4	Students will employ appropriate digital tools and techniques necessary in analysing data and creative design.
PO 5	Students will gain competence to pursue higher learning, research and careers or will be able to opt for entrepreneurship.
PO 6	Students will interact meaningfully with others displaying leadership and coordination in executing projects.
PO 7	Students will demonstrate responsibility as citizens committed to national development through community outreach, wellness of self and a sustainable environment.

COs	COURSE OUTCOME
CO 1	Describe the principles and methodology for the practical work.
CO 2	Explain the procedure, data and methodology for the practical work
CO 3	Apply the principles of phase rule and electrochemistry for carrying out the practical work
CO 4	Demonstrate laboratory skills for safe handling of the equipment and chemicals

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
<b>CO1</b>	S	S	S	S	S	S	S	M	S	M
<b>CO2</b>	M	S	S	S	M	S	S	M	M	M
<b>CO3</b>	S	S	S	M	S	S	S	M	S	M
<b>CO4</b>	S	S	S	S	S	S	S	M	M	M
<b>CO5</b>	S	M	S	S	S	S	S	M	M	S

<b>CO /PSO</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	3	3	3	3	3
<b>CO2</b>	3	3	3	3	3
<b>CO3</b>	3	3	3	3	3
<b>CO4</b>	3	3	3	3	3
<b>Weightage</b>	12	12	12	12	12
<b>Weighted percentage of Course Contribution to PSOs</b>	3.0	3.0	3.0	3.0	3.0

**Signature of BOS Chairman**

	<b>VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)</b> Elayampalayam, Tiruchengode-637 205.							
	Programme	<b>B.Sc</b>	Programme Code	<b>UCH</b>	Regulations	<b>2023-2026</b>		
Department	<b>Chemistry</b>		Semester		<b>5</b>			
Course Code	Course Name	Hours per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
<b>23U4CHDE02</b>	<b>INDUSTRIAL CHEMISTRY</b>	3	0	0	3	25	75	100
Course Objectives	This course is designed to provide knowledge on 1. Classifications and characteristics of fuels 2. Preparation of cosmetics 3. Manufacture of sugar, paper, cement and leather and food processing 4. Applications of abrasives, lubricants and other industrial products 5. Intellectual property rights							

#### Content of the Syllabus

<b>Unit – I</b>	<b>Survey of Indian Industries and mineral resources in India</b>	Hours	12
	<p><b>Fuels:</b> Classification, characteristics of fuels. Solid fuels: coal - classification; analysis of coal- proximate analysis and ultimate analysis; calorific value-determination, carbonisation of coal.</p> <p>Liquid fuels: Petroleum - characteristics; Gasoline aviation petrol knocking in internal combustion engines, antiknock agents; unleaded petrol-octane number, cetane number.</p> <p>Gaseous fuel: advantages over solid and liquid fuels; water gas, producer gas, carburetted water gas - preparations - uses.</p> <p>Natural gas: LPG-composition, advantages, application; gobar gas production, composition, advantages, application. Propellants – rocket fuels (basic idea)</p>		
<b>Unit - II</b>	<b>Cosmetics</b>	Hours	12
	<p>Skin care: powders, ingredients; creams and lotion-cleansing, moisturising, all purpose shaving cream, sunscreen; make up preparations.</p> <p>Dental care: tooth pastes – ingredients.</p> <p>Hair care: shampoos-types, ingredients; conditioners-types, ingredients.</p> <p>Perfumes: natural-plant origin-parts of the plant used, chief constituents; animal origin-amber gries, civetone and musk; synthetic-classificationesters- amylsalicylate alcohols-citronellol; terpeneols-geraniol and nerol; ketones-muskone, coumarin; aldehydes-vanilin.</p> <p><b>Soaps and Detergents</b></p> <p>Soaps-properties, manufacture of soap-batch process; types-transparent soap, toilet soap, powder soap and liquid soap – ingredients.</p> <p>Detergents-definition, properties-cleansing action; soapless detergents anionic, cationic and non-ionic (general idea only); uses of detergents as surfactants. Biodegradability of soaps and detergents.</p>		

		Hours	12
<b>Unit - III</b>	<p><b>Sugar Industry</b> Manufacture from sugar cane; recovery of sugar from molasses; testing and estimation of sugar.</p> <p><b>Food Preservation and processing</b> Food spoilage – causes; Food preservation - methods – high temperature, low temperature, drying, radiation; Food additives – preservatives, flavours, colours, anti-oxidants, sweetening agents; hazards of using food additives; Food standards – Agmark and Codex alimentarius.</p>		
		Hours	12
<b>Unit - IV</b>	<p><b>Abrasives</b> Definition, characteristics, types-natural and synthetic; natural abrasives – diamond, corundum, emery, garnet, quartz – composition, uses; synthetic abrasives – carborundum, aluminium carbide, boron carbide, boron nitride, synthetic graphite – composition and uses.</p> <p><b>Leather Industry</b> Structure and composition of skin, hide; Manufacture of leather – pretanning process – curing, liming, beating, pickling; methods of tanning vegetable, chrome – one bath, two bath process; finishing.</p> <p><b>Paper Industry</b> Manufacture of pulp - mechanical, chemical processes; sulphate pulp, rag pulp; manufacture of paper-beating, refining, filling, sizing, colouring, calendaring; cardboard.</p>		
		Hours	12
<b>Unit – V</b>	<p><b>Lubricants</b> Definition, classification-liquid, semi-solid, solid and synthetic; properties-viscosity index, flash point, cloud point, pour point, aniline point and drop point; greases-properties, types; cutting fluids, selection of lubricants.</p> <p><b>Cement Industry</b> Cement – types, raw materials; manufacture-wet process, constituent of cement, setting of cement; properties of cement-quality, setting time, soundness, strength; mortar, concrete, RCC; curing and decay of concrete.</p> <p><b>Intellectual Property Rights</b> Introduction to Intellectual Property Rights – Patents - Factors for patentability - Novelty, Non obviousness, Industrial applications – Patent offices in India: Trademark - Types of trademarks- Certification marks, logos, brand names, signatures, symbols and service marks.</p>		
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)		
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.		
<b>Total Hours</b>			<b>60</b>



<b>Text Books</b>	
1	Sharma, B.K. Industrial Chemistry, 9th ed.; Goel Publishing House: Meerut, 1998.
2	Wilkinson, J.B.E. Moore, R.J. Harry's Cosmeticology, 7th ed.; Chemical Publishers: New York, 1982.
3	Alex V. Ramani, Food Chemistry, MJP publishers: Chennai, 2009.
4	Jayashree Ghosh, Applied Chemistry, S. Chand: New Delhi, 2006.
5	Srilakshmi, B. Food Science, 4th ed.; New Age International Publication, 2005.
<b>References</b>	
1	Jain, P.C.; Jain, M. Engineering Chemistry, 16th ed.; Dhanapet Rai: Delhi, 1992
2	George Howard, Principles and Practice of Perfumes and Cosmetics, Stanley Therones, Cheltenham: UK, 1987.
3	Thankamma Jacob, Foods, Drugs and Cosmetics - A Consumer Guide, Macmillan : London, 1997.
4	ShankuntalaManay, N.; Shadaksharaswamy, M. Food Facts and Principles, 3rd ed.; New Age Publication, 2008.
5	Neeraj Pandey, KhushdeepDharni, Intellectual Property Rights, PHI Learning, 2014.
<b>Website and e-learning source</b>	
1	<a href="http://www.sciencecases.org/irradiation/irradiation_notes.asp">http://www.sciencecases.org/irradiation/irradiation_notes.asp</a>
2	<a href="http://discovery.kcpc.usyd.edu.au/9.5.5/">http://discovery.kcpc.usyd.edu.au/9.5.5/</a>
3	<a href="https://www.wipo.int/about-ip/en/">https://www.wipo.int/about-ip/en/</a>
4	<a href="http://www.nptel.ac.in">www.nptel.ac.in</a>
5	<a href="http://swayam.gov.in">http://swayam.gov.in</a>



<b>POs</b>	<b>PROGRAMME OUTCOME</b>
PO 1	Students will possess basic subject knowledge required for higher studies, professional and applied courses
PO 2	Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the science & humanities stream.
PO 3	Students will develop scientific aptitude Integrate skills of analysis, critiquing, application and creativity.
PO 4	Students will employ appropriate digital tools and techniques necessary in analysing data and creative design.
PO 5	Students will gain competence to pursue higher learning, research and careers or will be able to opt for entrepreneurship.
PO 6	Students will interact meaningfully with others displaying leadership and coordination in executing projects.
PO 7	Students will demonstrate responsibility as citizens committed to national development through community outreach, wellness of self and a sustainable environment.

<b>COs</b>	<b>COURSE OUTCOME</b>
CO 1	Summarize the properties of fuels which include petroleum, water gas, natural gas and propellants
CO 2	Evaluate cosmetic products, soaps, detergents.
CO 3	Explain manufacture of sugar, food spoilages and food additives
CO 4	Explain properties of abrasives, manufacture of leather and paper
CO 5	Explain properties and manufacture of lubricants and cement, and intellectual property rights

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>
<b>CO1</b>	S	S	S	S	S	S	S	M	S	M
<b>CO2</b>	M	S	S	S	M	S	S	M	M	M
<b>CO3</b>	S	S	S	M	S	S	S	M	S	M
<b>CO4</b>	S	S	S	S	S	S	S	M	M	M
<b>CO5</b>	S	M	S	S	S	S	S	M	M	S

<b>CO /PSO</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	3	3	3	3	3
<b>CO2</b>	3	3	3	3	3
<b>CO3</b>	3	3	3	3	3
<b>CO4</b>	3	3	3	3	3
<b>CO5</b>	3	3	3	3	3
<b>Weightage</b>	15	15	15	15	15
<b>Weighted percentage of Course Contribution to Pos</b>	3.0	3.0	3.0	3.0	3.0

**Signature of BOS Chairman**

	<b>VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)</b> Elayampalayam, Tiruchengode-637 205.							
Programme	<b>B.Sc.</b>	Programme Code	<b>UCH</b>	Regulations	<b>2023-2026</b>			
Department	<b>Chemistry</b>		Semester		<b>5</b>			
Course Code	Course Name	Hours per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
<b>23U5CHCO5</b>	<b>Core Course-IX ORGANIC CHEMISTRY-I</b>		5		4	25	75	100
Course Objectives	<p>This course aims to provide an understanding of</p> <ol style="list-style-type: none"> <li>1. Stereoisomerism in chirals and geometric isomerism in olefins, conformations of ethane and butane.</li> <li>2. Preparation and properties of aromatic and aliphatic nitro compounds and amines.</li> <li>3. Preparation of different dyes, food colour and additives.</li> <li>4. Preparation and properties of five membered heterocycles like pyrrole, furan and thiophene</li> <li>5. Preparation and properties of six membered heterocycles like pyridine, quinoline and isoquinoline.</li> </ol>							

### Content of the Syllabus

<b>Unit – I</b>	<b>Stereochemistry</b>	Hours	12
	<p>Fischer Projection, Newmann and Sawhorse Projection formulae and their interconversions; Geometrical isomerism: cis–trans, syn-anti isomerism, E/Z notations.</p> <p>Optical Isomerism: Optical activity, specific rotation, asymmetry, enantiomers, distereoisomers, meso structures - molecules with one and two chiral centres, racemisation- methods of racemisation; resolution methods of resolution. C.I.P rules. R and S notations for one and two chirality (stereogenic) centres.</p> <p>Molecules with no asymmetric carbon atoms – allenes and biphenyls. Conformational analysis of ethane and butane.</p>		
<b>Unit - II</b>	<b>Chemistry of Nitrogen Compounds – I</b>	Hours	12
	<p><b>Nitroalkanes</b> Nomenclature, isomerism, preparation from alkyl halides, halo acids, alkanes; physical properties; reactions – reduction, halogenations, Grignard reagent, Pseudo acid character. Nitro - aci nitro tautomerism.</p>		
	<p><b>Aromatic nitro compounds</b> Nomenclature, preparation – nitration, from diazonium salts, physical properties; reactions - reduction of nitrobenzene in different medium, Electrophilic substitution reactions, TNT.</p>		
	<p><b>Amines: Aliphatic amines</b> Nomenclature, isomerism, preparation – Hofmanns' degradation reaction, Gabriel's phthalimide synthesis, Curtius Schmidt rearrangement.</p> <p>Physical properties, reactions – alkylation, acylation, carbylamines reaction, Mannich reaction, oxidation, basicity of amines.</p>		

	<b>Chemistry of Nitrogen Compounds – II</b>	Hours	12
<b>Unit - III</b>	<p><b>Aromatic amines</b> – Nomenclature, preparation – from nitro compounds, Hofmann’s method; Schmidt reaction, properties – basic nature, ortho effect; reactions – alkylation, acylation, carbylamines reaction, reaction with nitrous acid, aldehydes, oxidation, Electrophilic substitution reactions, diazotization and coupling reactions; sulphanic acid - zwitter ion formation.</p> <p>Distinction between primary, secondary and tertiary amines – aliphatic and aromatic Diazonium compounds</p> <p>Diazomethane, Benzene diazonium chloride - preparations and synthetic applications.</p> <p><b>Dyes</b> Theory of colour and constitution; classification based on structure and application; preparation –Martius yellow, aniline yellow, methyl orange, alizarin, indigo, malachite green. Industry oriented content.</p> <p>Dyes Industry, Food colour and additives</p>		
	<b>Heterocyclic compounds</b>	Hours	12
<b>Unit - IV</b>	<p>Nomenclature and classification. General characteristics – aromatic character and reactivity.</p> <p>Five-membered heterocyclic compounds</p> <p>Pyrrole – preparation - from succinimide, Paal Knorr synthesis; reactions – reduction, basic character, acidic character, electrophilic substitution reactions, ring opening.</p> <p>Furan – preparation from mucic acid and pentosan; reactions – hydrogenation, reaction with oxygen, Diels Alder reactions, formation of thiophene and pyrrole; Electrophilic substitution reaction.</p> <p>Thiophene synthesis - from acetylene; reactions –reduction; oxidation; electrophilic substitution reactions.</p>		
	<b>Six-membered heterocyclic compounds</b>	Hours	12
<b>Unit - V</b>	<p>Pyridine – synthesis - from acetylene, Physical properties; reactions - basic character, oxidation, reduction, electrophilic substitution reactions; nucleophilic substitution- uses Condensed ring systems</p> <p>Quinoline – preparation - Skraup synthesis and Friedlander’s synthesis; reactions – basic nature, reduction, oxidation; electrophilic substitutions; nucleophilic substitutions – Chichibabin reaction</p> <p>Isoquinoline – preparation by the Bischler – Napieralski reaction, reduction, oxidation; electrophilic substitution.</p>		
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)		
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.		
<b>Total Hours</b>			60

<b>Text Books</b>	
1	M.K. Jain, S.C.Sharma, Modern Organic Chemistry, Vishal Publishing, fourth reprint, 2009.
2	S.M. Mukherji, and S.P. Singh, Reaction Mechanism in Organic Chemistry, Macmillan India Ltd., third edition, 2009.
3	ArunBahl and B.S. Bahl, Advanced organic chemistry, New Delhi, S.Chand& Company Pvt. Ltd., Multicolour edition, 2012.
4	P. L.Soni and H. M. Chawla, Text Book of Organic Chemistry, Sultan Chand & Sons, New Delhi, twenty ninth edition, 2007.
5	C.N.Pillai, Text Book of Organic Chemistry, Universities Press (India) Private Ltd., 2009.
<b>References</b>	
1	R. T. Morrison and R. N. Boyd, Organic Chemistry, Pearson Education, Asia, sixth edition, 2012.
2	T.W.Graham Solomons, Organic Chemistry, John Wiley & Sons, eleventh edition, 2012.
3	A. Carey Francis, Organic Chemistry, Tata McGraw-Hill Education Pvt. Ltd., New Delhi, seventh edition, 2009.
4	I. L. Finar, Organic Chemistry, Vol. (1& 2), England, Wesley Longman Ltd, sixth edition, 2006.
5	J. A. Joule, and G. F. Smith, Heterocyclic Chemistry, Wiley, Fifth Edition, 2010.
<b>Website and e-learning source</b>	
1	<a href="http://www.epgpathshala.nic.in">www.epgpathshala.nic.in</a>
2	<a href="http://www.nptel.ac.in">www.nptel.ac.in</a>
3	<a href="http://swayam.gov.in">http://swayam.gov.in</a>
4	Virtual Textbook of Organic Chemistry



<b>POs</b>	<b>PROGRAMME OUTCOME</b>
PO 1	Students will possess basic subject knowledge required for higher studies, professional and applied courses
PO 2	Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the science & humanities stream.
PO 3	Students will develop scientific aptitude Integrate skills of analysis, critiquing, application and creativity.
PO 4	Students will employ appropriate digital tools and techniques necessary in analysing data and creative design.
PO 5	Students will gain competence to pursue higher learning, research and careers or will be able to opt for entrepreneurship.
PO 6	Students will interact meaningfully with others displaying leadership and coordination in executing projects.
PO 7	Students will demonstrate responsibility as citizens committed to national development through community outreach, wellness of self and a sustainable environment.

<b>COs</b>	<b>COURSE OUTCOME</b>
CO 1	Assign RS notations to chirals and EZ notations to olefins and explain conformations of ethane and butane.
CO 2	Explain preparation and properties of aromatic and aliphatic nitro compounds and amines.
CO 3	Explain colour and constitution of dyes and food additives.
CO 4	Discuss preparation and properties of five membered heterocycles like pyrrole, furan and thiophene.
CO 5	Discuss preparation and properties of six membered heterocycles like pyridine, quinoline and isoquinoline.

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>
<b>CO1</b>	S	S	S	S	S	S	S	M	S	M
<b>CO2</b>	M	S	S	S	M	S	S	M	M	M
<b>CO3</b>	S	S	S	M	S	S	S	M	S	M
<b>CO4</b>	S	S	S	S	S	S	S	M	M	M
<b>CO5</b>	S	M	S	S	S	S	S	M	M	S

<b>CO /PSO</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	3	3	3	3	3
<b>CO2</b>	3	3	3	3	3
<b>CO3</b>	3	3	3	3	3
<b>CO4</b>	3	3	3	3	3
<b>CO5</b>	3	3	3	3	3
<b>Weightage</b>	15	15	15	15	15
<b>Weighted percentage of Course Contribution to Pos</b>	3.0	3.0	3.0	3.0	3.0

**Signature of BOS Chairman**

		<b>VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)</b> Elayampalayam, Tiruchengode-637 205.							
Programme	<b>B.Sc</b>	Programme Code	<b>UCH</b>		Regulations	<b>2023-2026</b>			
Department	<b>Chemistry</b>		Semester			<b>5</b>			
Course Code	Course Name		Hours per Week		Credit	Maximum Marks			
			L	T	P	C	CA	ESE	Total
<b>23U5CHCO6</b>	<b>CORE COURSE-X: INORGANIC CHEMISTRY-I</b>		5	0	0	4	25	75	100
Course Objectives	The course aims to provide knowledge on 1. Nomenclature, isomerism and theory of coordination compounds, and chelate complexes 2. Crystal field theory, magnetic properties, stability of complexes and Jahn Teller effect 3. Preparation and properties of metal carbonyls 4. Lanthanides and actinides 5. Preparation and properties of inorganic polymers								

### Content of the Syllabus

<b>Unit - I</b>	<b>Co-ordination Chemistry - I</b>	Hours	12
	IUPAC Nomenclature of coordination compounds, Isomerism in coordination compounds. Werner's coordination theory – effective atomic number –interpretation of geometry and magnetic properties by Pauling's theory – geometry of co-ordination compounds with co-ordination number 4 &6.  Chelates – types of ligands forming chelates – stability of chelates, applications of chelates in qualitative and quantitative analysis– application of DMG and oxine in gravimetric analysis –estimation of hardness of water using EDTA, metal ion indicators.  Role of metal chelates in living systems – haemoglobin and chlorophyll		
<b>Unit - II</b>	<b>Co-ordination Chemistry - II</b>	Hours	12
	Crystal field theory –Crystal field splitting of energy levels in octahedral and tetrahedral complexes, Crystal field stabilization energy (CFSE), spectrochemical series - calculation of CFSE in octahedral and tetrahedral complexes - factors influencing the magnitude of crystal field splitting, crystal field effect on ionic radii, lattice energies, heats of ligation with water as a ligand (heat of hydration), interpretation of magnetic properties, spectra of $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ - Jahn – Teller effect. Stability of complexes in aqueous solution, stability constants- factors affecting the stability of a complex ion, thermodynamic and kinetic stability (elementary idea). Comparison of VBT and CFT.		
<b>Unit - III</b>	<b>Organometallic compounds</b>	Hours	12
	<b>Metal Carbonyls</b> Mono and polynuclear carbonyls, General methods of preparation of carbonyls – general properties of binary carbonyls – bonding in carbonyls – structure and bonding in carbonyls of Ni, Fe, Cr, Co, Mn, Ru and Os. EAN rule as applied to metal carbonyls.  Ferrocene-Methods of preparation, physical and chemical properties		
<b>Unit - IV</b>	<b>Inner transition elements (Lanthanoids and Actinoids)</b>	Hours	12
	General characteristics of f-block elements - Comparative account of lanthanoids and actinoids - Occurrence, Oxidation states, Magnetic properties, Colour and spectra - Lanthanoids and Actinoids, Separation by ion-Exchange and Solvent extraction methods – Lanthanoids contraction- Chemistry of thorium and Uranium-Occurrence, Ores, Extraction, properties and uses - Preparation, Properties and uses of ceric ammonium sulphate, thorium dioxide and uranyl acetate.		
<b>Unit – V</b>	<b>Inorganic polymers</b>	Hours	12

	General properties – classification of inorganic polymers based on element in the backbone (Si, S, B and P) - preparation and properties of silicones (polydimethylsiloxane and polymethylhydrosiloxane) phosphorous based polymer (polyphosphazines and polyphosphonitrilic chloride), sulphur based polymer (polysulfide and polymeric sulphur nitride), boron based polymers (borazine polymers) – industrial applications of inorganic polymers.	
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)	
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.	
<b>Total Hours</b>		60
<b>Text Books</b>		
1	Puri B R, Sharma L R, Kalia K C (2011), Principles of Inorganic Chemistry, 31thEdition, Milestone Publishers & Distributors, Delhi.	
2	Satya Prakash, Tuli G. D., Basu S. K., Madan R. D. (2009), Advanced Inorganic Chemistry, 18th Edition, S. Chand & Co., New Delhi	
3	Lee J D, (1991), Concise Inorganic Chemistry, 4th Edition, ELBS William Heinemann, London.	
4	W V Malik, G D Tuli, R D Madan, (2000), Selected Topics in Inorganic Chemistry, S. Chand and Company Ltd.	
5	A. K. De, Text book of Inorganic Chemistry, Wiley East Ltd, seventh edition, 1992.	
<b>References</b>		
1	Madan R D, Sathya Prakash, (2003), Modern Inorganic Chemistry, 2nd ed ., S.Chand and Company, New Delhi.	
2	Gopalan R, (2009) Inorganic Chemistry for Undergraduates, Ist Edition, University Press (India) Private Limited, Hyderabad	
3	Sivasankar B, (2013) Inorganic Chemistry.Ist Edition, Pearson, Chennai	
4	Alan G. Sharp (1992), Inorganic Chemistry, 3rd Edition, Addition- Wesley, England	
5	Peter Atkins, Tina Overton, Jonathan Rourke and Mark Weller, Inorganic Chemistry, Oxford University Press, sixth edition, 2014.	
<b>Website and e-learning source</b>		
1	<a href="http://www.epgpathshala.nic.in">www.epgpathshala.nic.in</a>	
2	<a href="http://www.nptel.ac.in">www.nptel.ac.in</a>	
3	<a href="http://swayam.gov.in">http://swayam.gov.in</a>	





<b>POs</b>	<b>PROGRAMME OUTCOME</b>
PO 1	Students will possess basic subject knowledge required for higher studies, professional and applied courses
PO 2	Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the science & humanities stream.
PO 3	Students will develop scientific aptitude Integrate skills of analysis, critiquing, application and creativity.
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PO 6	Students will interact meaningfully with others displaying leadership and coordination in executing projects.
PO 7	Students will demonstrate responsibility as citizens committed to national development through community outreach, wellness of self and a sustainable environment.

<b>COs</b>	<b>COURSE OUTCOME</b>
CO 1	Explain isomerism, Werner's Theory and stability of chelate complexes
CO 2	Discuss crystal field theory, magnetic properties and spectral properties of complexes.
CO 3	Explain preparation and properties of metal carbonyls
CO 4	Give a comparative account of the characteristics of lanthanides and actinides
CO 5	Explain properties and uses of inorganic polymers of silicon, sulphur, boron and phosphorous

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>
<b>CO1</b>	S	S	S	S	S	S	S	M	S	M
<b>CO2</b>	M	S	S	S	M	S	S	M	M	M
<b>CO3</b>	S	S	S	M	S	S	S	M	S	M
<b>CO4</b>	S	S	S	S	S	S	S	M	M	M
<b>CO5</b>	S	M	S	S	S	S	S	M	M	S

<b>CO /PSO</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	3	3	3	3	3
<b>CO2</b>	3	3	3	3	3
<b>CO3</b>	3	3	3	3	3
<b>CO4</b>	3	3	3	3	3
<b>CO5</b>	3	3	3	3	3
<b>Weightage</b>	15	15	15	15	15
<b>Weighted percentage of Course Contribution to Pos</b>	3.0	3.0	3.0	3.0	3.0

**Signature of BOS Chairman**

	<b>VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)</b> Elayampalayam, Tiruchengode-637 205.									
	Programme	<b>B.Sc</b>	Programme Code	<b>UCH</b>		Regulations	<b>2023-2026</b>			
Department	<b>Chemistry</b>		Semester		<b>5</b>					
Course Code	Course Name			Hours per Week	Credit	Maximum Marks				
				L	T	P	C	CA	ESE	Total
<b>23U5CHCO7</b>	<b>CORE PAPER-XI: PHYSICAL CHEMISTRY-I</b>			5			4	25	75	100
Course Objectives	The course aims at providing an overall view of 1. Gibbs free energy, Helmholtz free energy, Ellingham's diagram and partial molar properties 2. Chemical kinetics and different types of chemical reactions 3. Adsorption, homogeneous and heterogeneous catalysis 4. Colloids and macromolecules 5. Photochemistry, fluorescence and phosphorescence									

### Content of the Syllabus

		Hours	
<b>Unit – I</b>	<b>Thermodynamics - III</b>		12
	Free energy and work functions - Need for free energy functions, Gibbs free energy, Helmholtz free energy - their variation with temperature, pressure and volume, criteria for spontaneity; Gibbs-Helmholtz equation – derivations and applications; Maxwell relationships, thermodynamic equations of state; Thermodynamics of mixing of ideal gases, Ellingham Diagram-application.  Partial molar properties – chemical potential, Gibbs Duhem equation, variation of chemical potential with temperature and pressure, chemical potential of a system of ideal gases, Gibbs- Duhem-Margules equation.		
<b>Unit – II</b>	<b>Chemical Kinetics</b>		12
	<b>Rate of reaction</b> - Average and instantaneous rates, factors influencing rate of reaction - molecularity of a reaction - rate equation - order of reaction. order and molecularity of simple and complex reactions, Rate laws - Rate constants – derivation of rate constants and characteristics for zero, first order, second and third order (equal initial concentration) – Derivation of time for half change with examples. Methods of determination of order of Volumetry, manometry and polarimetry.  Effect of temperature on reaction rate – temperature coefficient - concept of activation energy - Arrhenius equation. Theories of reaction rates – Collision theory – derivation of rate constant of bimolecular gaseous reaction – Failure of collision theory. Lindemann's theory of unimolecular reaction. Theory of absolute reaction rates – Derivation of rate constant for a bimolecular reaction – significance of entropy and free energy of activation. Comparison of collision theory and ARRT.  Complex reactions – reversible and parallel reactions (no derivation and only examples) – kinetics of consecutive reactions – steady state approximation.		
<b>Unit – III</b>		Hours	12
	Adsorption – Chemical and physical adsorption and their general characteristics- distinction between them Different types of isotherms – Freundlich and Langmuir. Adsorption isotherms and their limitations – BET theory, kinetics of enzyme catalysed reaction –Michaelis- Menten and Briggs-		

	Haldene equation – Lineweaver- Burk plot – inhibition – reversible – competitive, noncompetitive and uncompetitive (no derivation of rate equations)		
	Catalysis – general characteristics of catalytic reactions, auto catalysis, promoters, negative catalysis, poisoning of a catalyst – theories of homogenous and heterogeneous catalysis – Kinetics of Acid – base and enzyme catalysis. Heterogenous catalysis		
<b>Unit – IV</b>	<b>Colloids and Surface Chemistry</b>	Hours	12
	<b>Colloids:</b> Types of Colloids, Characteristics Colloids (Lyophilic and Lyophobic sols), Preparation of Sols- Dispersion methods, aggregation methods, Properties of Sols- Optical properties, Electrical properties – Electrical double layer, Electro Kinetic properties- Electro-osmosis, Electrophoresis, Coagulation or precipitation, Stability of sols, associated colloids, Emulsions, Gels-preparation of Gels, Applications of colloids		
	Macromolecules: Molecular weight of Macromolecules-Number average molecular weight- average molecular weight, Determination of Molecular weight of molecules		
<b>Unit – V</b>	<b>Photochemistry</b>	Hours	12
	Laws of photo chemistry – Lambert – Beer, Grotthus – Draper and Stark – Einstein. Quantum efficiency. Photochemical reactions – rate law – Kinetics of H <sub>2</sub> -Cl <sub>2</sub> , H <sub>2</sub> -Br <sub>2</sub> and H <sub>2</sub> -I <sub>2</sub> reactions, comparison between thermal and photochemical reactions.  Fluorescence – applications including fluorimetry – sensitised fluorescence, phosphorescence – applications - chemiluminescence and photosensitisation – examples Chemistry of Vision – II cis retinal – vitamin A as a precursor - colour perception of vision		
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSOthers to be solved (To be discussed during the Tutorial hours)		
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.		
<b>Total Hours</b>			60
<b>Text Books</b>			
1	B.R. Puri and L.R. Sharma, Principles of Physical Chemistry, Shoban Lal Nagin Chand and Co., forty eighth edition, 2021.		
2	Peter Atkins, and Julio de Paula, James Keeler, Physical Chemistry, Oxford University press, International eleventh edition, 2018.		
3	ArunBahl, B.S. Bahl, G. D. Tuli Essentials of physical chemistry, 28th edition 2019, S, Chand & Co.		
4	S. K. Dogra and S. Dogra, Physical Chemistry through Problems: New Age International, fourth edition, 1996.		
5	J. Rajaram and J.C. Kuriacose, Thermodynamics, ShobanLalNagin Chand and CO., 1986.		
<b>References</b>			
1	J. Rajaram and J.C. Kuriacose, Chemical Thermodynamics, Pearson, 1st edition, 2013.		
2	Keith J. Laidler, Chemical kinetics, third edition, Pearson, 2003.		
3	P. W. Atkins, and Julio de Paula, Physical Chemistry, Oxford University press, seventh edition, 2002.		
4	K. L. Kapoor, A Textbook of Physical Chemistry, Macmillan India Ltd, third edition, 2009.		
5	B.R. Puri, L.R. Sharma and M.S. Pathania, Principles of Physical Chemistry, Shobanlal Nagin Chand and Co. Jalendhar, forty first, edition, 2001		

<b>Website and e-learning source</b>	
1	<a href="https://nptel.ac.in">https://nptel.ac.in</a>
2	<a href="https://swayam.gov.in">https://swayam.gov.in</a>
3	<a href="http://www.epgpathshala.nic.in">www.epgpathshala.nic.in</a>



<b>POs</b>	<b>PROGRAMME OUTCOME</b>
PO 1	Students will possess basic subject knowledge required for higher studies, professional and applied courses
PO 2	Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the science & humanities stream.
PO 3	Students will develop scientific aptitude Integrate skills of analysis, critiquing, application and creativity.
PO 4	Students will employ appropriate digital tools and techniques necessary in analysing data and creative design.
PO 5	Students will gain competence to pursue higher learning, research and careers or will be able to opt for entrepreneurship.
PO 6	Students will interact meaningfully with others displaying leadership and coordination in executing projects.
PO 7	Students will demonstrate responsibility as citizens committed to national development through community outreach, wellness of self and a sustainable environment.

<b>COs</b>	<b>COURSE OUTCOME</b>
CO 1	Explain Gibbs and Helmholtz free energy functions, partial molar quantities and Ellinghams
CO 2	Apply the concepts of chemical kinetics to predict the rate of the reaction and order of the reaction, demonstrate the effect of temperature on reaction rate, and the significance of free energy and entropy of activation.
CO 3	Compare chemical and physical adsorption, Freundlich and Langmuir adsorption isotherms, and differentiate between homogenous and heterogeneous catalysis.
CO 4	Demonstrate the types and characteristics of colloids, preparation of sols and emulsions, and determine the molecular weights of macromolecules.
CO 5	Utilize the concepts of photochemistry in fluorescence, phosphorescence, chemiluminescence and color perception of vision.

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>
<b>CO1</b>	S	S	S	S	S	S	S	M	S	M
<b>CO2</b>	M	S	S	S	M	S	S	M	M	M
<b>CO3</b>	S	S	S	M	S	S	S	M	S	M
<b>CO4</b>	S	S	S	S	S	S	S	M	M	M
<b>CO5</b>	S	M	S	S	S	S	S	M	M	S

<b>CO /PSO</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>C01</b>	3	3	3	3	3
<b>C02</b>	3	3	3	3	3
<b>C03</b>	3	3	3	3	3
<b>C04</b>	3	3	3	3	3
<b>C05</b>	3	3	3	3	3
<b>Weightage</b>	15	15	15	15	15
<b>Weighted percentage of Course Contribution to Pos</b>	3.0	3.0	3.0	3.0	3.0

**Signature of BOS Chairman**

	<b>VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)</b> Elayampalayam, Tiruchengode-637 205.								
Programme	<b>B.Sc</b>	Programme Code	<b>UCH</b>		Regulations	<b>2021-2024</b>			
Department	<b>Chemistry</b>		Semester			<b>5</b>			
Course Code	Course Name		Hours per Week		Credit	Maximum Marks			
			L	T	P	C	CA	ESE	Total
<b>23U5CHDE03</b>	<b>ELECTIVE COURSE - III: ANALYTICAL CHEMISTRY</b>		4			4	25	75	100
Course Objectives	1. To help the student to develop the habit of accurate manipulation and an attitude of critical thinking. 2. To learn the basic analytical methods and appreciate what is involved in an analysis. 3. To develop the student knowledge to handle the chemicals in proper and hygiene manner.								
<b>POs</b>	<b>PROGRAMME OUTCOME</b>								
PO 1	Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines.								
PO 2	Demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups.								
PO 3	Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence.								
PO 4	Apply one's learning to real life situations.								
PO 5	Analyse and synthesise data from a variety of sources.								
PO 6	Establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation.								
PO 7	Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group.								
PO 8	Ability to analyse, interpret and draw conclusions from quantitative/qualitative data.								
PO 9	Critical sensibility to lived experiences, with self awareness and reflexivity of both self and society.								
PO 10	Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information source.								
PO 11	Ability to work independently, identify appropriate resources required for a project.								
PO 12	Possess knowledge of the values and beliefs of multiple cultures and a global perspective.								
PO 13	Appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work.								
PO 14	Building a team who can help achieve the vision, motivating and inspiring team members.								
PO 15	Ability to acquire knowledge and skills.								

<b>COs</b>	<b>COURSE OUTCOME</b>
CO 1	Students will utilize the learned analytical skills in handling various chemical and biochemical instruments.
CO 2	Students will be able to learn basic understanding on precipitation and gravimetric techniques.
CO 3	Students will have basic understanding on purification and separation techniques.
CO 4	Students will be able to interpret the results of quantitative experiments and interpret the data in meaningful way.

CO 5	Students will have a thorough understanding of thermal and electro analytical techniques.
Pre-requisites	

<b>KNOWLEDGE LEVELS</b>															
<b>1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing</b>															
<b>CO / PO / KL Mapping</b>															
<b>(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)</b>															
Cos	KLs					POs					KLs				
CO 1	2	PO 1					3								
		PO 2					5								
		PO 3					3								
CO 2	1	PO 4					1								
		PO 5					2								
		PO 6					4								
CO 3	4	PO 7					6								
		PO 8					2								
		PO 9					3								
CO 4	3	PO 10					5								
		PO 11					4								
		PO 12					4								
CO 5	5	PO 13					3								
		PO 14					2								
		PO 15					3								
<b>CO / PO Mapping</b>															
<b>(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)</b>															
COs	<b>Programme Outcome (POs)</b>														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	2	1	2	2	3	1	1	3	2	1	1	1	2	3	2
CO2	1	1	1	3	2	1	1	2	1	1	1	1	1	2	1
CO3	2	2	2	1	1	3	1	1	2	2	3	3	2	1	2
CO4	3	1	3	1	2	2	1	2	3	1	2	2	3	2	3
CO5	1	3	1	1	1	2	2	1	1	3	2	2	1	1	1

<b>Course Assessment Methods</b>
Direct
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations
Indirect
1. Course End Delivery



Content of the Syllabus			
Unit - I	<b>Handling of Chemicals and Analysis</b>	Hours	12
	<b>Laboratory Hygiene and safety</b> Storage and handling of corrosive, flammable, explosive, toxic, carcinogenic and poisonous chemicals. Simple first aid procedures for accidents involving acids, alkalis, bromine, burns and cut by glass. Threshold vapour concentration - safe limits. Waste disposal. Heating methods, stirring methods, filtration techniques. <b>Error in chemical analysis</b> Accuracy, precision, Types of error-absolute and relative error, methods of eliminating or minimizing errors. Methods of expressing precision: mean, median, deviation, average deviation and coefficient of variation. Significant figures and its application with respect to the glassware used. Normal error curve and its importance.		
Unit - II	<b>Solubility Equilibria</b>	Hours	12
	<b>General Separation Techniques</b> Solubility and solubility products, expressions for solubility products. Determination of solubility from solubility products. <b>Precipitation titrations</b> Argentometric titrations, indicators for precipitation titrations involving silver. Determination of chloride by Volhard's method. Adsorption indicators. <b>Gravimetric methods of analysis</b> Separation by precipitation, factors affecting solubility, gravimetric factor. Purity of precipitates, von Weiman ratio. Co-precipitation, post precipitation.		
Unit - III	<b>General purification techniques</b>	Hours	12
	Purification of solid organic compounds, recrystallisation, use of miscible solvents, use of drying agents and their properties, sublimation. Purification of liquids. Experimental techniques of distillation, fractional distillation, distillation under reduced pressure. Extraction, use of immiscible solvents, solvent extraction. Chemical methods of purification and test of purity.		
Unit - IV	<b>Chromatographic Techniques</b>	Hours	12
	Principle of adsorption and partition chromatography. Column chromatography: adsorbents, classification of adsorbents, solvents, preparation of column, adsorption and applications. Thin Layer Chromatography: choice of adsorbent, choice of solvent, preparation of chromatogram, sample, Rf value and its applications. Paper chromatography, solvent used, Rf value, factors which affect Rf value. Ion exchange chromatography, resins used, experimental techniques, applications. HPLC and Gas Chromatography, principle, detector (FID, TCD, ECD), Applications.		
Unit - V	<b>Thermal and electroanalytical techniques</b>	Hours	12
	Principle - Thermogravimetric analysis and Differential Thermal Analysis - discussion of various components with block diagram- TGA & DTA curves of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ and $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$ in air and in $\text{CO}_2$ - factors affecting TGA & DTA curves. Polarography- principle, concentration polarization, dropping mercury electrode (DME)- advantages and disadvantages- migration, residual, limiting and diffusion currents- Use of supporting electrolytes- Ilkovic equation (derivation not required) and significance-current voltage curve- oxygen wave. Half wave potential ( $E_{1/2}$ )- Polarography as an analytical tool in quantitative and qualitative analysis.		
<b>Total Hours</b>			60

Text Books	
1	D.A. Skoog, D.M. West and F.J. Holler, Analytical Chemistry: An Introduction, 5th edition, Saunders college publishing, Philadelphia, 1990.
2	U.N. Dash, Analytical Chemistry: Theory and Practice, Sultan Chand and sons Educational Publishers, New Delhi, 1995.



3	R.A. Day Jr. A.L. Underwood, Quantitative Analysis, 5th edition, Prentice Hall of India Private Ltd., New Delhi, 1988
4	R. Gopalan, Analytical Chemistry, S. Chand and Co., New Delhi
<b>Reference Books</b>	
1	Elementary Organic Spectroscopy: Principles and Chemical Applications, S.Chand and company Ltd., Ram Nagar, New Delhi, 1990
2	V.K. Srivastava, K.K. Srivastava, Introduction to Chromatography: Theory and Practice, S. Chand and company, New Delhi, 1987
3	R.M. Roberts, J.C. Gilbert, L.B. Rodewald, A.S. Wingrove, Modern Experimental Organic Chemistry, 4th edition, Holt Saunders international editions
4	A.K. Srivastava, P.C. Jain, Chemical Analysis: An Instrumental Approach for B.Sc. Hons. and M.Sc. Classes, S. Chand and company Ltd., Ram Nagar, New Delhi
<b>Website and e-learning source</b>	
1	<a href="https://www.news-medical.net/life-sciences/Analytical-Chemistry-Techniques.aspx">https://www.news-medical.net/life-sciences/Analytical-Chemistry-Techniques.aspx</a> .
2	<a href="https://www.toppr.com/guides/chemistry/organic-chemistry/purification-of-organic-compounds">https://www.toppr.com/guides/chemistry/organic-chemistry/purification-of-organic-compounds</a>
3	<a href="https://www.hitachihightech.com/global/products/science/tech/ana/thermal/descriptions/ta.html">https://www.hitachihightech.com/global/products/science/tech/ana/thermal/descriptions/ta.html</a>

**Signature of BOS Chairman**

	<b>VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)</b> Elayampalayam, Tiruchengode-637 205.									
	Programme	<b>B.Sc</b>	Programme Code	<b>UCH</b>		Regulations	<b>2023-2026</b>			
Department	<b>Chemistry</b>			Semester		<b>5</b>				
Course Code	Course Name			Hours per Week		Credit		Maximum Marks		
				L	T	P	C	CA	ESE	Total
<b>23U5CHDE04</b>	<b>ELECTIVE COURSE - IV BIOCHEMISTRY</b>			4	0	0	4	25	75	100
Course Objectives	The course aims at providing knowledge on 1. Relationship between biochemistry and medicine, composition of blood 2. structure and properties of amino acids, peptides, enzyme, vitamins and proteins 3. Biological functions of proteins, enzymes, vitamins and hormones 4. Biochemistry of nucleic acids and lipids 5. Metabolism of lipids									

### Content of the Syllabus

<b>Unit - I</b>	<b>Logic of Living Organisms</b>	Hours	12
	Relationship of Biochemistry and Medicine Blood - Composition of Blood, Blood Coagulation – Mechanism. Hemophilia and Sickle Cell Anaemia Maintenance of pH of Blood – Bicarbonate Buffer, Acidosis, Alkalosis.		
<b>Unit - II</b>	<b>Peptides and Proteins</b>	Hours	12
	<b>Amino acids</b> – nomenclature, classification – essential and Nonessential; Synthesis - Gabriel Phthalimide, Strecker; properties – zwitter ion and isoelectric point, electrophoresis and reactions.		
	<b>Peptides</b> – peptide bond – nomenclature – synthesis of simple peptides – solution and solid phase. Determination of structure of peptides, N terminal analysis – Sanger’s & Edmann method; C terminal analysis - Enzymic method.		
<b>Proteins</b> – classification based on composition, functions and structure; properties and reactions – colloidal nature, coagulation, hydrolysis, oxidation, denaturation, renaturation; colour tests for proteins; structure of proteins – primary, secondary, tertiary and quaternary. Metabolism of Amino acids – general aspects of metabolism (a brief outline); urea cycle.			
<b>Unit - III</b>	<b>Enzymes and Vitamins</b>	Hours	12
	Nomenclature and classification, characteristics, factors influencing enzyme activity – mechanism of enzyme action – Lock and key hypothesis, Koshland’s induced fit model.		
	Proenzymes, antienzymes, coenzymes and isoenzymes; allosteric enzyme regulation.		
Vitamins as coenzymes – functions of TPP, lipoic acid, NAD, NADP, FMN, FAD, pyridoxal phosphate, CoA, folic acid, biotin, cyanocobalamin.			
<b>Unit - IV</b>		Hours	12

	<p><b>Amino acids</b> Components of nucleic acids - nitrogenous bases and pentose sugars, structure of nucleosides and nucleotides, DNA- structure &amp; functions; RNA –types– structure - functions; biosynthesis of proteins</p> <p><b>Hormones</b> Adrenalin and thyroxine — chemistry, structure and functions (No structure elucidation).</p>		
Unit - V		Hours	12
	<p><b>Lipids</b> Occurrence, biological significance of fats, classification of lipids.</p> <p><b>Simple lipids</b> – Oils and fats, chemical composition, properties, reactions – hydrolysis, hydrogenation, trans-esterification, saponification, rancidity; analysis of oils and fats – saponification number, iodine number, acid value, R.M. value. Distinction between animal and vegetable fats.</p> <p><b>Compound lipids</b> – Lipoproteins - VLDL, LDL, HDL, chylomicrons – biological significance. Cholesterol – occurrence, structure, test, physiological activity. Metabolism of lipids: <math>\beta</math>-oxidation of fatty acids.</p>		
	<p>Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)</p> <p>Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)</p>		
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.		
<b>Total Hours</b>			60

Text Books	
1	Bahl, B. S.; Bhal, A. Advanced Organic Chemistry, 3rd ed.; S. Chand: New Delhi, 2003.
2	Jain, M.K.; Sharma, S.C. Modern Organic Chemistry, Vishal Publications: New Delhi, 2017.
3	Shanmugam, A. Fundamentals of Biochemistry for Medical Students, 6th ed.; Published by the author, 1999.
4	Veerakumari, L. Biochemistry, 1st ed.; MJP Publications: Chennai, 2004.
5	Jain, J. L.; Fundamentals of Biochemistry, 2nd ed.; S.Chand: New Delhi, 1983.
References	
1	Conn, E. E.; Stumpf, P. K. Outline of Biochemistry, 5th ed.; Wiley Eastern: New Delhi, 2002.
2	West, E. S.; Todd, W. R.; Mason, H. S.; Van Bruggen, J. T. Text Book of Biochemistry, 4th ed.; Macmillan: New York, 1970.
3	Lehninger, A. L. Principles of Biochemistry, 2nd ed.; CBS Publisher: Delhi, 1993.
4	Rastogi, S. C. Biochemistry, 2nd ed.; Tata McGraw-Hill: New Delhi, 2003.
5	Chatterjea, M. N.; Shinde, R. Textbook of Medical Biochemistry, 5 <sup>th</sup> ed.; Jaypee Brothers: New Delhi, 2002.
Website and e-learning source	
1	<a href="http://library.med.utah.edu/NetBiochem/nucacids.html">http://library.med.utah.edu/NetBiochem/nucacids.html</a>
2	<a href="http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/E/EnzymeKinetics.html">http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/E/EnzymeKinetics.html</a>
3	<a href="https://swayam.gov.in/courses/4384-biochemistry">https://swayam.gov.in/courses/4384-biochemistry</a> Biochemistry

4	<a href="https://onlinecourses.nptel.ac.in/noc19_cy07/preview">https://onlinecourses.nptel.ac.in/noc19_cy07/preview</a> Experimental Biochemistry
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POs	PROGRAMME OUTCOME
PO 1	Students will possess basic subject knowledge required for higher studies, professional and applied courses
PO 2	Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the science & humanities stream.
PO 3	Students will develop scientific aptitude Integrate skills of analysis, critiquing, application and creativity.
PO 4	Students will employ appropriate digital tools and techniques necessary in analysing data and creative design.
PO 5	Students will gain competence to pursue higher learning, research and careers or will be able to opt for entrepreneurship.
PO 6	Students will interact meaningfully with others displaying leadership and coordination in executing projects.
PO 7	Students will demonstrate responsibility as citizens committed to national development through community outreach, wellness of self and a sustainable environment.

COs	COURSE OUTCOME
CO 1	Explain molecular logic of living organisms, composition of blood and blood Coagulation
CO 2	Explain synthesis and properties of amino acids, determination of structure of peptides and proteins
CO 3	Explain factors influencing enzyme activity and vitamins as coenzymes
CO 4	Explain RNA and DNA structure and functions
CO 5	Explain biological significance of simple and compound lipids

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

CO / PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
<b>Weightage</b>	15	15	15	15	15
<b>Weighted percentage of Course Contribution to Pos</b>	3.0	3.0	3.0	3.0	3.0

Signature of BOS Chairman

Programme	B.Sc	Programme Code	UCH			Regulations	2021-2024			
Department	Chemistry			Semester			6			
Course Code	Course Name			Hours per Week			Credit	Maximum Marks		
				L	T	P	C	CA	ESE	Total
<b>23U5CHCP05</b>	<b>CORE COURSE- XIII GRAVIMETRIC ANALYSIS AND ORGANIC PREPARATION</b>					4	3	40	60	100
Course Objectives	1. The students will get training in the quantitative analysis of metal ions using gravimetric method. 2. The students will get training for systematic qualitative analysis and preparation of simple organic compounds.									
<b>POs</b>	<b>PROGRAMME OUTCOME</b>									
PO 1	Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines.									
PO 2	Demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups.									
PO 3	Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence.									
PO 4	Apply one's learning to real life situations.									
PO 5	Analyse and synthesise data from a variety of sources.									
PO 6	Establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation.									
PO 7	Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group.									
PO 8	Ability to analyse, interpret and draw conclusions from quantitative/qualitative data.									
PO 9	Critical sensibility to lived experiences, with self awareness and reflexivity of both self and society.									
PO 10	Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information source.									
PO 11	Ability to work independently, identify appropriate resources required for a project.									
PO 12	Possess knowledge of the values and beliefs of multiple cultures and a global perspective.									
PO 13	Appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work.									
PO 14	Building a team who can help achieve the vision, motivating and inspiring team members.									
PO 15	Ability to acquire knowledge and skills.									

COs	COURSE OUTCOME
CO 1	Students will learn to predict the outcome of organic reactions.
CO 2	To understanding of the general reactivity of functional groups and mechanism.
CO 3	Enable the students to work effectively as a member of a team.
CO 4	To Communicate productively with lab mates, teaching assistant and instructor.
CO 5	Students will learn to maintain a detailed scientific notebook.
Pre-requisites	



<b>KNOWLEDGE LEVELS</b>															
<b>1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing</b>															
<b>CO / PO / KL Mapping</b>															
<b>(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)</b>															
Cos	KLs					POs					KLs				
CO 1	2					PO 1					3				
						PO 2					1				
						PO 3					4				
CO 2	1					PO 4					2				
						PO 5					6				
						PO 6					2				
CO 3	3					PO 7					3				
						PO 8					4				
						PO 9					2				
CO 4	5					PO 10					4				
						PO 11					2				
						PO 12					4				
CO 5	4					PO 13					3				
						PO 14					4				
						PO 15					2				
<b>CO / PO Mapping</b>															
<b>(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)</b>															
COs	<b>Programme Outcome (POs)</b>														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	2	1	1	3	1	1	1	1	3	2	1	1	2	2	1
CO2	2	3	1	1	2	3	1	3	1	2	2	2	2	2	1
CO3	3	2	1	2	1	2	1	2	2	3	1	1	3	3	1
CO4	1	2	2	1	3	2	1	2	1	1	3	3	1	1	2
CO5	1	1	3	1	2	1	2	1	1	1	2	2	1	1	3

<b>Course Assessment Methods</b>				
Direct				
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations				
Indirect				
1. Course End Delivery				
<b>Content of the Syllabus</b>				
<b>Unit – III</b>	<b>Organic Preparations - I</b>		Hours	30
	Preparations involve the following reactions: 1. Oxidation - Preparation of Benzoic acid from Benzaldehyde 2. Hydrolysis - Preparation of Methyl salicylate from Salicylic acid 3. Nitration- Preparation of p - Nitroacetanilide from Acetanilide.			
<b>Unit – IV</b>	<b>Organic Preparations - II</b>		Hours	30

	4. Bromination - Preparation of p - Bromoacetanilide from Acetanilide 5. Bromination - Preparation of sym -Tribromophenol from Phenol 6. Benzoylation - Preparation of Benzanilide from aniline.		
<b>Unit – V</b>	<b>Gravimetric Estimations</b>	Hours	30
	1. Estimation of Nickel as Nickel DMG Complex 2. Estimation Barium as Barium Chromate 3. Estimation of Lead as Lead Chromate 4. Estimation of Calcium as Calcium oxalate 5. Estimation of Barium as Barium sulfate		
<b>Total Hours</b>			<b>90</b>

<b>Text Books</b>	
1	Dr. N.S Gnanaprasagam, Organic chemistry Lab manual.
2	V. Venkateswaran, R.Veerawamy and A.R. Kulandaivelu, Basic Principle of Practical chemistry, S. Chand and Sons, New Delhi, 2004.
<b>References</b>	
1	R.K. Bansal, Laboratory Manual of Organic chemistry, 3rd Edition, New Age Internal Publication.
2	B.S. Furniss, A.J. Hannaford, P.W.D Smith and A.R. Tatchell, Vogel's Practical Organic chemistry, 5th Edition, ELBS (1989).
<b>E-References</b>	
1	<a href="https://www.toppr.com/guides/chemistry/organic-chemistry/qualitative-analysisof-organic-compounds/">https://www.toppr.com/guides/chemistry/organic-chemistry/qualitative-analysisof-organic-compounds/</a>
2	<a href="https://www.csub.edu/chemistry/organic/manual/Lab14_QualitativeAnalysis.pdf">https://www.csub.edu/chemistry/organic/manual/Lab14_QualitativeAnalysis.pdf</a>
3	<a href="https://chem.libretexts.org/Ancillary_Materials/Laboratory_Experiments/Wet_Lab_Experiments/General_Chemistry_Labs/Online_Chemistry_Lab_Manual/Chem_11_/07%3A_Gravimetric_Analysis_(Experiment)">https://chem.libretexts.org/Ancillary_Materials/Laboratory_Experiments/Wet_Lab_Experiments/General_Chemistry_Labs/Online_Chemistry_Lab_Manual/Chem_11_/07%3A_Gravimetric_Analysis_(Experiment)</a>

**Signature of BOS Chairman**

	<b>VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)</b> Elayampalayam, Tiruchengode-637 205.									
	Programme	<b>B.Sc</b>	Programme Code	<b>UCH</b>	Regulations	<b>2023-2026</b>				
Department	<b>Chemistry</b>			Semester		<b>6</b>				
Course Code	Course Name			Hours per Week	Credit	Maximum Marks				
				L	T	P	C	CA	ESE	Total
<b>23U6CHCO8</b>	<b>CORE COURSE-XIV: ORGANIC CHEMISTRY-II</b>			6	0	0	4	25	75	100
Course Objectives	This course aims at providing knowledge on 1. Classification, isolation and discussing the properties of alkaloids and terpenes 2. Preparation and properties of saccharides 3. Biomolecules 4. Different molecular rearrangement 5. Preparation and properties of organometallic compounds									

Content of the Syllabus			
<b>Unit - I</b>	<b>Alkaloids &amp; Terpenes</b>	Hours	12
	<b>Alkaloids</b> Classification, isolation, general properties- Hofmann Exhaustive Methylation; Structure elucidation – Coniine, piperine, nicotine.  <b>Terpenes:</b> Classification, Isoprene rule, isolation and structural elucidation of Citral, alpha terpineol, Menthol, Geraniol and Camphor.		
<b>Unit - II</b>	<b>Carbohydrates</b>	Hours	12
	Definition and Classification of Carbohydrates with examples. Relative configuration of sugars. Determination of configuration (Fischer's Proof). Definition of enantiomers, diastereomers, epimers and anomers with suitable examples.  <b>Monosaccharides</b> – configuration – D and L hexoses – aldohexoses and ketohexoses. Glucose, Fructose – Occurrence, preparation, properties, reactions, structural elucidation, uses. Interconversions of sugar series – ascending, descending, aldose to ketose and ketose to aldose.  <b>Disaccharides</b> – sucrose, lactose, maltose - preparation, properties and uses (no structural elucidation).  <b>Polysaccharides</b> – Source, constituents and biological importance of homopolysaccharides- starch and cellulose, heteropolysaccharides – hyaluronic acid, heparin.		
<b>Unit - III</b>	<b>Molecular rearrangements</b>	Hours	12
	Molecular Rearrangement: Type of rearrangements, Mechanism for Benzidine, Favorskii, Claisen, Fries, Hofmann, Curtius, Schmidt and Beckmann, Pinacol-pinacolone rearrangement.		



<b>Unit - IV</b>	<b>Special reagents in organic synthesis</b>	Hours	12
	AIBN, 9BBN, BINAP/BINOL, BOC, DABCO, DCC, DIBAL, DMAP, NBS/NCS, NMP, PCC, TBHP, TEMPO Organometallic compounds in Organic Synthesis Preparation, Properties and applications: Grignard Reagents, Organo Lithium Compounds, Ziegler – Natta, Wilkinson, Metal Carbonyl, Zeiss's Salt.		
<b>Unit - V</b>	<b>Green Chemistry</b>	Hours	12
	Principles, chemistry behind each principle and applications in chemical synthesis. Green reaction media – green solvents, green reagents and catalysts; tools used like microwave and ultra-sound in chemical synthesis.		
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)		
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.		
<b>Total Hours</b>			<b>60</b>

<b>Text Books</b>	
1	M. K. Jain, S. C.Sharma, Modern Organic Chemistry, Vishal Publishing, 4th reprint, 2009.
2	S.M. Mukherji, and S.P. Singh, Reaction Mechanism in Organic Chemistry, Macmillan IndiaLtd., 3rd edition, 2009.
3	Arun Bahl and B.S. Bahl, Advanced organic chemistry, New Delhi, S.Chand & Company Pvt. Ltd., Multicolour edition, 2012.
4	P. L.Soni and H. M. Chawla, Text Book of Organic Chemistry, Sultan Chand & Sons, New Delhi, 29th edition, 2007.
5	C Bandyopadhyaya; An Insight into Green Chemistry; Published on 2020.
<b>References</b>	
1	R. T. Morrison and R. N. Boyd, Organic Chemistry, Pearson Education, Asia,6th edition, 2012.
2	T.W.Graham Solomons, Organic Chemistry, John Wiley & Sons,11th edition, 2012.
3	A. Carey Francis, Organic Chemistry, Tata McGraw-Hill Education Pvt. Ltd., New Delhi, 7th edition,2009.
4	I. L. Finar, Organic Chemistry, Vol. (1& 2), England, Wesley Longman Ltd, 6th edition, 2006.
5	J. A. Joule, and G. F. Smith, Heterocyclic Chemistry, Wiley, 5 <sup>th</sup> Edition, 2010.
<b>Website and e-learning source</b>	
1	<a href="http://www.epgpathshala.nic.in">www.epgpathshala.nic.in</a>
2	<a href="http://www.nptel.ac.in">www.nptel.ac.in</a>
3	<a href="http://swayam.gov.in">http://swayam.gov.in</a>
4	Virtual Textbook of Organic Chemistry
5	<a href="https://vlab.amrita.edu/">https://vlab.amrita.edu/</a>



POs	PROGRAMME OUTCOME
PO 1	Students will possess basic subject knowledge required for higher studies, professional and applied courses
PO 2	Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the science & humanities stream.
PO 3	Students will develop scientific aptitude Integrate skills of analysis, critiquing, application and creativity.
PO 4	Students will employ appropriate digital tools and techniques necessary in analysing data and creative design.
PO 5	Students will gain competence to pursue higher learning, research and careers or will be able to opt for entrepreneurship.
PO 6	Students will interact meaningfully with others displaying leadership and coordination in executing projects.
PO 7	Students will demonstrate responsibility as citizens committed to national development through community outreach, wellness of self and a sustainable environment.

COs	COURSE OUTCOME
CO 1	Explain isolation and properties of alkaloids and terpenes
CO 2	Explain preparation and reactions of mono and disachharides
CO 3	Classify biomolecules and natural products based on their structure, properties, reactions and uses.
CO 4	Explain molecular rearrangements like benzidine, Hoffmann etc.,
CO 5	Preparation and properties of organolithium compounds

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Signature of BOS Chairman

	<b>VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)</b> Elayampalayam, Tiruchengode-637 205.									
	Programme	<b>B.Sc</b>	Programme Code	<b>UCH</b>	Regulations	<b>2023-2026</b>				
Department	<b>Chemistry</b>			Semester		<b>6</b>				
Course Code	Course Name			Hours per Week	Credit	Maximum Marks				
				L	T	P	C	CA	ESE	Total
<b>23U6CHC09</b>	<b>CORE PAPER-XV: INORGANIC CHEMISTRY-II</b>			6	0	0	4	25	75	100
Course Objectives	The course aims to provide knowledge on 1. Tracer elements and their role in the biological system. 2. Iron transport and storage 3. Metallo enzymes, oxygen transport. 4. Silicates and their applications 5. Industrial applications of refractories, alloys, paints and pigments.									

Content of the Syllabus			
<b>Unit - I</b>	<b>Bioinorganic Chemistry</b>	Hours	12
	Essential and trace elements: Role of Na <sup>+</sup> , K <sup>+</sup> , Mg <sup>2+</sup> , Ca <sup>2+</sup> , Fe <sup>3+</sup> , Cu <sup>2+</sup> and Zn <sup>2+</sup> in biological systems. Effect of excess intake (Toxicity) of Metal ions – trace elements - As, Cd, Pb, Hg.		
<b>Unit - II</b>	<b>Metal ion transport and storage</b>	Hours	12
	Iron – storage, transport - Transferrin and Ferritin; Iron-porphyrins – myoglobin, haemoglobin – oxygen transport - Bohr effect; Sodium/potassium pump, calcium pump; transport and storage – copper and zinc.		
<b>Unit - III</b>	<b>Metallo enzymes</b>	Hours	12
	Isomerase and synthetases, structure of cyanocobalamin (Vitamin B12), nature of Co-C bond; Metalloenzymes - functions of carboxy peptidase A, zinc metalloenzyme – mechanism and uses, Zn-Cu enzyme - structure and function, carbonic anhydrase, Vitamin B-12 as transferase and isomerase - Iron-sulphur proteins - 2Fe-2S – rubredoxin, 4Fe-2S – ferridoxin, Iron sulphur cluster enzymes. In vivo and In vitro nitrogen fixation – biological functions of nitrogenase and molybdo enzymes.		
<b>Unit - IV</b>	<b>Silicates</b>	Hours	12
	Introduction – general properties of silicates, structure – types of silicates – ortho silicates(zircon), pyrosilicates (thortveitite), chain silicates(pyroxenes), ring silicates(beryl), sheet silicates(talc, mica, asbestos), silicates having three dimensional structure (feldspars, zeolites, ultramarines) reactions in square planar complexes.		

	<b>Industrial Applications of Inorganic Compounds</b>	Hours	12
<b>Unit - V</b>	Refractories, pyrochemical, explosives. Alloys, Paints and pigments - requirements of a good paint; classification, constituents of paints – pigments, vehicles, thinners, driers, extenders, anti-knocking agents, anti-skinning agents, plasticizers, binders-application; varnishes- oils, spirit; enamels. Nanocomposite Hydrogels: synthesis, characterization and uses. Industrial visits and internship mandatory.		
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)		
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.		
<b>Total Hours</b>			60
<b>Text Books</b>			
1	Puri B R, Sharma L R, Kalia K C (2011), Principles of Inorganic Chemistry, 31th ed., Milestone Publishers & Distributors, Delhi.		
2	Satya Prakash, Tuli G. D., Basu S. K., Madan R. D. (2009), Advanced Inorganic Chemistry, 18th Edition, S. Chand & Co., New Delhi		
3	Lee J D, (1991), Concise Inorganic Chemistry, 4th ed., ELBS William Heinemann, London.		
4	W V Malik, G D Tuli, R D Madan, (2000), Selected Topics in Inorganic Chemistry, Schand and Company Ltd.		
5	A. K. De, Text book of Inorganic Chemistry, Wiley East Ltd, seventh edition, 1992.		
<b>References</b>			
1	Madan R D, Sathya Prakash, (2003), Modern Inorganic Chemistry, 2nded., S.Chand and Company, New Delhi.		
2	Gopalan R, (2009) Inorganic Chemistry for Undergraduates, Ist Edition, University Press (India) Private Limited, Hyderabad		
3	Sivasankar B, (2013) Inorganic Chemistry. Ist Edition, Pearson, Chennai.		
4	Alan G. Sharp (1992), Inorganic Chemistry, 3rd Edition, Addition- Wesley, England.		
5	Peter Atkins, Tina Overton, Jonathan Rourke and Mark Weller, Inorganic Chemistry, Oxford University Press, sixth edition, 2014.		
<b>Website and e-learning source</b>			
1	<a href="http://www.epgpathshala.nic.in">www.epgpathshala.nic.in</a>		
2	<a href="http://www.nptel.ac.in">www.nptel.ac.in</a>		
3	<a href="http://swayam.gov.in">http://swayam.gov.in</a>		

POs	PROGRAMME OUTCOME
PO 1	Students will possess basic subject knowledge required for higher studies, professional and applied courses
PO 2	Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the science & humanities stream.
PO 3	Students will develop scientific aptitude Integrate skills of analysis, critiquing, application and creativity.
PO 4	Students will employ appropriate digital tools and techniques necessary in analysing data and creative design.
PO 5	Students will gain competence to pursue higher learning, research and careers or will be able to opt for entrepreneurship.
PO 6	Students will interact meaningfully with others displaying leadership and coordination in executing projects.
PO 7	Students will demonstrate responsibility as citizens committed to national development through community outreach, wellness of self and a sustainable environment.



COs	COURSE OUTCOME
CO 1	Ability to explain the importance of tracer elements on biological system.
CO 2	Explain the metal ion transport, Bohr effect, Na, K, Ca pump.
CO 3	Explain the function of Vitamin B12, Zn-Cu enzyme, ferredoxin, cluster enzymes.
CO 4	Classification and structure of silicates.
CO 5	Explain the manufacture of refractories, explosives, paints and pigments

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
<b>Weightage</b>	15	15	15	15	15
<b>Weighted percentage of Course Contribution to Pos</b>	3.0	3.0	3.0	3.0	3.0

**Signature of BOS Chairman**



	<b>VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)</b> Elayampalayam, Tiruchengode-637 205.										
	Programme	<b>B.Sc</b>	Programme Code	<b>UCH</b>		Regulations	<b>2023-2026</b>				
Department	<b>Chemistry</b>		Semester		<b>6</b>						
Course Code	Course Name		Hours per Week			Credit			Maximum Marks		
			L	T	P	C	CA	ESE	Total		
<b>23U6CHC10</b>	<b>CORE PAPER-XVI: PHYSICAL CHEMISTRY-II</b>		5			4	25	75	100		
Course Objectives	The course aims at providing an overall view of the 1. Phase diagram of one and two component systems 2. Chemical equilibrium, 3. Separation techniques for binary liquid mixtures. 4. Electrical conductance and transport number. 5. Galvanic cells, EMF and significance of electrochemical series.										

### Content of the Syllabus

<b>Unit - I</b>	<b>Phase Rule</b>	Hours	12
	Definition of terms; derivation of phase rule ; application to one component systems – water and sulphur - super cooling, sublimation ; two component systems – solid liquid equilibria- simple eutectic (lead - silver and bismuth - cadmium), freezing mixtures (potassium iodide water), compound formation with- congruent melting points (magnesium – zinc and ferric chloride – water system), peritectic change (sodium – potassium), solid solution (gold-silver); copper sulphate – water system.		
<b>Unit - II</b>	<b>Chemical equilibrium</b>	Hours	12
	Law of mass action – thermodynamic derivation – relationship between $K_p$ and $K_c$ –application to the homogeneous equilibria – dissociation of $PCl_5$ gas, $N_2O_4$ gas –equilibrium constant and degree of dissociation - formation of HI, $NH_3$ , and $SO_3$ –heterogeneous equilibrium – decomposition of solid calcium carbonate –Lechatelier principle – van't Hoff reaction isotherm – temperature dependence of equilibrium constant – van't Hoff reaction isochore – Clayperon equation – Clausius Clayperon equation and its applications.		
<b>Unit - III</b>	<b>Binary liquid mixtures</b>	Hours	12
	Ideal liquid mixtures – non ideal solutions – azeotropic mixtures – fractional distillation – partially miscible mixtures – phenol-water, triethylamine-water, nicotine-water – effect of impurities on critical solution temperature; immiscible liquids- steam distillation; Nernst distribution law – applications.		
<b>Unit - IV</b>	<b>Electrical Conductance and Transference</b>	Hours	12
	Arrhenius theory of electrolytic dissociation – Ostwald's dilution law, limitations of Arrhenius theory; behavior of strong electrolytes – interionic effects – Debye Huckel theory –Onsager equation (no derivation), significance of Onsager equation, Debye Falkenhagen effect, Wien effect. Ionic mobility – Discharge of ions on electrolysis (Hittorf's theoretical device), transport number – determination – Hittorf's method, moving boundary method – factors affecting transport number – determination of ionic mobility; Kohlrausch's law applications; molar ionic conductance and viscosity (Walden's rule); applications of conductance measurements – determination of – degree of dissociation of weak electrolyte, dissociation constant of weak acid and weak base, ionic product of		

	water, solubility and solubility product of sparingly soluble salts - conductometric titrations – acid base titrations.		
<b>Unit - V</b>	<b>Galvanic Cells and Applications</b>	Hours	12
	Galvanic cell, representation, reversible and irreversible cells, EMF and its measurement – standard cell; relationship between electrical energy and chemical energy; sign of EMF and spontaneity of a reaction, thermodynamics and EMF – calculation of $\Delta G$ , $\Delta H$ , and $\Delta S$ from EMF data; reversible electrodes, electrode potential, standard electrode potential, primary and secondary reference electrodes, Nernst equation for electrode potential and cell EMF; types of electrodes – metal/metal ion, metal amalgam/metal ion, metal, insoluble salt/anion, gas electrode, redox electrode; electrochemical series – applications of electrochemical series. Chemical cells with and without transport, concentration cells with and without transport; <b>Applications of EMF measurements</b> applications of EMF measurements – determination of activity coefficient of electrolytes, transport number, valency of ions, solubility product, pH using hydrogen gas electrode, quinhydrone electrode and glass electrode, potentiometric titrations – acid base titrations, redox titrations, precipitation titrations, ionic product of water and degree of hydrolysis; redox indicators - use of diphenylamine indicator in the titration of ferrous iron against dichromate. <b>Industrial component</b> Galvanic cells- lead storage, Ni-Cd, Li and Zn-air, Al-air batteries Fuel cells – H <sub>2</sub> -O <sub>2</sub> cell – efficiency of fuel cells. Corrosion –mechanism, types and methods of prevention.		
<b>Total Periods</b>			60
<b>Text Books</b>			
1	B.R. Puri and L.R. Sharma, Principles of Physical Chemistry, ShobanLalNagin Chand and Co., forty eighth edition, 2021.		
2	Peter Atkins, and Julio de Paula, James Keeler, Physical Chemistry, Oxford University press, International eleventh edition, 2018.		
3	ArunBahl, B.S. Bahl, G. D. Tuli Essentials of physical chemistry, 28th edition 2019, S, Chand & Co.		
4	S. K. Dogra and S. Dogra, Physical Chemistry through Problems: New Age International, fourth edition, 1996.		
5	J. Rajaram and J.C. Kuriacose, Thermodynamics, ShobanLalNagin Chand and CO., 1986.		
<b>References</b>			
1	K. L. Kapoor, A Textbook of Physical Chemistry, Macmillan India Ltd, third edition, 2009.		
2	Gilbert. W. Castellen, Physical Chemistry, Narosa Publishing House, third edition, 1985.		
3	P. W. Atkins, and Julio de Paula, Physical Chemistry, Oxford University press, seventh edition, 2002.		
4	B.R. Puri, L.R. Sharma and M.S. Pathania, Principles of Physical Chemistry, Shobanlal Nagin Chand and Co. Jalendhar, forty first, edition, 2001		
5	D.N.Bajpai, Advanced Physical Chemistry, S.Chand & Co., 2001.		
Website and e-learning source			
1	<a href="https://nptel.ac.in">https://nptel.ac.in</a>		
2	<a href="https://swayam.gov.in">https://swayam.gov.in</a>		
3	<a href="https://archive.nptel.ac.in/content/storage2/courses/112108150/pdf/PPT_s/MTS_07_m.pdf">https://archive.nptel.ac.in/content/storage2/courses/112108150/pdf/PPT s/MTS_07_m.pdf</a>		
4	Thermodynamics – NPTEL		
5	<a href="https://www.youtube.com/watch?v=f0udxGcoztE">https://www.youtube.com/watch?v=f0udxGcoztE</a> Introduction to chemical equilibrium – MIT open course ware		





POs	PROGRAMME OUTCOME
PO 1	Students will possess basic subject knowledge required for higher studies, professional and applied courses
PO 2	Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the science & humanities stream.
PO 3	Students will develop scientific aptitude Integrate skills of analysis, critiquing, application and creativity.
PO 4	Students will employ appropriate digital tools and techniques necessary in analysing data and creative design.
PO 5	Students will gain competence to pursue higher learning, research and careers or will be able to opt for entrepreneurship.
PO 6	Students will interact meaningfully with others displaying leadership and coordination in executing projects.
PO 7	Students will demonstrate responsibility as citizens committed to national development through community outreach, wellness of self and a sustainable environment.

COs	COURSE OUTCOME
CO 1	Construct the phase diagram for one component and two component systems, explain the properties of freezing mixture, component with congruent melting points and solid solutions.
CO 2	Apply the concepts of chemical equilibrium in dissociation of $PCl_5$ , $N_2O_4$ and formation of HI, $NH_3$ , $SO_3$ and decomposition of calcium carbonate. Demonstrate important principles such as Le chatelier principle, van't Hoff reaction isotherm and Clausius-Clayperon equation.
CO 3	Identify an appropriate distillation method for the separation of binary liquid mixtures such as azeotropic mixtures, partially miscible mixtures and immiscible liquids.
CO 4	Explain the significance of Arrhenius theory, Debye-Huckel theory, Onsager equation and Kohlrausch's law in conductance.
CO 5	Construct electrochemical cell with the help of electrochemical series and calculate cell EMF. Demonstrate the applications of EMF and significance of potentiometric titrations.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Signature of BOS Chairman

	<b>VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)</b> Elayampalayam, Tiruchengode-637 205.									
	Programme	<b>B.Sc</b>	Programme Code	<b>UCH</b>	Regulations	<b>2023-2026</b>				
Department	<b>Chemistry</b>			Semester		<b>6</b>				
Course Code	Course Name			Hours per Week		Credit	Maximum Marks			
				L	T	P	C	CA	ESE	Total
<b>23U6CHDE05</b>	<b>ELECTIVE COURSE - V FUNDAMENTALS OF SPECTROSCOPY</b>			4	1	0	4	25	75	100
Course Objectives	This course is designed to provide knowledge on 1. Electrical and magnetic properties of organic and inorganic compounds 2. Basic principles of microwave, UV-Visible, infrared, Raman, NMR and Mass spectrometry 3. Instrumentation of microwave, UV-Visible, infrared, Raman, NMR and Mass spectrometry 4. Applications of various spectral techniques in structural elucidation 5. Solving combined spectral problems									

Content of the Syllabus			
<b>Unit - I</b>		Hours	12
	<b>Electrical and Magnetic properties of molecules</b> Dipole moment – polar and nonpolar molecules – polarisability of molecules. Application of dipole moments in the study of organic and inorganic molecules. Magnetic permeability, volume susceptibility, mass susceptibility and molar susceptibility; diamagnetism, paramagnetism – determination of magnetic susceptibility using Guoy balance, ferromagnetism, anti ferromagnetism <b>Microwave spectroscopy</b> Rotation spectra - diatomic molecules (rigid rotator approximation) selection rules – determination of bond length, effect of isotopic substitution – instrumentation and applications		
<b>Unit - II</b>		Hours	12
	<b>Ultraviolet and Visible spectroscopy</b> Electronic spectra of diatomic molecules (Born Oppenheimer approximation) - vibrational coarse structure – rotational fine structure of electronic vibration transitions – Frank Condon principle – dissociation in electronic transitions – BirgeSpomer method of evaluation of dissociation energy – pre-dissociation transition - $\sigma - \sigma^*$ , $\pi - \pi^*$ , $n - \sigma^*$ , $n - \pi^*$ transitions. Applications of UV-Woodward – Fisher rules as applied to conjugated dienes and $\alpha$ , $\beta$ - unsaturated ketones. Elementary Problems. Colorimetry - principle and applications (estimation of $Fe^{3+}$ )		
<b>Unit - III</b>		Hours	12
	<b>Infrared spectroscopy</b> Vibration spectra –diatomic molecules – harmonic oscillator and anharmonic oscillator; Vibration – rotation spectra – diatomic molecule as rigid rotator and anharmonic oscillator (Born-Oppenheimer approximation oscillator) - selection rules, vibrations of polyatomic molecules – stretching and bending vibrations – applications – determination of force constant, moment of inertia and internuclear distance – isotopic shift – application of IR spectra to simple organic and inorganic molecules – (group frequencies) <b>Raman Spectroscopy</b> Rayleigh scattering and Raman scattering of light – Raman shift – classical theory of Raman effect –		

	quantum theory of Raman effect – Vibrational Raman spectrum – selection rules – mutual exclusion principle – instrumentation (block diagram) – applications.		
<b>Unit - IV</b>	<b>Nuclear magnetic resonance spectroscopy</b>	Hours	12
	PMR – theory of PMR – instrumentation - number of signals – chemical shift – peak areas and proton counting – spin-spin coupling – applications. Problems related to shielding and deshielding of protons, chemical shifts of protons in hydrocarbons, and in simple monofunctional organic compounds; spin-spin splitting of neighbouring protons in vinyl and allyl systems.		
<b>Unit - V</b>	<b>Mass spectrometry</b>	Hours	12
	Principle – different kinds of ionisation – instrumentation – the mass spectrum – types of ions – determination of molecular formula fragmentation and structural elucidation – McLafferty rearrangement; Retro Diels Alder reaction - illustrations with simple organic molecules. Solving structure elucidation problems using multiple spectroscopic data (NMR, MS, IR and UV-Vis).		
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)		
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.		
<b>Total Hours</b>			60

<b>Text Books</b>	
1	Gopalan, R.; Subramaniam, P. S.; Rengarajan, K. Elements of Analytical Chemistry; S Chand: New Delhi, 2003.
2	Usharani, S. Analytical Chemistry, 1 <sup>st</sup> ed.; Macmillan: India, 2002.
3	Banwell, C.N.; Mc Cash, E. M. Fundamentals of Molecular Spectroscopy, 4 <sup>th</sup> ed.; Tata McGraw Hill, New Delhi, 2017.
4	U.N.Dash, Analytical Chemistry Theory and Practice, Sultan Chand & Sons, 2 <sup>nd</sup> Ed., 2005
5	B.K.Sharma, Spectroscopy, 2 <sup>nd</sup> ed., Goel Publishing House, 2011.
<b>References</b>	
1	Srivastava, A. K.; Jain, P. C. Chemical Analysis an Instrumental Approach, 3 <sup>rd</sup> ed.; S. Chand, New Delhi, 1997.
2	Robert D Braun. Introduction to Instrumental Analysis; Mc.Graw Hill: New York, 1987.
3	Skoog, D. A.; Crouch, S. R.; Holler, F.J.; West, D. M. Fundamentals of Analytical Chemistry, 9 <sup>th</sup> ed.; Harcourt college Publishers: USA, 2013.
4	Madan, R. L.; Tuli, G. D. Physical Chemistry, 2 <sup>nd</sup> ed.; S.Chand: New Delhi, 2005.
5	Puri, B. R.; Sharma, L. R.; Pathania, M.S. Principles of Physical Chemistry, 43 <sup>rd</sup> ed.; Vishal Publishing: Delhi, 2008.
<b>Website and e-learning source</b>	
1	<a href="http://vallance.chem.ox.ac.uk/pdfs/SymmetryLectureNotes2004.pdf">http://vallance.chem.ox.ac.uk/pdfs/SymmetryLectureNotes2004.pdf</a>
2	<a href="http://chemistry.rutgers.edu/undergrad/chem207/SymmetryGroupTheory.html">http://chemistry.rutgers.edu/undergrad/chem207/SymmetryGroupTheory.html</a>
3	<a href="http://www.epgpathshala.nic.in">www.epgpathshala.nic.in</a>

4	<a href="http://www.nptel.ac.in">www.nptel.ac.in</a>
5	<a href="http://swayam.gov.in">http://swayam.gov.in</a>



POs	PROGRAMME OUTCOME
PO 1	Students will possess basic subject knowledge required for higher studies, professional and applied courses
PO 2	Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the science & humanities stream.
PO 3	Students will develop scientific aptitude Integrate skills of analysis, critiquing, application and creativity.
PO 4	Students will employ appropriate digital tools and techniques necessary in analysing data and creative design.
PO 5	Students will gain competence to pursue higher learning, research and careers or will be able to opt for entrepreneurship.
PO 6	Students will interact meaningfully with others displaying leadership and coordination in executing projects.
PO 7	Students will demonstrate responsibility as citizens committed to national development through community outreach, wellness of self and a sustainable environment.

COs	COURSE OUTCOME
CO 1	Explain electrical and magnetic properties of materials and microwave spectroscopy
CO 2	Explain theory, instrumentation and applications of Infrared and Raman spectroscopy
CO 3	Apply selection rules to understand spectral transitions, explain Woodward – Fieser’s rule for the calculation of wavelength maximum of conjugated dienes
CO 4	Explain theory, instrumentation and applications of NMR spectroscopy
CO 5	Explain theory, instrumentation and applications of Mass spectrometry

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

**Signature of BOS Chairman**

	<b>VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)</b> Elayampalayam, Tiruchengode-637 205.									
	Programme	<b>B.Sc</b>	Programme Code	<b>UCH</b>		Regulations	<b>2023-2026</b>			
Department	<b>Chemistry</b>		Semester		<b>6</b>					
Course Code	Course Name			Hours per Week	Credit	Maximum Marks				
				L	T	P	C	CA	ESE	Total
<b>23U6CHDEO6</b>	<b>ELECTIVE COURSE - VI POLYMER SCIENCE</b>			4	0	0	4	25	75	100
Course Objectives	The course aims at providing an overall view of 1. Classification of polymers, preparation of polymers 2. Kinetics of polymerization and characterization of polymers 3. Analytical techniques used to characterize polymers 4. Reactions of polymers 5. Speciality polymers like PVC, PMMA									

Content of the Syllabus				
<b>Unit - I</b>	<b>Introduction</b>		Hours	12
	Difference between polymer and macromolecule – classification – synthetic and natural, organic and inorganic, thermoplastic and thermosetting. Plastics, elastomers, fibres and liquid resins. <b>Techniques of polymerization</b> Bulk, solution, emulsion and suspension polymerization			
<b>Unit - II</b>	<b>Kinetics of polymerization</b>		Hours	12
	Kinetics of condensation and addition polymerisation; ionic, free radical, copolymerisation and coordination polymerisation – reactivity ratios – block and graft copolymers. <b>Characterisation of polymers</b> Appearance, feel and hardness, density, effect of heat, solubility, combustion, tensile strength, shear, stress, impact strength, mechanical, thermomechanical and rheological properties of polymers in viscoelastic state.			
<b>Unit - III</b>	<b>Molecular Weight and Properties of Polymers</b>		Hours	12
	Molecular Weight of Polymers-Number Average and Weight Average, Molecular Weight Distribution, Determination of Molecular Weight polydispersity index – membrane and vapour phase osmometry, light scattering - Zimm plot, ultracentrifuge – sedimentation velocity and sedimentation equilibrium – viscometry – gel permeation chromatography Thermal properties of polymers – Glass Transition Temperature-State of Aggregation and State of Phase Transitions, Factors Influencing Glass Transition Temperature, Importance of Glass Transition Temperature, Heat Distortion Temperature, TGA / DTA, Crystallinity of Polymers: Crystalline Behaviour, Degree of Crystallinity.			
<b>Unit - IV</b>	<b>Reactions of Polymers</b>		Hours	12
	Hydrolysis, Acidolysis, Aminolysis, Addition and Substitution Reactions (One Example Each) Cyclisation, Cross-Linking and Reactions of Specific Functional Groups in the Polymer <b>Polymer technology</b> Processing of polymers – casting, thermoforming, moulding – extrusion, compression, blow moulding – foaming, lamination, reinforcing – processing of fibres – melt, wet and dry spinning.			

		Hours	12
<b>Unit - V</b>	<p><b>Speciality polymers</b>  Polyelectrolytes, conducting polymers, polymeric supports for solid phase synthesis, biomedical polymers, liquid crystalline polymers, electroluminescent polymers – two examples of each of these polymers. Polyethylene, PVC, PMMA, polyester; rubber – synthetic and natural, vulcanisation of rubber.</p> <p><b>Polymer Degradation</b>  Types of Degradation - Thermal, Mechanical, Ultra Sound, Photo Radiation and Chemical Degradation Methods.  Rubber-Natural and Synthetic-Structure, Mechanism of Vulcanisation Biodegradable and Non-Biodegradable Polymers.</p>		
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)		
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.		
<b>Total Hours</b>			60

<b>Text Books</b>	
1	Gowariker V.R, N.V. Viswanthan and Jayadev Sreedhar. Polymer Science. New Delhi: New Age International, 2015
2	Misra G.S. Introductory Polymer Chemistry. New Delhi: Wiley Eastern, 2010.
3	Bahadur P and Sastry N V. Principles of Polymer Science. New Delhi: Narosa Publishing House, 2005
4	Ahluwalia, V.K. Anuradha Mishra, Polymer Science A Text Book, Ane Books India: New Delhi, 2008.
5	Morrison, R. R.; Boyd, R. N.; Bhattacharjee, S. K. Organic Chemistry, 7th ed.; Pearson: New Delhi, 2011.
<b>References</b>	
1	Billmeyer, F.W. Polymer Science. India: Wiley-Interscience, 2007.
2	Seymour, R. B.; Carraher Jr.C.E. Polymer Chemistry: An Introduction, Marcel Dckker Inc : New York, 1981.
3	Sinha, R. Outlines of Polymer Technology, Prentice Hall of India: New Delhi, 2000.
4	Joel R. Fried, Polymer Science and Technology, 3rd ed.; Prentice Hall of India: New Delhi, 2014.
<b>Website and e-learning source</b>	
1	<a href="https://polymerdatabase.com">https://polymerdatabase.com</a>
2	<a href="http://amrita.vlab.co.in/?sub=2&amp;brch=190&amp;sim=603&amp;cnt=1">http://amrita.vlab.co.in/?sub=2&amp;brch=190&amp;sim=603&amp;cnt=1</a>
3	<a href="http://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/polymers.htm">http://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/polymers.htm</a>
4	<a href="http://nsdl.niscair.res.in/bitstream/123456789/406/2/Molecular+weights+of+polymers.pdf">http://nsdl.niscair.res.in/bitstream/123456789/406/2/Molecular+weights+of+polymers.pdf</a>

POs	PROGRAMME OUTCOME
PO 1	Students will possess basic subject knowledge required for higher studies, professional and applied courses
PO 2	Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the science & humanities stream.
PO 3	Students will develop scientific aptitude Integrate skills of analysis, critiquing, application and creativity.
PO 4	Students will employ appropriate digital tools and techniques necessary in analysing data and creative design.
PO 5	Students will gain competence to pursue higher learning, research and careers or will be able to opt for entrepreneurship.
PO 6	Students will interact meaningfully with others displaying leadership and coordination in executing projects.
PO 7	Students will demonstrate responsibility as citizens committed to national development through community outreach, wellness of self and a sustainable environment.



COs	COURSE OUTCOME
CO 1	Explain classification of polymers, elastomers, fibres and liquid resins
CO 2	Explain addition and condensation polymerization, mechanical properties of polymers
CO 3	Determine the molecular weight of polymers, and explain the thermal properties of polymers
CO 4	Explain reactions of polymers and polymer processing
CO 5	Discuss speciality polymers like PVC, PMMA, rubbers, biodegradable polymers

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Signature of BOS Chairman



	<b>VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)</b> Elayampalayam, Tiruchengode-637 205.									
	Programme	<b>B.Sc</b>	Programme Code	<b>UCH</b>	Regulations	<b>2023-2026</b>				
Department	<b>Chemistry</b>			Semester		<b>6</b>				
Course Code	Course Name			Hours per Week		Credit	Maximum Marks			
				L	T	P	C	CA	ESE	Total
<b>23U6CHCP05</b>	<b>CORE PRACTICAL XVII: PHYSICAL CHEMISTRY PRACTICAL-II</b>			0	0	3	2	40	60	100
Course Objectives	This course aims at providing 1. Basic principles of physical chemistry experiments 2. Hands on experience in carrying out the experiments									

Content of the Syllabus			
<b>Unit - I</b>	<b>Phase diagrams</b>	Hours	15
	1. Simple eutectic - determination of eutectic temperature and composition of naphthalene diphenyl amine or naphthalene-diphenyl system 2. Determination of transition temperature of a salt hydrate. 3. Determination of upper critical solution temperature of phenol – water system 4. Effect of an electrolyte on miscibility temperature of phenol – water system 5. Determination of concentration of sodium chloride using phenol sodium chloride system		
<b>Unit - II</b>	<b>Distribution law</b>	Hours	09
	6. Determination of the distribution coefficient of iodine between carbon tetrachloride and water. 7. Determination of equilibrium constant of the reaction $I_2 + I^- \rightarrow I_3^-$ 8. Determination of concentration of the given potassium iodide solution using the above equilibrium constant.		
<b>Unit - III</b>	<b>Electrochemistry</b>	Hours	06
	9. Conductometric titration of hydrochloric acid against sodium hydroxide 10. Potentiometric titration of ferrous ion against potassium dichromate using quinhydrone electrode.		
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)		
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.		
<b>Total Hours</b>			<b>30</b>

<b>References</b>	
1	Sindhu, P.S. Practicals in Physical Chemistry, Macmillan India : New Delhi, 2005.
2	Khosla, B. D. Garg, V. C.; Gulati, A. Senior Practical Physical Chemistry, R. Chand : New Delhi, 2011.
3	Gupta, Renu, Practical Physical Chemistry, 1 <sup>st</sup> Ed.; New Age International : New Delhi, 2017.
<b>Website and e-learning source</b>	
1	<a href="https://www.vlab.co.in/broad-area-chemical-sciences">https://www.vlab.co.in/broad-area-chemical-sciences</a>



<b>POs</b>	<b>PROGRAMME OUTCOME</b>
PO 1	Students will possess basic subject knowledge required for higher studies, professional and applied courses
PO 2	Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the science & humanities stream.
PO 3	Students will develop scientific aptitude Integrate skills of analysis, critiquing, application and creativity.
PO 4	Students will employ appropriate digital tools and techniques necessary in analysing data and creative design.
PO 5	Students will gain competence to pursue higher learning, research and careers or will be able to opt for entrepreneurship.
PO 6	Students will interact meaningfully with others displaying leadership and coordination in executing projects.
PO 7	Students will demonstrate responsibility as citizens committed to national development through community outreach, wellness of self and a sustainable environment.

<b>COs</b>	<b>COURSE OUTCOME</b>
CO 1	Describe the principles and methodology for the practical work.
CO 2	Explain the procedure, data and methodology for the practical work
CO 3	Apply the principles of phase rule and electrochemistry for carrying out the practical work
CO 4	Demonstrate laboratory skills for safe handling of the equipment and chemicals

<b>CO /PSO</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	3	3	3	3	3
<b>CO2</b>	3	3	3	3	3
<b>CO3</b>	3	3	3	3	3
<b>CO4</b>	3	3	3	3	3
<b>Weightage</b>	12	12	12	12	12
<b>Weighted percentage of Course Contribution to PSOs</b>	3.0	3.0	3.0	3.0	3.0

<b>CO /PO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>
<b>CO1</b>	3	3	3	3	3
<b>CO2</b>	3	3	3	3	3
<b>CO3</b>	3	3	3	3	3
<b>CO4</b>	3	3	3	3	3
<b>Weightage</b>	12	12	12	12	12
<b>Weighted percentage of Course Contribution to POs</b>	3.0	3.0	3.0	3.0	3.0

**Signature of BOS Chairman**

	<b>VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN</b> <b>(AUTONOMOUS)</b> Elayampalayam, Tiruchengode-637 205.							
	Programme	<b>B.Sc</b>	Programme Code	<b>UCH</b>		Regulations	<b>2023-2026</b>	
Department	<b>Chemistry</b>		Semester		<b>3</b>			
Course Code	Course Name	Hours per Week		Credit	Maximum Marks			
		L	T	P	C	CA	ESE	Total
<b>23U3CHGE01</b>	<b>Chemistry for Biological Sciences I (Botany &amp; Zoology)</b>	4	0	0	3	25	75	100
<b>COURSE OBJECTIVES</b>	This course aims at providing knowledge on <ol style="list-style-type: none"> <li>1 basics of atomic orbitals, chemical bonds, hybridization and fundamentals of organic chemistry</li> <li>2 nuclear chemistry and industrial chemistry</li> <li>3 importance of specialty drugs and separation and purification techniques.</li> </ol>							

<b>Unit - I</b>	<b>Chemical Bonding and Nuclear Chemistry</b>	Hours	12
	<p>Chemical Bonding: Molecular Orbital Theory-bonding, antibonding and non-bonding orbitals. M.O diagrams for Hydrogen, Helium, Nitrogen; discussion of bond order and magnetic properties.</p> <p>Nuclear Chemistry: Fundamental particles - Isotopes, Isobars, Isotones and Isomers-Differences between chemical reactions and nuclear reactions- group displacement law. Nuclear binding energy - mass defect - calculations. Nuclear fission and nuclear fusion - differences – Stellar energy. Applications of radioisotopes – carbon dating, rock dating and medicinal applications.</p>		
<b>Unit - II</b>	<b>Industrial Chemistry</b>	Hours	12
	<p>Fuels: Fuel gases: Natural gas, water gas, semi water gas, carbureted water gas, producer gas, CNG, LPG and oil gas (manufacturing details not required).</p> <p>Silicones: Synthesis, properties and uses of silicones.</p> <p>Fertilizers: Urea, ammonium sulphate, potassium nitrate NPK fertilizer, superphosphate, triple superphosphate.</p>		
<b>Unit - III</b>	<b>Fundamental Concepts in Organic Chemistry</b>	Hours	12
	<p>Hybridization: Orbital overlap hybridization and geometry of CH<sub>4</sub>, C<sub>2</sub>H<sub>4</sub>, C<sub>2</sub>H<sub>2</sub> and C<sub>6</sub>H<sub>6</sub>. Polar effects: Inductive effect and consequences on K<sub>a</sub> and K<sub>b</sub> of organic acids and bases, electromeric, mesomeric, hyper conjugation and steric-examples and explanation Reaction mechanisms: Types of reactions- aromaticity-aromatic electrophilic substitution; nitration, halogenation, Friedel-Craft's alkylation and acylation.</p> <p>Heterocyclic compounds: Preparation, properties of pyrrole and pyridine.</p>		

<b>Unit - IV</b>	<b>Drugs and Speciality Chemicals</b>	Hours	12
	Definition, structure and uses: Antibiotics viz., Penicillin, Chloramphenicol and Streptomycin; Anaesthetics viz., Chloroform, and ether; Antipyretics viz., aspirin, paracetamol and ibuprofen; Artificial Sweeteners viz., saccharin, Aspartame and cyclamate; Organic Halogen compounds viz., Freon, Teflon.		
<b>Unit - V</b>	<b>Analytical Chemistry</b>	Hours	12
	Introduction qualitative and quantitative analysis. Principles of volumetric analysis. Separation and purification techniques: extraction, distillation and crystallization. Chromatography: principle and application of column, paper and thin layer chromatography.		
<b>Total Hours</b>			<b>60</b>

<b>Text Books</b>	
1	V.Veeraiyan, Textbook of Ancillary Chemistry; High mount publishing house, Chennai, first edition, 2009.
2	S.Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur, 2006.
3	Arun Bahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand and Company, New Delhi, twenty third edition, 2012.
4	P.L.Soni, H.M.Chawla, Text Book of Inorganic Chemistry; Sultan Chand & sons, New Delhi, twenty ninth edition, 2007.
<b>References</b>	
1	P.L.Soni, Mohan Katyal, Text book of Inorganic chemistry; Sultan Chand and Company, New Delhi, twentieth edition, 2007.
2	B.K,Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014.
3	Jayashree gosh, Fundamental Concepts of Applied Chemistry; Sultan & Chand, Edition 2006.
<b>E-References</b>	

<b>POs</b>	<b>PROGRAMME OUTCOME</b>
PO 1	Students will possess basic subject knowledge required for higher studies, professional and applied courses
PO 2	Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the science & humanities stream.
PO 3	Students will develop scientific aptitude Integrate skills of analysis, critiquing, application and creativity.
PO 4	Students will employ appropriate digital tools and techniques necessary in analysing data and creative design.
PO 5	Students will gain competence to pursue higher learning, research and careers or will be able to opt for entrepreneurship.
PO 6	Students will interact meaningfully with others displaying leadership and coordination in executing projects.
PO 7	Students will demonstrate responsibility as citizens committed to national development through community outreach, wellness of self and a sustainable environment.

COs	COURSE OUTCOME
CO 1	State the theories of chemical bonding, nuclear reactions and its
CO 2	Evaluate the efficiencies and uses of various fuels and fertilizers.
CO 3	Explain the type of hybridization, electronic effect and mechanism involved in the organic reactions.
CO 4	Demonstrate the structure and uses of antibiotics, anaesthetics, antipyretics and artificial sugars.
CO 5	Analyse various methods to identify an appropriate method for the separation of chemical components.
Pre-requisites	Higher secondary chemistry

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

CO / PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
<b>Weightage</b>	15	15	15	15	15
<b>Weighted percentage of Course Contribution to Pos</b>	3.0	3.0	3.0	3.0	3.0

Signature of BOS Chairman



**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN  
(AUTONOMOUS)**

Elayampalayam, Tiruchengode-637 205.



Programme	<b>B.Sc</b>	Programme Code	<b>UCH</b>			Regulations	<b>2023-2026</b>			
Department	<b>Chemistry</b>			Semester			<b>3</b>			
Course Code	Course Name			Hours per Week			Credit	Maximum Marks		
				L	T	P	C	CA	ESE	Total
<b>23U3CHGE03</b>	<b>Chemistry for Physical Sciences I (Physics)</b>			4	0	0	3	25	75	100
<b>COURSE OBJECTIVES</b>	<p>This course aims at providing knowledge on</p> <ol style="list-style-type: none"> <li>1. basics of atomic orbitals, chemical bonds, hybridization</li> <li>2. concepts of thermodynamics and its applications.</li> <li>3. concepts of nuclear chemistry</li> <li>4. importance of chemical industries</li> <li>5. Qualitative and analytical methods.</li> </ol>									

**Content of the Syllabus**

<b>Unit - I</b>	<b>Chemical Bonding and Nuclear Chemistry</b>	Hours	12
	<p>Chemical Bonding: Molecular Orbital Theory-bonding, antibonding and non-bonding orbitals. M.O diagrams for Hydrogen, Helium, Nitrogen; discussion of bond order and magnetic properties.</p> <p>Nuclear Chemistry: Fundamental particles - Isotopes, Isobars, Isotones and Isomers- Differences between chemical reactions and nuclear reactions- group displacement law. Nuclear binding energy - mass defect - calculations. Nuclear fission and nuclear fusion - differences – Stellar energy. Applications of radioisotopes – carbon dating, rock dating and medicinal applications.</p>		
<b>Unit - II</b>	<b>Industrial Chemistry</b>	Hours	12
	<p>Fuels: Fuel gases: Natural gas, water gas, semi water gas, carbureted water gas, producer gas, CNG, LPG and oil gas (manufacturing details not required).</p> <p>Silicones: Synthesis, properties and uses of silicones.</p> <p>Fertilizers: Urea, ammonium sulphate, potassium nitrate NPK fertilizer, superphosphate, triple superphosphate.</p>		
<b>Unit - III</b>	<b>Fundamental Concepts in Organic Chemistry</b>	Hours	12
	<p>Hybridization: Orbital overlap hybridization and geometry of CH<sub>4</sub>, C<sub>2</sub>H<sub>4</sub>, C<sub>2</sub>H<sub>2</sub> and C<sub>6</sub>H<sub>6</sub>.</p> <p>Polar effects: Inductive effect and consequences on K<sub>a</sub> and K<sub>b</sub> of organic acids and bases, electromeric, mesomeric, hyper conjugation and steric-examples and explanation</p> <p>Reaction mechanisms: Types of reactions- aromaticity-aromatic electrophilic substitution; nitration, halogenation, Friedel-Craft's alkylation and acylation.</p> <p>Heterocyclic compounds: Preparation, properties of pyrrole and pyridine.</p>		
<b>Unit - IV</b>	<b>Thermodynamics and Phase Equilibria</b>	Hours	12
	<p>Thermodynamics: Types of systems, reversible and irreversible processes, isothermal and adiabatic processes and spontaneous processes. Statements of first law and</p>		

	<p>second law of thermodynamics. Carnot's cycle and efficiency of heat engine. Entropy and its significance. Free energy change and its importance (no derivation). Conditions for spontaneity in terms of entropy and Gibbs free energy. Relationship between Gibbs free energy and entropy.</p> <p>Phase Equilibria: Phase rule - definition of terms in it. Applications of phase rule to water system. Two component system - Reduced phase rule and its application to a simple eutectic system (Pb-Ag).</p>		
<b>Unit - V</b>	<b>Analytical Chemistry</b>	Hours	12
	<p>Introduction qualitative and quantitative analysis. Principles of volumetric analysis. Separation and purification techniques: extraction, distillation and crystallization. Chromatography: principle and application of column, paper and thin layer chromatography.</p>		
<b>Total Hours</b>			<b>60</b>

<b>Text Books</b>	
1	V.Veeraiyan, Textbook of Ancillary Chemistry; High mountpublishing house, Chennai, first edition,2009.
2	S.Vaithyanathan, Text book of Ancillary Chemistry; PriyaPublications, Karur,2006.
3	ArunBahl, B.S.Bahl, Advanced Organic Chemistry; S.Chandand Company, New Delhi, twenty third edition,2012.
4	P.L.Soni, H.M.Chawla, Text Book of Inorganic Chemistry;Sultan Chand & sons, New Delhi, twenty ninth edition, 2007.
<b>References</b>	
1	P.L.Soni, Mohan Katyal, Text book of Inorganic chemistry; Sultan Chand and Company, New Delhi, twentieth edition, 2007.
2	B.K,Sharma, Industrial Chemistry; GOEL publishing house,Meerut, sixteenth edition, 2014.
3	Jayashree gosh, Fundamental Concepts of Applied Chemistry; Sultan & Chand, Edition 2006.
<b>E-References</b>	

<b>POs</b>	<b>PROGRAMME OUTCOME</b>
PO 1	Students will possess basic subject knowledge required for higher studies, professional and applied courses
PO 2	Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the science & humanities stream.
PO 3	Students will develop scientific aptitude Integrate skills of analysis, critiquing, application and creativity.
PO 4	Students will employ appropriate digital tools and techniques necessary in analysing data and creative design.
PO 5	Students will gain competence to pursue higher learning, research and careers or will be able to opt for entrepreneurship.
PO 6	Students will interact meaningfully with others displaying leadership and coordination in executing projects.
PO 7	Students will demonstrate responsibility as citizens committed to national development through community outreach, wellness of self and a sustainable environment.





COs	COURSE OUTCOME
CO 1	state the theories of chemical bonding, nuclear reactions and its
CO 2	evaluate the efficiencies and uses of various fuels and fertilizers.
CO 3	explain the type of hybridization, electronic effect and mechanism involved in theorganic reactions.
CO 4	demonstrate the structure and uses of antibiotics, anaesthetics, antipyretics andartificial sugars.
CO 5	analyse various methods to identify an appropriate method for the separation of chemical components.
Pre-requisites	Higher secondary chemistry

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Signature of BOS Chairman

	<b>VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN</b> <b>(AUTONOMOUS)</b> Elayampalayam, Tiruchengode-637 205.							
	Programme	<b>B.Sc</b>	Programme Code	<b>UCH</b>		Regulations	<b>2023-2026</b>	
Department	<b>Chemistry</b>		Semester		<b>1</b>			
Course Code	Course Name	Hours per Week		Credit	Maximum Marks			
		L	T	P	C	CA	ESE	Total
<b>23U1CHGE01/ 24U1CHGE01</b>	<b>Chemistry for Biological Sciences I (Biochemistry &amp; Nutrition and Dietetics )</b>	4	0	0	3	25	75	100
<b>COURSE OBJECTIVES</b>	This course aims at providing knowledge on <ol style="list-style-type: none"> <li>1 basics of atomic orbitals, chemical bonds, hybridization and fundamentals of organic chemistry</li> <li>2 nuclear chemistry and industrial chemistry</li> <li>3 importance of specialty drugs and separation and purification techniques.</li> </ol>							

<b>Unit - I</b>	<b>Chemical Bonding and Nuclear Chemistry</b>	Hours	12
	<p>Chemical Bonding: Molecular Orbital Theory-bonding, antibonding and non-bonding orbitals. M.O diagrams for Hydrogen, Helium, Nitrogen; discussion of bond order and magnetic properties.</p> <p>Nuclear Chemistry: Fundamental particles - Isotopes, Isobars, Isotones and Isomers-Differences between chemical reactions and nuclear reactions- group displacement law. Nuclear binding energy - mass defect - calculations. Nuclear fission and nuclear fusion - differences – Stellar energy. Applications of radioisotopes – carbon dating, rock dating and medicinal applications.</p>		
<b>Unit - II</b>	<b>Industrial Chemistry</b>	Hours	12
	<p>Fuels: Fuel gases: Natural gas, water gas, semi water gas, carbureted water gas, producer gas, CNG, LPG and oil gas (manufacturing details not required).</p> <p>Silicones: Synthesis, properties and uses of silicones.</p> <p>Fertilizers: Urea, ammonium sulphate, potassium nitrate NPK fertilizer, superphosphate, triple superphosphate.</p>		
<b>Unit - III</b>	<b>Fundamental Concepts in Organic Chemistry</b>	Hours	12
	<p>Hybridization: Orbital overlap hybridization and geometry of CH<sub>4</sub>, C<sub>2</sub>H<sub>4</sub>, C<sub>2</sub>H<sub>2</sub> and C<sub>6</sub>H<sub>6</sub>. Polar effects: Inductive effect and consequences on K<sub>a</sub> and K<sub>b</sub> of organic acids and bases, electromeric, mesomeric, hyper conjugation and steric-examples and explanation Reaction mechanisms: Types of reactions- aromaticity-aromatic electrophilic substitution; nitration, halogenation, Friedel-Craft's alkylation and acylation.</p> <p>Heterocyclic compounds: Preparation, properties of pyrrole and pyridine.</p>		

<b>Unit - IV</b>	<b>Drugs and Speciality Chemicals</b>	Hours	12
	Definition, structure and uses: Antibiotics viz., Penicillin, Chloramphenicol and Streptomycin; Anaesthetics viz., Chloroform, and ether; Antipyretics viz., aspirin, paracetamol and ibuprofen; Artificial Sweeteners viz., saccharin, Aspartame and cyclamate; Organic Halogen compounds viz., Freon, Teflon.		
<b>Unit - V</b>	<b>Analytical Chemistry</b>	Hours	12
	Introduction qualitative and quantitative analysis. Principles of volumetric analysis. Separation and purification techniques: extraction, distillation and crystallization. Chromatography: principle and application of column, paper and thin layer chromatography.		
<b>Total Hours</b>			<b>60</b>

<b>Text Books</b>	
1	V.Veeraiyan, Textbook of Ancillary Chemistry; High mount publishing house, Chennai, first edition, 2009.
2	S.Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur, 2006.
3	Arun Bahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand and Company, New Delhi, twenty third edition, 2012.
4	P.L.Soni, H.M.Chawla, Text Book of Inorganic Chemistry; Sultan Chand & sons, New Delhi, twenty ninth edition, 2007.
<b>References</b>	
1	P.L.Soni, Mohan Katyal, Text book of Inorganic chemistry; Sultan Chand and Company, New Delhi, twentieth edition, 2007.
2	B.K,Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014.
3	Jayashree gosh, Fundamental Concepts of Applied Chemistry; Sultan & Chand, Edition 2006.
<b>E-References</b>	



<b>POs</b>	<b>PROGRAMME OUTCOME</b>
PO 1	Students will possess basic subject knowledge required for higher studies, professional and applied courses
PO 2	Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the science & humanities stream.
PO 3	Students will develop scientific aptitude Integrate skills of analysis, critiquing, application and creativity.
PO 4	Students will employ appropriate digital tools and techniques necessary in analysing data and creative design.
PO 5	Students will gain competence to pursue higher learning, research and careers or will be able to opt for entrepreneurship.
PO 6	Students will interact meaningfully with others displaying leadership and coordination in executing projects.
PO 7	Students will demonstrate responsibility as citizens committed to national development through community outreach, wellness of self and a sustainable environment.

COs	COURSE OUTCOME
CO 1	State the theories of chemical bonding, nuclear reactions and its
CO 2	Evaluate the efficiencies and uses of various fuels and fertilizers.
CO 3	Explain the type of hybridization, electronic effect and mechanism involved in the organic reactions.
CO 4	Demonstrate the structure and uses of antibiotics, anaesthetics, antipyretics and artificial sugars.
CO 5	Analyse various methods to identify an appropriate method for the separation of chemical components.
Pre-requisites	Higher secondary chemistry

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

CO / PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
<b>Weightage</b>	15	15	15	15	15
<b>Weighted percentage of Course Contribution to Pos</b>	3.0	3.0	3.0	3.0	3.0

Signature of BOS Chairman

		<b>VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN</b> <b>(AUTONOMOUS)</b> Elayampalayam, Tiruchengode-637 205.							
Programme	<b>B.Sc.</b>	Programme Code	<b>UCH</b>		Regulations	<b>2023-2026</b>			
Department	<b>Chemistry</b>		Semester			<b>1/III</b>			
Course Code	Course Name	Hours per Week		Credit	Maximum Marks				
		L	T	P	C	CA	ESE	Total	
<b>23U1CHGEP1</b> \ <b>23U3CHGEP1</b>	<b>Chemistry Practical for Physical and Biological Sciences - I</b>		0	0	3	2	25	75	100
<b>COURSE OBJECTIVES</b>	This course aims to provide knowledge on the <ul style="list-style-type: none"> <li>basics of preparation of solutions.</li> <li>principles and practical experience of volumetric analysis</li> </ul>								

<b>Content of the Syllabus</b>			
	<b>VOLUMETRIC ANALYSIS</b>	Hours	21
	1. Estimation of sodium hydroxide using standard sodium carbonate. 2. Estimation of hydrochloric acid using standard oxalic acid. 3. Estimation of ferrous sulphate using standard Mohr's salt. 4. Estimation of oxalic acid using standard ferrous sulphate. 5. Estimation of potassium permanganate using standard sodium hydroxide. 6. Estimation of magnesium using EDTA. 7. Estimation of ferrous ion using diphenyl amine as indicator.		
	<b>Total Hours</b>		<b>21</b>

<b>Text Books</b>	
1	V.Venkateswaran, R.Veerasingam, A.R.Kulandaivelu, Basic Principles of Practical Chemistry; Sultan Chand & sons, Second edition, 1997.

<b>POs</b>	<b>PROGRAMME OUTCOME</b>
PO 1	Students will possess basic subject knowledge required for higher studies, professional and applied courses
PO 2	Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the science & humanities stream.
PO 3	Students will develop scientific aptitude Integrate skills of analysis, critiquing, application and creativity.
PO 4	Students will employ appropriate digital tools and techniques necessary in analysing data and creative design.
PO 5	Students will gain competence to pursue higher learning, research and careers or will be able to opt for entrepreneurship.
PO 6	Students will interact meaningfully with others displaying leadership and coordination in executing projects.

PO 7	Students will demonstrate responsibility as citizens committed to national development through community outreach, wellness of self and a sustainable environment.
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COs	COURSE OUTCOME
CO 1	gain an understanding of the use of standard flask and volumetric pipettes, burette.CO 2: design, carry out, record and interpret the results of volumetric titration.
CO 2	apply their skill in the analysis of water/hardness.
CO 3	analyze the chemical constituents in allied chemical products
CO4	gain an understanding of the use of standard flask and volumetric pipettes, burette.CO 2: design, carry out, record and interpret the results of volumetric titration.
Pre-requisites	

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Signature of BOS Chairman



**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN  
(AUTONOMOUS)**

Elayampalayam, Tiruchengode-637 205.



Programme	<b>B.Sc</b>	Programme Code	<b>UCH</b>			Regulations	<b>2023-2026</b>			
Department	<b>Chemistry</b>			Semester			<b>2</b>			
Course Code	Course Name			Hours per Week			Credit	Maximum Marks		
				L	T	P	C	CA	ESE	Total
<b>23U4CHGE02</b>	<b>Chemistry for Biological Sciences II (Botany &amp; Zoology)</b>			4	0	0	3	25	75	100
<b>COURSE OBJECTIVES</b>	<p>This course aims at providing knowledge on</p> <ol style="list-style-type: none"> <li>1. nomenclature of coordination compounds and carbohydrates.</li> <li>2. Amino Acids and Essential elements of biosystem</li> <li>3. understand the concepts of kinetics and catalysis</li> <li>4. provide fundamentals of electrochemistry and photochemistry</li> </ol>									

**Content of the Syllabus**

<b>Unit - I</b>	<b>Co-ordination Chemistry and Water Technology</b>	Hours	12
	<p>Co-ordination Chemistry: Definition of terms - IUPAC Nomenclature- Werner's theory - EAN rule - Pauling's theory – Postulates - Applications to <math>[\text{Ni}(\text{CO})_4]</math>, <math>[\text{Ni}(\text{CN})_4]^{2-}</math>, <math>[\text{Co}(\text{CN})_6]^{3-}</math> Chelation - Biological role of Hemoglobin and Chlorophyll (elementary idea) - Applications in qualitative and quantitative analysis.</p> <p>Water Technology: Hardness of water, determination of hardness of water using EDTA method, zeolite method-Purification techniques – BOD and COD.</p>		
<b>Unit - II</b>	<b>Carbohydrates</b>	Hours	12
	<p>Classification, preparation and properties of glucose and fructose. Discussion of open chain ring structures of glucose and fructose. Glucose-fructose interconversion. Preparation and properties of sucrose, starch and cellulose.</p>		
<b>Unit - III</b>	<b>Amino Acids and Essential elements of bio system</b>	Hours	12
	<p>Classification - preparation and properties of alanine, preparation of dipeptides using Bergmann method - Proteins- classification – structure - Colour reactions – Biological functions – nucleosides -nucleotides – RNA and DNA – structure. Essentials of trace metals in biological system-Na, Cu, K, Zn, Fe, Mg.</p>		
<b>Unit - IV</b>	<b>Electrochemistry</b>	Hours	12
	<p>Galvanic cells - Standard hydrogen electrode - calomel electrode - standard electrode potentials -electrochemical series. Strong and weak electrolytes - ionic product of water -pH, pKa, pKb. Conductometric titrations - pH determination by colorimetric method – buffer solutions and its biological applications - electroplating - Nickel and chrome plating – Types of cells -fuel cells-corrosion and its prevention.</p>		
	<b>Photochemistry</b>	Hours	12

<b>Unit - V</b>	Grothus - Drapper's law and Stark-Einstein's law of photochemical equivalence, Quantum yield - Hydrogen -chloride reaction. Phosphorescence, fluorescence, chemiluminescence and photosensitization and photosynthesis (definition with examples).
<b>Total Hours</b>	
<b>60</b>	

<b>Text Books</b>	
1	V.Veeraiyan, Textbook of Ancillary Chemistry; High mountpublishing house, Chennai, first edition,2009.
2	S.Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur,2006.
3	ArunBahl, B.S.Bahl, Advanced Organic Chemistry; S.Chandand Company, New Delhi, twenty third edition,2012.
4	P.L.Soni, H.M.Chawla, Text Book of Inorganic Chemistry;Sultan Chand & sons, New Delhi, twenty ninth edition, 2007.
<b>References</b>	
1	Arun Bahl, B.S.Bahl, Advanced Organic Chemistry; S.Chandand Company, New Delhi, twenty third edition, 2012.
2	P.L.Soni, H.M.Chawla, Text Book of Organic Chemistry; Sultan Chand & sons, New Delhi, twenty ninth edition, 2007.
3	P.L.Soni, Mohan Katyal, Text book of Inorganic chemistry; Sultan Chand and Company, New Delhi, twentieth edition,2007.
4	B.R.Puri, L.R.Sharma, M.S.Pathania, Text book Physical Chemistry; Vishal Publishing Co., New Delhi, forty seventhedition, 2018.
5	B.K,Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014.
<b>E-References</b>	

<b>POs</b>	<b>PROGRAMME OUTCOME</b>
PO 1	Students will possess basic subject knowledge required for higher studies, professional and applied courses
PO 2	Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the science & humanities stream.
PO 3	Students will develop scientific aptitude Integrate skills of analysis, critiquing, application and creativity.
PO 4	Students will employ appropriate digital tools and techniques necessary in analysing data and creative design.
PO 5	Students will gain competence to pursue higher learning, research and careers or will be able to opt for entrepreneurship.
PO 6	Students will interact meaningfully with others displaying leadership and coordination in executing projects.
PO 7	Students will demonstrate responsibility as citizens committed to national development through community outreach, wellness of self and a sustainable environment.

<b>COs</b>	<b>COURSE OUTCOME</b>



CO 1	Write the IUPAC name for complex, different theories to explain the bonding in coordination compounds and water technology.
CO 2	Explain the preparation and property of carbohydrate.
CO 3	Enlighten the biological role of transition metals, amino acids and nucleic acids.
CO 4	Apply/demonstrate the electrochemistry principles in corrosion, electroplating and fuel cells.
CO 5	Outline the various type of photochemical process.
Pre-requisites	<b>Chemistry for Biological Sciences I</b>

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
<b>CO1</b>	S	S	S	S	S	S	S	M	S	M
<b>CO2</b>	M	S	S	S	M	S	S	M	M	M
<b>CO3</b>	S	S	S	M	S	S	S	M	S	M
<b>CO4</b>	S	S	S	S	S	S	S	M	M	M
<b>CO5</b>	S	M	S	S	S	S	S	M	M	S

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
<b>CO1</b>	3	3	3	3	3
<b>CO2</b>	3	3	3	3	3
<b>CO3</b>	3	3	3	3	3
<b>CO4</b>	3	3	3	3	3
<b>CO5</b>	3	3	3	3	3
<b>Weightage</b>	15	15	15	15	15
<b>Weighted percentage of Course Contribution to Pos</b>	3.0	3.0	3.0	3.0	3.0

**Signature of BOS Chairman**



**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN  
(AUTONOMOUS)**

Elayampalayam, Tiruchengode-637 205.



Programme	<b>B.Sc</b>	Programme Code	<b>UCH</b>			Regulations	<b>2023-2026</b>			
Department	<b>Chemistry</b>			Semester			<b>4</b>			
Course Code	Course Name	Hours per Week			Credit	Maximum Marks				
		L	T	P	C	CA	ESE	Total		
<b>23U4CHGE04</b>	<b>Chemistry for Physical Sciences II (Physics)</b>			4	0	0	3	25	75	100
<b>COURSE OBJECTIVES</b>	<p>This course aims at providing knowledge on</p> <ol style="list-style-type: none"> <li>1. Co-ordination Chemistry and Water Technology</li> <li>2. Carbohydrates and Amino acids</li> <li>3. basics and applications of electrochemistry</li> <li>4. basics and applications of kinetics and catalysis</li> <li>5. Various photochemical phenomenon</li> </ol>									

**Content of the Syllabus**

<b>Unit - I</b>	<b>Co-ordination Chemistry and Water Technology</b>	Hours	12
	<p>Co-ordination Chemistry: Definition of terms-IUPAC Nomenclature - Werner's theory - EAN rule - Pauling's theory – Postulates - Applications to <math>[\text{Ni}(\text{CO})_4]</math>, <math>[\text{Ni}(\text{CN})_4]^{2-}</math>, <math>[\text{Co}(\text{CN})_6]^{3-}</math> Chelation - Biological role of Haemoglobin and Chlorophyll (elementary idea) – Applications in qualitative and quantitative analysis.</p> <p>Water Technology: Hardness of water, determination of hardness of water using EDTA method, zeolite method-Purification techniques- BOD, COD.</p>		
<b>Unit - II</b>	<b>Carbohydrates and Amino acids</b>	Hours	12
	<p>Carbohydrates: Classification, preparation and properties of glucose, fructose and sucrose. Discussion of open chain ring structures of glucose and fructose. Glucose –fructose interconversion. Properties of starch and cellulose.</p> <p>Amino acids: Classification - preparation and properties of alanine, preparation of dipeptides using Bergmann method. RNA and DNA (elementary idea only).</p>		
<b>Unit - III</b>	<b>Electrochemistry</b>	Hours	12
	<p>Galvanic cells - Standard hydrogen electrode - calomel electrode - standard electrode potentials - electrochemical series. Strong and weak electrolytes - ionic product of water -pH, pKa, pKb. Conductometric titrations - pH determination by colorimetric method – buffer solutions and its biological applications - electroplating - Nickel and chrome plating – Types of cells -fuel cells- corrosion and its prevention.</p>		
<b>Unit - IV</b>	<b>Kinetics and Catalysis</b>	Hours	12
	<p>Order and molecularity. Integrated rate expression for I and II (2A → Products) order reactions. Pseudo first order reaction, methods of determining order of a reaction – Half-life period – Catalysis - homogeneous and heterogeneous, catalyst used in Contact and Haber's processes. Concept of energy of activation and Arrhenius equation.</p>		

<b>Unit - V</b>	<b>Photochemistry</b>	Hours	12
	Grothus - Drapper's law and Stark-Einstein's law of photochemical equivalence, Quantum yield - Hydrogen -chloride reaction. Phosphorescence, fluorescence, chemiluminescence and photosensitization and photosynthesis (definition with examples).		
<b>Total Hours</b>			<b>60</b>

<b>Text Books</b>	
1	V.Veeraiyan, Textbook of Ancillary Chemistry; High mountpublishing house, Chennai, first edition,2009.
2	S.Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur,2006.
3	ArunBahl, B.S.Bahl, Advanced Organic Chemistry; S.Chandand Company, New Delhi, twenty third edition,2012.
4	P.L.Soni, H.M.Chawla, Text Book of Inorganic Chemistry;Sultan Chand & sons, New Delhi, twenty ninth edition, 2007.
<b>References</b>	
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3	P.L.Soni, Mohan Katyal, Text book of Inorganic chemistry; Sultan Chand and Company, New Delhi, twentieth edition,2007.
4	B.R.Puri, L.R.Sharma, M.S.Pathania, Text book Physical Chemistry; Vishal Publishing Co., New Delhi, forty seventhedition, 2018.
5	B.K,Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014.
<b>E-References</b>	

<b>POs</b>	<b>PROGRAMME OUTCOME</b>
PO 1	Students will possess basic subject knowledge required for higher studies, professional and applied courses
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PO 6	Students will interact meaningfully with others displaying leadership and coordination in executing projects.
PO 7	Students will demonstrate responsibility as citizens committed to national development through community outreach, wellness of self and a sustainable environment.

COs	COURSE OUTCOME
CO 1	Write the IUPAC name for complex, different theories to explain the bonding in coordination compounds and water technology.
CO 2	Explain the preparation and property of carbohydrate.
CO 3	Enlighten the biological role of transition metals, amino acids and nucleic acids.
CO 4	Apply/demonstrate the electrochemistry principles in corrosion, electroplating and fuel cells.
CO 5	Outline the various type of photochemical process.
Pre-requisites	<b>Chemistry for Physical Sciences I</b>

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
<b>CO1</b>	S	S	S	S	S	S	S	M	S	M
<b>CO2</b>	M	S	S	S	M	S	S	M	M	M
<b>CO3</b>	S	S	S	M	S	S	S	M	S	M
<b>CO4</b>	S	S	S	S	S	S	S	M	M	M
<b>CO5</b>	S	M	S	S	S	S	S	M	M	S

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
<b>CO1</b>	3	3	3	3	3
<b>CO2</b>	3	3	3	3	3
<b>CO3</b>	3	3	3	3	3
<b>CO4</b>	3	3	3	3	3
<b>CO5</b>	3	3	3	3	3
<b>Weightage</b>	15	15	15	15	15
<b>Weighted percentage of Course Contribution to Pos</b>	3.0	3.0	3.0	3.0	3.0

Signature of BOS Chairman



**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN  
(AUTONOMOUS)**

Elayampalayam, Tiruchengode-637 205.



Programme	<b>B.Sc</b>	Programme Code	<b>UCH</b>			Regulations	<b>2023-2026</b>			
Department	<b>Chemistry</b>			Semester			<b>2</b>			
Course Code	Course Name	Hours per Week			Credit	Maximum Marks				
		L	T	P	C	CA	ESE	Total		
<b>23U2CHGE02/ 24U2CHGE02</b>	<b>Chemistry for Biological Sciences II (Biochemistry &amp; Nutrition and Dietetics )</b>			4	0	0	3	25	75	100
<b>COURSE OBJECTIVES</b>	<p>This course aims at providing knowledge on</p> <ol style="list-style-type: none"> <li>1. nomenclature of coordination compounds and carbohydrates.</li> <li>2. Amino Acids and Essential elements of biosystem</li> <li>3. understand the concepts of kinetics and catalysis</li> <li>4. provide fundamentals of electrochemistry and photochemistry</li> </ol>									

**Content of the Syllabus**

<b>Unit - I</b>	<b>Co-ordination Chemistry and Water Technology</b>	Hours	12
	<p>Co-ordination Chemistry: Definition of terms - IUPAC Nomenclature - Werner's theory - EAN rule - Pauling's theory – Postulates - Applications to <math>[\text{Ni}(\text{CO})_4]</math>, <math>[\text{Ni}(\text{CN})_4]^{2-}</math>, <math>[\text{Co}(\text{CN})_6]^{3-}</math> Chelation - Biological role of Hemoglobin and Chlorophyll (elementary idea) - Applications in qualitative and quantitative analysis.</p> <p>Water Technology: Hardness of water, determination of hardness of water using EDTA method, zeolite method-Purification techniques – BOD and COD.</p>		
<b>Unit - II</b>	<b>Carbohydrates</b>	Hours	12
	<p>Classification, preparation and properties of glucose and fructose. Discussion of open chain ring structures of glucose and fructose. Glucose-fructose interconversion. Preparation and properties of sucrose, starch and cellulose.</p>		
<b>Unit - III</b>	<b>Amino Acids and Essential elements of bio system</b>	Hours	12
	<p>Classification - preparation and properties of alanine, preparation of dipeptides using Bergmann method - Proteins- classification – structure - Colour reactions – Biological functions – nucleosides -nucleotides – RNA and DNA – structure. Essentials of trace metals in biological system-Na, Cu, K, Zn, Fe, Mg.</p>		
<b>Unit - IV</b>	<b>Electrochemistry</b>	Hours	12
	<p>Galvanic cells - Standard hydrogen electrode - calomel electrode - standard electrode potentials -electrochemical series. Strong and weak electrolytes - ionic product of water -pH, pKa, pKb. Conductometric titrations - pH determination by colorimetric method – buffer solutions and its biological applications - electroplating - Nickel and chrome plating – Types of cells -fuel cells-corrosion and its prevention.</p>		

<b>Unit - V</b>	<b>Photochemistry</b>	Hours	12
	Grothus - Drapper's law and Stark-Einstein's law of photochemical equivalence, Quantum yield - Hydrogen -chloride reaction. Phosphorescence, fluorescence, chemiluminescence and photosensitization and photosynthesis (definition with examples).		
<b>Total Hours</b>			<b>60</b>

<b>Text Books</b>	
1	V.Veeraiyan, Textbook of Ancillary Chemistry; High mountpublishing house, Chennai, first edition,2009.
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3	ArunBahl, B.S.Bahl, Advanced Organic Chemistry; S.Chandand Company, New Delhi, twenty third edition,2012.
4	P.L.Soni, H.M.Chawla, Text Book of Inorganic Chemistry;Sultan Chand & sons, New Delhi, twenty ninth edition, 2007.
<b>References</b>	
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2	P.L.Soni, H.M.Chawla, Text Book of Organic Chemistry; Sultan Chand & sons, New Delhi, twenty ninth edition, 2007.
3	P.L.Soni, Mohan Katyal, Text book of Inorganic chemistry; Sultan Chand and Company, New Delhi, twentieth edition,2007.
4	B.R.Puri, L.R.Sharma, M.S.Pathania, Text book Physical Chemistry; Vishal Publishing Co., New Delhi, forty seventhedition, 2018.
5	B.K,Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014.
<b>E-References</b>	



<b>POs</b>	<b>PROGRAMME OUTCOME</b>
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COs	COURSE OUTCOME
CO 1	Write the IUPAC name for complex, different theories to explain the bonding in coordination compounds and water technology.
CO 2	Explain the preparation and property of carbohydrate.
CO 3	Enlighten the biological role of transition metals, amino acids and nucleic acids.
CO 4	Apply/demonstrate the electrochemistry principles in corrosion, electroplating and fuel cells.
CO 5	Outline the various types of photochemical processes.
Pre-requisites	<b>Chemistry for Biological Sciences I</b>

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
<b>CO1</b>	S	S	S	S	S	S	S	M	S	M
<b>CO2</b>	M	S	S	S	M	S	S	M	M	M
<b>CO3</b>	S	S	S	M	S	S	S	M	S	M
<b>CO4</b>	S	S	S	S	S	S	S	M	M	M
<b>CO5</b>	S	M	S	S	S	S	S	M	M	S

CO / PSO	PSO1	PSO2	PSO3	PSO4	PSO5
<b>CO1</b>	3	3	3	3	3
<b>CO2</b>	3	3	3	3	3
<b>CO3</b>	3	3	3	3	3
<b>CO4</b>	3	3	3	3	3
<b>CO5</b>	3	3	3	3	3
<b>Weightage</b>	15	15	15	15	15
<b>Weighted percentage of Course Contribution to Pos</b>	3.0	3.0	3.0	3.0	3.0

Signature of BOS Chairman

	<b>VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN</b> <b>(AUTONOMOUS)</b> Elayampalayam, Tiruchengode-637 205.								
	Programme	<b>B.Sc.</b>	Programme Code	<b>UCH</b>	Regulations	<b>2023-2026</b>			
Department	<b>Chemistry</b>		Semester			<b>II/IV</b>			
Course Code	Course Name	Hours per Week		Credit	Maximum Marks				
		L	T	P	C	CA	ESE	Total	
<b>23U2CHGEP2/ 23U4CHGEP2</b>	<b>Chemistry Practical for Physical and Biological Sciences - II</b>		0	0	3	2	25	75	100
<b>COURSE OBJECTIVES</b>	This course aims to provide knowledge on the <ul style="list-style-type: none"> <li>• identification of organic functional groups</li> <li>• different types of organic compounds with respect to their properties.</li> <li>• determination of elements in organic compounds</li> </ul>								

<b>Content of the Syllabus</b>			
	<b>SYSTEMATIC ANALYSIS OF ORGANIC COMPOUNDS</b>	Hours	30
	The analysis must be carried out as follows: <ol style="list-style-type: none"> <li>(a) Functional group tests [phenol, acids (mono &amp; di) aromatic primary amine, amides (mono &amp; di), aldehyde and glucose].</li> <li>(b) Detection of elements (N, S, Halogens).</li> <li>(c) To distinguish between aliphatic and aromatic compounds.</li> <li>(d) To distinguish – Saturated and unsaturated compounds.</li> </ol>		
	<b>Total Hours</b>		<b>30</b>
<b>Text Books</b>			
1.	V.Venkateswaran, R.Veerasingam, A.R.Kulandaivelu, Basic Principles of Practical Chemistry; Sultan Chand & sons, Second edition, 1997.		



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COs	COURSE OUTCOME
CO 1	gain an understanding of the use of standard flask and volumetric pipettes, burette.
CO 2	design, carry out, record and interpret the results of volumetric titration
CO 3	apply their skill in the analysis of water/hardness.
CO4	analyze the chemical constituents in allied chemical product.
Pre-requisites	

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
<b>Weightage</b>	15	15	15	15	15
<b>Weighted percentage of Course Contribution to Pos</b>	3.0	3.0	3.0	3.0	3.0

Signature of BOS Chairman