

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

MASTER OF SCIENCE (M.Sc.)

M.Sc., CHEMISTRY REGULATIONS AND SYLLABUS

(2024-25)

[FOR CANDIDATES ADMITTED FROM 2023-25 ONWARDS UNDER
AUTONOMOUS – CHOICE BASED CREDIT SYSTEM (CBCS) & OUTCOME
BASED EDUCATION (OBE) PATTERN]



SPONSORED BY

ANGAMMAL EDUCATIONAL TRUST

Elayampalayam – 637 205, Tiruchengode Tk., Namakkal Dt., Tamil Nadu.

Veerachipalayam - 637 303, Sankari Tk., Salem Dt., Tamil Nadu.

Tel. : 04288 234670 (4 lines), Mobile : 64437 34670, Fax : 04288 234894

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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+' 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.

OUTCOMES-BASED CURRICULUM FRAMEWORK	
Programme	M. Sc., Chemistry
Programme Code	PCH
Duration	PG – 2YEARS
Programme Outcomes (Pos)	<p>PO1: Problem Solving Skill Apply knowledge of Management theories and Human Resource practices to solve business problems through research in Global context.</p> <p>PO2: Decision Making Skill Foster analytical and critical thinking abilities for data-based decision-making.</p> <p>PO3: Ethical Value Ability to incorporate quality, ethical and legal value-based perspectives to all organizational activities.</p> <p>PO4: Communication Skill Ability to develop communication, managerial and interpersonal skills.</p> <p>PO5: Individual and Team Leadership Skill Capability to lead themselves and the team to achieve organizational goals.</p> <p>PO6: Employability Skill Inculcate contemporary business practices to enhance employability skills in the competitive environment.</p> <p>PO7: Entrepreneurial Skill Equip with skills and competencies to become an entrepreneur.</p> <p>PO8: Contribution to Society Succeed in career endeavors and contribute significantly to society.</p> <p>PO 9 Multicultural competence Possess knowledge of the values and beliefs of multiple cultures and a global perspective.</p> <p>PO 10: Moral and ethical awareness/reasoning Ability to embrace moral/ethical values in conducting one’s life.</p>
Programme Specific Outcomes (PSOs)	<p>PSO1 – Placement To prepare the students who will demonstrate respectful engagement with others’ ideas, behaviors, beliefs and apply diverse frames of reference to decisions and actions.</p> <p>PSO 2 - Entrepreneur To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate startups and high potential organizations.</p>

	<p>PSO3 – Research and Development Design and implement HR systems and practices grounded in research that comply with employment laws, leading the organization towards growth and development.</p> <p>PSO4 – Contribution to Business World To produce employable, ethical and innovative professionals to sustain in the dynamic business world.</p> <p>PSO 5 – Contribution to the Society To contribute to the development of the society by collaborating with stakeholders for mutual benefit.</p>
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Elective Courses

Courses are grouped (Group A to Group F) so as to include topics from Pure Chemistry (PC), Applied Chemistry (AC) and Industrial Components (IC) like pharmaceutical industries, Polymer labs courses for flexibility of choice by the stakeholders / institutions.

Semester I: Elective I and Elective II

Elective I to be chosen from Group A and **Elective II** to be chosen from Group B

Group A: (PC/AC/IC)

1. Pharmaceutical Chemistry
2. Nanomaterials and Nanotechnology

Group B:(PC/AC/IC)

1. Electrochemistry
2. Molecular Spectroscopy

Semester II: Elective III & Elective IV

Elective III to be chosen from **Group C** and **Elective IV** to be chosen from **Group D**
Group C:(PC/AC/IC)

1. Medicinal Chemistry
2. Green Chemistry

Group D :(PC/AC/IC)

1. Bioinorganic Chemistry
2. Material Science

Semester III: Elective V

Elective V to be chosen from Group E.

Group E: (PC/AC/IC)

1. Pharmacognosy and Phytochemistry
2. Biomolecules and Heterocyclic compounds

Semester IV: Elective VI

Elective VI to be chosen from Group F.

Group F:(PC/AC/IC)

1. Chemistry of Natural products
2. Polymer Chemistry

Skill Enhancement Courses

Skill Enhancement Courses are chosen to keep in pace with the latest developments in the academic / industrial front and provides flexibility of choice by the stakeholders / institutions.

Group G (Skill Enhancement Courses) SEC: (Practical based paper)

- Computational Chemistry
- 3D printing in Chemistry
- Preparation of Consumer products
- Chemistry in everyday life
- Cosmetic Chemistry
- Origin lab
- Industrial Chemistry
- Research Tools and Techniques

Ability Enhancement Courses

- Soft Skill courses

Different Types of Courses

(i) Core Courses (Illustrative)

1. Organic Reaction mechanism I & II
2. Structure and bonding in Inorganic compounds
3. Organic Chemistry Practical
4. Physical Chemistry-I & II
5. Inorganic Chemistry Practical
6. Organic synthesis and Photochemistry
7. Coordination Chemistry-I & II
8. Physical Chemistry Practical
9. Analytical Instrumentation technique practical

(ii) Elective Courses (ED within the Department Experts) (Illustrative)

1. Pharmaceutical Chemistry
2. Nanomaterials and Nanotechnology
3. Electrochemistry
4. Molecular Spectroscopy
5. Medicinal Chemistry
6. Green Chemistry
7. Pharmacognosy and Phytochemistry
8. Biomolecules and Heterocyclic compounds
9. Bio inorganic Chemistry
10. Material Science
11. Chemistry of Natural products
12. Polymer chemistry


(iii) Institution-Industry-Interaction (Industry aligned Courses)

Programmes /course work/ field study/ Internship/ Modelling the Industry Problem/
Statistical Analysis /Commerce-Industry related problems / MoU with Industry and the like
activities

SYLLABUS FRAMEWORK

SEM	Course Code	Course	Course Title	Ins. Hrs/Week	Credit	CIA Marks	ESE Marks	Total Marks
I	23P1CHC01	Core Course - I	Organic Reaction Mechanism-I	6	4	25	75	100
	23P1CHC02	Core Course - II	Structure and Bonding in Inorganic Compounds	6	4	25	75	100
	23P1CHCP01	Core Practical - I	Organic Chemistry Practical	6	4	40	60	100
	23P1CHDE01	Discipline Elective - I	Pharmaceutical Chemistry/Nanomaterials and Nanotechnology	4	3	25	75	100
	23P1CHDE02	Discipline Elective - II	Electrochemistry/ Molecular Spectroscopy	4	3	25	75	100
	23P1CHAC01	Ability Enhancement Course- Soft Skill -1	Analytical Chemistry - I	2	2	25	75	100
	23P1CHSP01	Skill Enhancement Course SEC 1	Preparation of Consumer products	2	2	40	60	100
Total				30	22	205	495	700
II	23P2CHC03	Core Course-III	Organic reaction mechanism-II	5	4	25	75	100
	23P2CHC04	Core Course-IV	Physical Chemistry-I	5	4	25	75	100
	23P2CHCP02	Core Practical-II	Inorganic Chemistry Practical	5	4	40	60	100
	23P2CHDE03	Discipline Elective - III	Medicinal Chemistry/Green Chemistry	5	3	25	75	100
	23P2CHDE04	Discipline Elective - IV	Bio Inorganic Chemistry/Material Science	5	3	25	75	100
	23P2CHAC02	Ability Enhancement Course (AECC)	Analytical Chemistry - II	2	2	25	75	100
	23P2CHSP02	Skill Enhancement Course SEC II	Research Tools and Techniques	3	2	40	60	100
TOTAL				30	22	205	495	700

SEM	Course Code	Course	Course Title	Ins. Hrs/Week	Credit	CIA Marks	ESE Marks	Total Marks
III	23P3CHCO5	Core Course-V	Organic synthesis and Photochemistry	6	5	25	75	100
	23P3CHCO6	Core Course -VI	Coordination Chemistry-I	6	5	25	75	100
	23P3CHCP03	Core Practical–III	Physical Chemistry Practical	6	3	40	60	100
	23P3CHDE05	Discipline Elective–V	Pharmacognosy and Phytochemistry	5	4	25	75	100
	23P3CHDE06	Discipline Elective–V	Biomolecules and Heterocyclic compounds	5	4	25	75	100
	23P3HR01	-	Human Rights	2	1	25	75	100
	23P3CHI01	Internship/Industrial Activity (the end of I year -30 hours)	Soft Skill-3 Internship /Industrial Activity (Carried out in Summer Vacation at the end of I year – 30hours)	-	1	-	-	-
TOTAL				30	23	165	435	600
IV	23P4CHC07	Core Course - VII	Coordination Chemistry-II	5	5	25	75	100
	23P4CHC08	Core Course - VIII	Physical Chemistry-II	5	5	25	75	100
	23P4CHCP04	Core Practical - IV	Analytical Instrumentation Technique Practical	5	4	40	60	100
	23P4CHDE07	Discipline Elective–VI	Chemistry of Natural products/ Polymer Chemistry	4	4	25	75	100
	23P4CHED01/ 23P4CHED02	EDC	Chemistry in Consumer Products/ Chemistry for Life Sciences	2	2	25	75	100
	23P4CHPR01	Core Project with Viva-Voce	Core Project with viva voce	9	4	40	60	100
TOTAL				30	24	180	420	600
GRAND TOTAL				120	91	755	1845	2600

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637205.									
	Programme	M.Sc	Programme Code	PCH			Regulations	2023-2024		
Department	Chemistry			Semester			I			
Course Code	Course Name	Periods per Week			Credit	Maximum Marks				
		L	T	P	C	CA	ESE	Total		
23P1CHC01	CORE COURSE- I: ORGANIC REACTION MECHANISM-I			5	1		04	25	75	100
Prerequisites	Basic concepts of organic chemistry									
Course Objectives	<ul style="list-style-type: none"> To understand the feasibility and the mechanism of various organic reactions. To comprehend the techniques in the determination of reaction mechanisms. To understand the concept of stereochemistry involved inorganic compounds. To correlate and appreciate the differences involved in the various types of organic reaction mechanisms. To design feasible synthetic routes for the preparation of organic compounds. To understand the mechanism involved in various types of organic reactions with evidences. 									

Content of the Syllabus						
Unit-I	Methods of Determination of Reaction Mechanism			Periods	15	
	Reaction intermediates, The transition state, Reaction coordinate diagrams, Thermodynamic and kinetic requirements of reactions: Hammond postulate. Methods of determining mechanism: non-kinetic methods-product analysis, Determination of intermediates-isolation, detection, and trapping. Cross-over experiments, isotopic labelling, isotope effects and stereo chemical Evidences-Effect of Structure on reactivity: Hammett and Taft equations. Linear free energy relationship, partial rate factor, substituent and reaction constants.					
Unit-II	Aromatic	and	Aliphatic	Electrophilic	Periods	15
	Substitution Aromaticity: Aromaticity in benzenoid, non-benzenoid, heterocyclic Compounds and annulenes. Aromatic electrophilic substitution: Orientation and reactivity of di-and poly substituted phenol, nitrobenzene and halobenzene. Reactions involving nitrogen electrophiles: nitration, Sulphur electrophiles: sulphonation; Halogen electrophiles: chlorination and bromination; Carbon electrophiles: Friedel-Crafts alkylation, acylation and arylation reactions. Aliphatic Electrophilic substitution Mechanisms: SE ₂ and SE _i , SE ₁ -Mechanism and evidences.					

Unit-III	Aromatic and Aliphatic Nucleophilic Substitution	Periods	15
	Aromatic nucleophilic substitution: Mechanisms - S_NAr , S_N1 and Benzyne mechanisms - Evidences - Reactivity, Effect of structure, leaving group and attacking nucleophile. Reactions: Oxygen and Sulphur-nucleophiles, Bucherer and Rosenmund reactions, von Richter, Sommelet- Hauser and Smiles rearrangements. S_N1 , ion pair, S_N2 mechanisms and evidences. Aliphatic nucleophilic substitutions at an allylic carbon, aliphatic trigonal carbon and vinyl carbon. S_N1 , S_N2 , S_Ni , and S_E1 mechanism and evidences, Swain-Scott, Grunwald-Winstein relationship –Ambident nucleophiles.		
Unit-IV	Stereochemistry-I	Periods	15
	Introduction to molecular symmetry and chirality axis, plane, center, alternating axis of symmetry. Optical isomerism due to asymmetric and dissymmetric molecules with C, N, S based chiral centers. Optical purity, prochirality, enantiotopic and diastereotopic atoms, groups, faces, axial and planar chirality, chirality due to helical shape, methods of determining the configuration. Racemic modifications: Racemization by thermal, anion, cation, reversible formation, epimerization, mutarotation. D,L system, Cram's and Prelog's rules: R, S-notations, proR, proS, side phase and rephase Cahn-Ingold-Prelogrules, absolute and relative configurations. Configurations of allenes, spiranes, biphenyls, cyclooctene, helicene, binaphthyls, ansa and cyclophanic compounds, exo-cyclicalkylidene-cycloalkanes. Topicity and prostereoisomerism, chiral shift reagents and chiral solvating reagents. Stereoselective and stereospecific synthesis.		
Unit-V	Rearrangements	Periods	15
	Rearrangements to electron deficient carbon: Pinacol-pinacolone and semi-pinacolone rearrangements- applications and stereochemistry, Wagner-Meerwein, Demjanov, Dienone-phenol, Baker-Venkataraman, Benzilic acid and Wolff rearrangements. Rearrangements to electron deficient nitrogen: Hofmann, Curtius, Schmidt, Lossen, Beckmann and abnormal Beckmann rearrangements. Rearrangements to electron deficient oxygen: Baeyer-Villiger oxidation and Dakin rearrangements. Rearrangements to electron rich atom: Favorskii, Quasi-Favorskii, Stevens,[1,2]-Wittig and [2,3]-Wittig rearrangements. Fries and Photo Fries rearrangement. Intramolecular rearrangements–Claisen, abnormal Claisen, Cope, oxy-Cope Benzidine rearrangements.		

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 / TRB / NET/ UGC-CSIR / GATE /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.
Total Periods	
75	

Text Books	
1	J.March and M.Smith, Advanced Organic Chemistry, 5 th edition, John-Wiley and Sons.2001.
2	E.S.Gould, Mechanism and Structure in Organic Chemistry ,Holt, Rinehart and Winston Inc.,1959.
3	P.S.Kalsi, Stereochemistry of carbon compounds, 8 th edition, New Age International Publishers, 2015.
4	P.Y. Bruice, Organic Chemistry, 7 th edn, Prentice Hall,2013
5	J.Clayden, N.Greeves, S.Warren, Organic Compounds,2 nd edition, Oxford University Press,2014.
6	R.T.Morrison, R.N.Boyd,S.K.Bhattacharjee <i>Organic Chemistry</i> ,7 th edn.,Pearson Education,2010
References	
1	F.A.Carey and R.J.Sundberg, Advanced Organic Chemistry Part-A and B,5 th edition, Kluwer Academic/ Plenum Publishers, 2007.
2	D.G.Morris, Stereochemistry, RSC Tutorial Chemistry Text1,2001.
3	N.S.Isaacs, Physical Organic Chemistry,ELBS, Longman,UK,1987.
4	E. L.Eliel, Stereochemistry of Carbon Compounds, Tata-McGraw Hill,2000.
5	I.L.Finar, Organic chemistry, Vol-1&2,6 th edition, Pearson Education Asia,2004.
6	E.S.Gould, <i>Mechanism and Structure in Organic Chemistry</i> ,Holt, Rinehart and Winston Inc.,1959.
7	S.H.Pine, <i>Organic Chemistry</i> ,5 th edn, McGraw Hill International Editionn,1987.

E-References	
1	https://sites.google.com/site/chemistryebookscollection02/home/organic-chemistry/organic
2	https://www.organic-chemistry.org/

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S
CO 5	M	S	M	S	S	M	S	M	S	S

Strong - 3

Medium-2

Low-1

Level of Correlation between PSO's and CO's

CO / PO	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

3 – Strong, 2 – Medium, 1 - Low

Methods of Evaluation		
Internal Evaluation	Continuous Internal Assessment Test	25 Marks
	Assignments	
	Seminars	

	Attendance and Class Participation	
External Evaluation	End Semester Examination	75 Marks
	Total	100 Marks
Methods of Assessment		
Recall (K1)	Simple definitions, MCQ, Recall steps, Concept definitions.	
Understand/ Comprehend (K2)	MCQ, True/False, Short essays, Concept explanations, short summary or overview.	
Application (K3)	Suggest idea/concept with examples, suggest formulae, solve problems, Observe, Explain.	
Analyze (K4)	Problem-solving questions, finish a procedure in many steps, Differentiate between various ideas, Map knowledge.	
Evaluate (K5)	Longer essay/ Evaluation essay, Critique or justify with pros and cons.	
Create (K6)	Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations.	

In order to avoid pull the score down of each PO, it is suggested that the usage L-Low (1) to the minimum.

The S, M, L is based on the course outcome. The mapping is based on the revised Bloom's Taxonomy Verbs used to describe your course outcome.

- Remember and Understanding – Lower level
- Apply and Analyze – Medium Level
- Evaluate and Create – Strong Level



**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR
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Elayampalayam, Tiruchengode-637 205.

Programme	M.Sc	Programme Code	PCH			Regulations	2023-2024		
Department	Chemistry			Semester			I		
Course Code	Course Name	Periods per Week			Credit	Maximum Marks			
		L	T	P	C	CA	ESE	Total	
23P1CHC02	CORE COURSE II: STRUCTURE AND BONDING IN INORGANIC COMPOUNDS	5	1		04	25	75	100	
Prerequisites	Basic concepts of Inorganic Chemistry								
Course Objectives	<ul style="list-style-type: none"> To determine the structural properties of main group compounds and clusters. To gain fundamental knowledge on the structural aspects of ionic crystals. To familiarize various diffraction and microscopic techniques. To study the effect of point defects and line defects in ionic crystals. To evaluate the structural aspects of solids. 								

Content of the Syllabus			
Unit – I	Structure of main group compounds and clusters	Periods	15
	VB theory – Effect of lone pair and electronegativity of atoms (Bent's rule) on the geometry of the molecules; Structure of silicates - isomorphous replacements in silicates – ortho, meta and pyro silicates – one dimensional, two dimensional and three-dimensional silicates. Structure of silicones, Structural and bonding features of B-N, S-N and P-N compounds; Poly acids – types, examples and structures; Borane cluster: Structural features of closo, nido, arachano and klado; carboranes, hetero and metalloboranes; Wade's rule to predict the structure of borane cluster;		
Unit – II	Solid state chemistry – I	Periods	15
	Ionic crystals: Packing of ions in simple, hexagonal and cubic close packing, voids in crystal lattice, Radius ratio, Crystal systems and Bravais lattices, Symmetry operations in crystals, glide planes and screw axis; point group and space group; Solid state energetics: Lattice energy – Born-Landé equation - Kapustinski equation, Madelung constant.		
Unit – III	Solid state chemistry – II	Periods	15
	Structural features of the crystal systems: Rock salt, zinc blende & wurtzite, fluorite and anti-fluorite, rutile and anatase, cadmium iodide and nickel arsenide; Spinel -normal and inverse types and perovskite structures. Crystal Growth methods: From melt and solution (hydrothermal, sol-gel methods) – principles and examples.		

Unit – IV	Techniques in solid state chemistry	Periods	15
	X-ray diffraction technique: Bragg's law, Powder diffraction method – Principle and Instrumentation; Interpretation of XRD data – JCPDS files, Phase purity, Scherrer formula, lattice constants calculation; Systematic absence of reflections; Electron diffraction technique – principle, instrumentation and application. Electron microscopy – difference between optical and electron microscopy, theory, principle, instrumentation, sampling methods and applications of SEM and TEM.		
Unit – V	Stability and Stereochemical Aspects	Periods	15
	Stability of complexes - thermodynamic aspects of complex formation, factors affecting stability, stability correlations, statistical and chelate effects; Determination of stability constants - polarographic, photometric and potentiometric methods. Stereochemical aspects - stereoisomerism in inorganic complexes, isomerism arising out of ligand distribution and ligand conformation, chirality.		
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 / TRB / NET/ UGC-CSIR / GATE /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.		
Total Periods			75

Text Books	
1.	A R West, Solid state Chemistry and its applications, 2nd Edition (Students Edition), John Wiley & Sons Ltd., 2014.
2.	A K Bhagi and G R Chatwal, A textbook of inorganic polymers, Himalaya Publishing House, 2001.
3.	Cotton and Wilkinson : Advanced inorganic Chemistry, Wiley Eastern (P), Ltd., 1968
4.	L Smart, E Moore, Solid State Chemistry – An Introduction, 4 th Edition, CRC Press, 2012.
5.	K.F. Purcell and J. C. Kotz, Inorganic Chemistry; W.B. Saunders company: Philadelphia, 1977.
6.	J. E. Huheey, E. A. Keiter and R. L. Keiter, Inorganic Chemistry; 4th ed.; Harper and Row: New York, 1983.

References	
1	D. E. Douglas, D.H. McDaniel and J. J. Alexander, Concepts and Models in Inorganic Chemistry, 3rd Ed, 1994.
2	R J D Tilley, Understanding Solids - The Science of Materials, 2 nd edition, Wiley Publication, 2013.
3	C N R Rao and J Gopalakrishnan, New Directions in Solid State Chemistry, 2 nd Edition, Cambridge University Press, 199.
4	T. Moeller, Inorganic Chemistry, A Modern Introduction; John Wiley: New York, 1982.
5	D. F. Shriver, P. W. Atkins and C.H. Langford; Inorganic Chemistry; 3rd ed.; Oxford University Press: London, 2001.
E-References	
1	https://ocw.mit.edu/courses/3-091-introduction-to-solid-state-chemistry-fall-2018/video_galleries/lecture-videos/

CO-PO Mapping (Course Articulation Matrix)


	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S
CO 5	M	S	M	S	S	M	S	M	S	S

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO /PO	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

3 – Strong, 2 – Medium, 1 - Low

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FORWOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.									
	Programme	M.Sc	Programme Code	PCH			Regulations	2023-2024		
Department	Chemistry			Semester			I			
Course Code	Course Name	Periods per Week			Credit	Maximum Marks				
		L	T	P	C	CA	ESE	Total		
23P1CHCP01	CORE PRACTICAL- I ORGANIC CHEMISTRY PRACTICAL				1	5	04	40	60	100
Course Objectives	<ul style="list-style-type: none"> To understand the concept of separation, qualitative analysis and preparation of organic compounds. To develop analytical skill in the handling of chemical reagents for separation of binary and ternary organic mixtures. To analyze the separated organic components systematically and derivatise them suitably. To construct suitable experimental setup for the organic preparations involving two stages. To experiment different purification and drying techniques for the compound using 									

Content of the Syllabus				
Unit – I	Separation and analysis		Periods	25
	A. Two component mixtures.			
Unit – II	Estimations		Periods	25
	a) Estimation of Phenol (bromination) b) Estimation of Aniline (bromination) c) Estimation of Ethyl methyl ketone (iodimetry) d) Estimation of Glucose (redox) e) Estimation of Aromatic nitro groups (reduction) f) Estimation of Acetyl group in ester (alkalimetry) g) Estimation of Amino group (acetylation)			
Unit – III	Two stage preparations		Periods	25
	a) <i>p</i> -Bromoacetanilide from aniline b) <i>p</i> -Nitroaniline from acetanilide c) 1,3,5-Tribromobenzene from aniline d) Acetyl salicylic acid from methyl salicylate e) <i>m</i> -Nitroaniline from nitrobenzene			

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 / TRB / NET/ UGC-CSIR / GATE /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 Transferableskills.
Total Periods	
75	

Text Books	
1	A R West, Solid state Chemistry and its applications, 2ndEdition (Students Edition), John Wiley & Sons Ltd., 2014.
2	A K Bhagi and G R Chatwal, A textbook of inorganic polymers, Himalaya Publishing House, 2001.
3	L Smart, E Moore, Solid State Chemistry – An Introduction, 4 th Edition, CRC Press, 2012.
References	
1	D. E. Douglas, D.H. McDaniel and J. J. Alexander, Concepts and Models in Inorganic Chemistry, 3rd Ed, 1994.
2	R J D Tilley, Understanding Solids - The Science of Materials, 2 nd edition, Wiley Publication, 2013.
3	C N R Rao and J Gopalakrishnan, New Directions in Solid State Chemistry, 2 nd Edition, Cambridge University Press, 199.
E-References	
1	https://ocw.mit.edu/courses/3-091-introduction-to-solid-state-chemistry-fall-2018/video_galleries/lecture-videos/

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S



CO 5	M	S	M	S	S	M	S	M	S	S
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3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO /PO	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

3 – Strong, 2 – Medium, 1 - Low

		VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FORWOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.							
Programme	M.Sc	Programme Code	PCH		Regulations	2023-2024			
Department	Chemistry		Semester			I			
Course Code	Course Name	Periods per Week			Credit	Maximum Marks			
		L	T	P	C	CA	ESE	Total	
23P1CHDE01	DISCIPLINE ELECTIVE I: PHARMACEUTICAL CHEMISTRY		3	1		03	25	75	100
Prerequisites	Basic knowledge on drugs and doses								
Course Objectives	<ul style="list-style-type: none"> • To understand the advanced concepts of pharmaceutical chemistry. • To recall the principle and biological functions of various drugs. • To train the students to know the importance as well the consequences of various drugs. • To have knowledge on the various analysis and techniques. • To familiarize on the drug dosage and its structural activities. 								

Content of the Syllabus			
Unit – I	Physical properties in Pharmaceuticals	Periods	15
	Physical properties of drug molecule: physical properties. Refractive index- Definition, explanation, formula, importance, determination, specific & molar refraction. Optical activity/rotation- monochromatic & polychromatic light, optical activity, angle of rotation, specific rotation examples, measurement of optical activity. Dielectric constant & Induced Polarization- Dielectric constant explanation & determination.		
Unit – II	Isotopic Dilution analysis	Periods	15
	Principle and applications, Neutron activation analysis: Principle, advantages and limitations, Scintillation counters: Body scanning. Introduction to radiopharmaceuticals. Properties of various types of radiopharmaceuticals, Radiopharmaceuticals as diagnostics, as therapeutics, for research and sterilization. Physico Chemical Properties and drug action. Physico chemical properties of drugs (a) Partition coefficient, (b) solubility (c) surface activity, (d) degree of ionization.		
Unit – III	Drug dosage and product development	Periods	15
	Introduction to drug dosage Forms & Drug Delivery system – Definition of Common terms. Drug Regulation and control, pharmacopoeias formularies, sources of drug, drug nomenclature (Biological & chemical classification), routes of administration of drugs products, need for a dosage form,		

	classification of dosage forms. Drug dosage and product development. Introduction to drug dosage Forms & Drug Delivery system.		
Unit – IV	Development of new drugs	Periods	15
	Introduction, procedure followed in drug design, the research for lead compounds, molecular modification of lead compounds. Structure-Activity Relationship (SAR): Factors effecting bioactivity, resonance, inductive effect, isoterism, bioisosterism, spatial considerations, biological properties of simple functional groups, theories of drug activity, occupancy theory, rate theory, induced-fit theory, 4.3 Quantitative structure activity relationship (QSAR): Development of QSAR, drug receptor interactions, the additivity of group contributions, physico-chemical parameters. Small molecules as drugs, Lipinski rule five, hit identification to lead development process, Chemistry Manufacturing and Control (CMC), Pre-clinical study.		
Unit – V	Computers in Pharmaceutical Chemistry	Periods	15
	Need of computers for chemistry. Computers for Analytical Chemists- Introduction to computers: Organization of computers, CPU, Computer memory, I/O devices, information storage, software components. Application of computers in chemistry: Programming in high level language (C+) to handle various numerical methods in chemistry – least square fit, solution to simultaneous equations, interpolation, extrapolation, data smoothing, numerical differentiation and integrations.		
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 / TRB / NET/ UGC-CSIR / GATE /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.		
Total Periods			75

Text Books	
1	Physical Chemistry- Bahl and Tuli.
2	Text Book of Physical Pharmaceutics, IInd edition, Vallabh Prakashan-.C.V.S. Subramanyam.
3	Medicinal Chemistry (Organic Pharmaceutical Chemistry), G.R Chatwal, Himalaya Publishing house.
4	Instrumental method of Analysis: Hubert H, Willard, 7th edition.
5	Textbook of Pharmaceutical Chemistry by, Jayshree Ghosh, S. Chand & company Ltd. Pharmaceutical Chemistry by Dr. S. Lakshmi, Sultan chand & Sons.

References	
1	Computers in chemistry, K.V. Raman, Tata Mc.Graw-Hill, 1993.
2	Computers for Chemists, S.K Pundir, Anshu bansal, A pragate prakashan., 2 nd edition, New age international (P) limited, New Delhi.
3	Physical Pharmacy and Pharmaceutical Sciences by Martins, Patrick J. Sinko, Lippincott. William and Wilkins.
4	Cooper and Gunn's Tutorial Pharmacy ,6th edition by S.J. Carter, CBS Publisher Ltd.
5	Ansels pharmaceutical Dosage forms and Drug Delivery System by Allen Popvich and Ansel, Indian edition-B.I. Publication Pvt. Ltd.
E-References	
1	https://www.ncbi.nlm.nih.gov/books/NBK482447/ https://training.seer.cancer.gov/treatment/chemotherapy/types.html

CO-PO Mapping (Course Articulation Matrix)


	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S
CO 5	M	S	M	S	S	M	S	M	S	S

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO /PO	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

3 – Strong, 2 – Medium, 1 - Low

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FORWOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.									
	Programme	M.Sc	Programme Code	PCH			Regulations	2023-2024		
Department	Chemistry			Semester			I			
Course Code	Course Name	Periods per Week			Credit	Maximum Marks				
		L	T	P	C	CA	ESE	Total		
23P1CHDE01	DISCIPLINE ELECTIVE I: NANO MATERIALS AND NANO TECHNOLOGY			3	1		03	25	75	100
Prerequisites	Basic knowledge of crystallography and material science									
Course Objectives	<ul style="list-style-type: none"> To understand the concept of nano materials and nano technology. To understand the various types of nano materials and their properties. To understand the applications of synthetically important nano materials. To correlate the characteristics of various nano materials synthesized by new technologies. To design synthetic routes for synthetically used new nano materials. 									

Content of the Syllabus			
Unit – I	Nano materials – classification & applications	Periods	15
	Introduction of nanomaterials and nanotechnologies, Introduction-role of size, classification-0D, 1D, 2D, 3D. Synthesis-Bottom –Up, Top–Down, consolidation of Nano powders. Features of nanostructures, Background of nanostructures. Techniques of synthesis of nanomaterials, Tools of the nanoscience. Applications of nanomaterials and technologies.		
Unit – II	Synthesis of Nanomaterials	Periods	15
	Synthesis of nanomaterials- top-down and bottom-up process-precipitation method-thermal decomposition Method - Solvothermal Method-Hydrothermal method-Electro-deposition method-Chemical vapour Deposition method-Laser ablation method--Sol-gel techniques- coprecipitation method – hydrolysis –sonochemical method- solvothermal method – combustion method – colloidal precipitation – template process.		
Unit – III	Mechanical properties	Periods	15
	Mechanical properties of materials, theories relevant to mechanical properties. Techniques to study mechanical properties of nanomaterials, adhesion and friction, thermal properties of nanomaterials Nanoparticles: gold and silver, metal oxides: silica, iron oxide and alumina - synthesis and properties.		
Unit - IV	Electrical properties	Periods	15
	Electrical properties, Conductivity and Resistivity, Classification of Materials based on Conductivity, magnetic properties, electronic properties of materials. Classification of magnetic phenomena. Semiconductor materials –		

	classification-Ge, Si, GaAs, SiC, GaN, GaP, CdS,PbS. Identification of materials as p and n –type semiconductor-Hall effect - quantum and anomalous, Hall voltage - interpretation of charge carrier density. Applications of semiconductors: p-n junction as transistors and rectifiers, photovoltaic and photogalvanic cell.		
Unit - V	Characterization and instrumentation	Periods	15
	Nano thin films, nanocomposites. Application of nanoparticles in different fields. Core-shell nanoparticles - types, synthesis, and properties. Nanocomposites - metal-, ceramic- and polymer-matrix composites-applications. Characterization – SEM, TEM and AFM - principle, instrumentation and applications.		
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 / TRB / NET/ UGC-CSIR / GATE /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.		
Total Periods			75

Text Books	
1	S.Mohan and V. Arjunan, Principles of Materials Science, MJP Publishers, 2016.
2	Arumugam, Materials Science, Anuradha Publications,2007.
3	Giacavazzo et. al., Fundamentals of Crystallography, International Union of Crystallography. Oxford Science Publications, 2010
4	Woolfson, An Introduction to Crystallography, Cambridge University Press, 2012.
5	James F. Shackelford and Madanapalli K. Muralidhara, Introduction to Materials Science for Engineers. 6 th ed., PEARSON Press, 2007.

References	
1	S.Mohan and V. Arjunan, Principles of Materials Science, MJP Publishers, 2016.
2	Arumugam, Materials Science, Anuradha Publications,2007.
3	Giacavazzo et. al., Fundamentals of Crystallography, International Union of Crystallography. Oxford Science Publications, 2010
4	Woolfson, An Introduction to Crystallography, Cambridge University Press, 2012.

5	James F. Shackelford and Madanapalli K. Muralidhara, Introduction to Materials Science for Engineers. 6 th ed., PEARSON Press, 2007.
E-References	
1	http://xrayweb.chem.ou.edu/notes/symmetry.html . http://www.uptti.ac.in/classroom-content/data/unit%20cell.pdf .

CO-PO Mapping (Course Articulation Matrix)


	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S
CO 5	M	S	M	S	S	M	S	M	S	S

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO /PO	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

3 – Strong, 2 – Medium, 1 - Low

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FORWOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.									
	Programme	M.Sc	Programme Code	PCH			Regulations	2023-2024		
Department	Chemistry			Semester			I			
Course Code	Course Name	Periods per Week			Credit	Maximum Marks				
		L	T	P	C	CA	ESE	Total		
23P1CHDE02	DISCIPLINE ELECTIVE II: ELECTROCHEMISTRY			3	1		03	25	75	100
Prerequisites	Basic knowledge of electrochemistry									
Course Objectives	<ul style="list-style-type: none"> To understand the behavior of electrolytes in terms of conductance, ionic atmosphere, interactions. To familiarize the structure of the electrical double layer of different models. To compare electrodes between current density and over potential. To discuss the mechanism of electrochemical reactions. To highlight the different types of over voltages and its applications in electro analytical techniques. 									

Content of the Syllabus			
Unit – I	Ionics	Periods	15
	Electrolytic Theory - Arrhenius theory – Advantages & Limitations, Need of Debye Huckel theory, Debye Huckel theory of strong electrolytes, activity coefficient of strong electrolytes Determination of activity coefficient. Debye - Falkenhagen effect and Wein effect – Determination of solute activities from solvent activities – Dependence of electrolyte activity on the hydration number Bjerrum Theory of ion association in electrolyte solutions. Derivation of Debye-Huckel limiting law at appreciable concentration of electrolytes modifications and applications. Debye-Huckel Onsager treatment of strong electrolyte-qualitative and quantitative verification and limitations. triple ion formations.		
Unit – II	Electrode-Electrolyte Interface	Periods	15
	Quantitative thermodynamic treatment of electrified interfaces -Lippmann equation electrical capacitance of the interface. Electro-kinetic phenomena: electro-osmosis, electrophoresis, streaming and sedimentation potentials, colloidal and poly electrolytes. Structures of electrified interfaces: Helmholtz -Perrin, Guoy- Chapman diffuse charge and Stern models of electrical double layer. Structure of semiconductor interfaces – diffuse charge region inside an intrinsic semiconductor: Garrett-Brattain space Charge.		

Unit – III	Electrodictics of Elementary Electrode Reactions	Periods	15
	Behavior of electrodes: Standard electrodes and electrodes at equilibrium. Anodic and Cathodic currents, condition for the discharge of ions. Nernst equation, polarizable and non-polarizable electrodes. Model of three electrode system, over potential. Rate of electro chemical reactions. Butler-Volmer equation. Significance of exchange current density, net current density and symmetry factor. Symmetry factor and transfer coefficient. Tafel equations and Tafel plots.		
Unit - IV	Electrodictics of Multistep Multi Electron System	Periods	15
	Electrode polarization and depolarization. Stoichiometric number. Electrochemical reaction mechanisms-rate expressions, order, and surface coverage. Reduction of Fe^{2+} , and dissolution of Fe to Fe^{2+} . Overvoltage - Chemical and electro chemical, Phase, activation and concentration. Evolution of oxygen and hydrogen at different pH. Pourbiax and Evan's diagrams.		
Unit - V	Concentration Polarization, Batteries and Fuel cells	Periods	15
	Modes of Transport of electro active species - Diffusion, migration and hydrodynamic modes. Polarography-principle and applications. Principle of square wave polarography. Cyclic voltammetry- anodic and cathodic stripping voltammetry and differential pulse voltammetry. Sodium and lithium-ion batteries and redox flow batteries. Fuel Cells: classification, alkaline fuel cells, phosphoric acid fuel cells, high temperature fuel cells.		
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 / TRB / NET/ UGC-CSIR / GATE /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.		
Total Periods			75

Text Books	
1	D. R. Crow, Principles and applications of electrochemistry, 4th edition, Chapman & Hall/CRC, 2014.
2	J. Rajaram and J.C. Kuriakose, Kinetics and Mechanism of chemical transformations Macmillan India Ltd., New Delhi, 2011.
3	S. Glasstone, Electro chemistry, Affiliated East-West Press, Pvt., Ltd., New Delhi, 2008.
4	B. Viswanathan, S. Sundaram, R. Venkataraman, K. Rengarajan and P.S. Raghavan, Electrochemistry-Principles and applications, S. Viswanathan Printers, Chennai, 2007.
5	Joseph Wang, Analytical Electrochemistry, 2 nd edition, Wiley, 2004.
References	
1	J.O.M. Bockris and A.K.N. Reddy, Modern Electro chemistry, vol.1 and 2B, Springer, Plenum Press, New York, 2008.
2	J.O.M. Bockris, A.K.N. Reddy and M.G. Aldeco Morden Electro chemistry, vol. 2A, Springer, Plenum Press, New York, 2008.
3	Philip H. Rieger, Electrochemistry, 2 nd edition, Springer, New York, 2010.
4	L.I. Antropov, Theoretical electrochemistry, Mir Publishers, 1977.
5	K.L. Kapoor, A Text book of Physical chemistry, volume-3, Macmillan, 2001.
E-References	
1	https://www.pdfdrive.com/modern-electrochemistry-e34333229 .

CO-PO Mapping (Course Articulation Matrix)


	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S
CO 5	M	S	M	S	S	M	S	M	S	S

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO /PO	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

3 – Strong, 2 – Medium, 1 - Low

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FORWOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.									
	Programme	M.Sc	Programme Code	PCH			Regulations	2023-2024		
Department	Chemistry			Semester			I			
Course Code	Course Name	Periods per Week		Credit	Maximum Marks					
		L	T	P	C	CA	ESE	Total		
23P1CHDE02	DISCIPLINE ELECTIVE II: MOLECULAR SPECTROSCOPY			3	1		03	25	75	100
Prerequisites	Basic knowledge of spectroscopy									
Course Objectives	<ul style="list-style-type: none"> To understand the influence of rotation and vibrations on the spectra of the polyatomic molecules. To study the principle of Raman spectroscopy, ESR spectroscopy, EPR spectroscopy and fragmentation patterns in Mass spectroscopy. To highlight the significance of Franck-Condon principle to interpret the selection rule, intensity and types of electronic transitions. To interpret the first and second order NMR spectra in terms of splitting and coupling patterns using correlation techniques such as COSY, HETCOR, NOESY. To carry out the structural elucidation of molecules using different spectral techniques. 									

Content of the Syllabus			
Unit – I	Rotational and Raman Spectroscopy	Periods	15
	Rotational spectra of diatomic and polyatomic molecules. Intensities of rotational spectral lines, effect of isotopic substitution. Non-rigid rotators. Classical theory of the Raman effect, polarizability as a tensor, polarizability ellipsoids, quantum theory of the Raman effect, Pure rotational Raman spectra of linear and asymmetric top molecules, Stokes and anti-Stokes lines. Vibrational Raman spectra, Raman activity of vibrations, rule of mutual exclusion, rotational fine structure-O and S branches, Polarization of Raman scattered photons.		
Unit – II	Vibrational Spectroscopy	Periods	15
	Vibrations of molecules, harmonic and anharmonic oscillators- vibrational energy expression, energy level diagram, vibrational wave functions and their symmetry, selection rules, expression for the energies of spectral lines, computation of intensities, hot bands, effect of isotopic substitution. Diatomic vibrating rotor, vibrational-rotational spectra of diatomic molecules, P, R branches, breakdown of the Born-Oppenheimer approximation. Vibrations of		

	polyatomic molecules – symmetry properties, overtone and combination frequencies. Influence of rotation on vibrational spectra of polyatomic molecule, P, Q, R branches, parallel and perpendicular vibrations of linear and symmetric top molecules.		
Unit – III	Electronic spectroscopy	Periods	15
	Electronic Spectroscopy: Electronic spectroscopy of diatomic molecules, Frank-Condon principle, dissociation and predissociation spectra. $\pi \rightarrow \pi^*$, $n \rightarrow \pi^*$ transitions and their selection rules. Photoelectron Spectroscopy: Basic principles, photoelectron spectra of simple molecules, X-ray photoelectron spectroscopy (XPS). Electronic spectra of polyatomic molecules- localized MOs, spectrum of HCHO, change of shape on excitation		
Unit – IV	NMR spectroscopy	Periods	15
	Chemical shift, Factors influencing chemical shifts: electronegativity and electrostatic effects; Mechanism of shielding and de-shielding. Spin systems: First order and second order coupling of AB systems, Simplification of complex spectra. Spin-spin interactions: Homonuclear coupling interactions - AX, AX ₂ , AB types. Vicinal, germinal and long-range coupling-spin decoupling. Nuclear Overhauser effect (NOE), Resonance of other nuclei. ¹³ C NMR: Chemical shift, ¹³ C coupling constants, two-dimensional NMR spectroscopy, NOISY, DEPT, INEPT terminology.		
Unit – V	Mass Spectrometry, EPR and Mossbauer Spectroscopy	Periods	15
	Instrumentation, Mass spectral fragmentation of organic compounds, McLafferty rearrangement, examples of mass spectral fragmentation of organic compounds with respect to their structure determination. ORD & CD: Definition, deduction of absolute configuration, octant rule for ketones. Effect of isotopes on the appearance of mass spectrum. EPR spectra of anisotropic systems - anisotropy in g-value, causes of anisotropy, anisotropy in hyperfine coupling, hyperfine splitting caused by quadrupole nuclei. Zero- field splitting (ZFS) and Kramer's degeneracy. Applications of EPR to organic and inorganic systems. Structural elucidation of organic compounds by combined spectral techniques. Principle of Mossbauer spectroscopy: Doppler shift, recoil energy. Isomer shift, quadrupole splitting, magnetic interactions. Applications: Mossbauer spectra of high and low-spin Fe and Sn compounds.		
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 / TRB / NET/ UGC-CSIR / GATE /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.		
Total Periods			75

Text Books	
1	C. N. Banwell and E. M. McCash, <i>Fundamentals of Molecular Spectroscopy</i> , 4 th Ed., Tata McGraw Hill, New Delhi, 2000.
2	R. M. Silverstein and F. X. Webster, <i>Spectroscopic Identification of Organic Compounds</i> , 6 th Ed., John Wiley & Sons, New York, 2003.
3	W. Kemp, <i>Applications of Spectroscopy</i> , English Language Book Society, 1987.
4	D. H. Williams and I. Fleming, <i>Spectroscopic Methods in Organic Chemistry</i> , 4 th Ed., Tata McGraw-Hill Publishing Company, New Delhi, 1988.
5	R. S. Drago, <i>Physical Methods in Chemistry</i> ; Saunders: Philadelphia, 1992.
References	
1	P.W. Atkins and J. de Paula, <i>Physical Chemistry</i> , 7 th Ed., Oxford University Press, Oxford, 2002.
2	I. N. Levine, <i>Molecular Spectroscopy</i> , John Wiley & Sons, New York, 1974.
3	A. Rahman, <i>Nuclear Magnetic Resonance-Basic Principles</i> , Springer-Verlag, New York, 1986.
4	K. Nakamoto, <i>Infrared and Raman Spectra of Inorganic and coordination Compounds</i> , PartB: 5th ed., John Wiley & Sons Inc., New York, 1997.
5	J. A. Weil, J. R. Bolton and J. E. Wertz, <i>Electron Paramagnetic Resonance</i> ; Wiley Interscience, 1994.
E-References	
1	https://onlinecourses.nptel.ac.in/noc20_cy08/preview
2	https://www.digimat.in/nptel/courses/video/104106122/L14.html

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S
CO 5	M	S	M	S	S	M	S	M	S	S

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO /PO	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

3 – Strong, 2 – Medium, 1 - Low



**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES
FORWOMEN (AUTONOMOUS)**
Elayampalayam, Tiruchengode-637 205.

Programme	M.Sc	Programme Code	PCH			Regulations	2023-2024			
Department	Chemistry			Semester			I			
Course Code	Course Name	Periods per Week			Credit	Maximum Marks				
		L	T	P		C	CA	ESE	Total	
23P1CHAC01	AECC 1: ANALYTICAL CHEMISTRY - I			2	-		2	25	75	100
Prerequisites	Basic knowledge of analytical chemistry									
Course Objectives	<ul style="list-style-type: none"> • To understand the glasswares usage and maintenance. • To discuss the mechanism about various separation techniques. • To familiarize the functions of HPLC and ICPMS. • To analyze TLC and column chromatography. • To prepare different types of solutions. 									

Content of the Syllabus

Unit – I	Laboratory glassware	Periods	6
	Cleaning Agents – Benzene, KOH, acid mixture, Detergents and chromic acid Test for cleanliness, Calibration of pipette, burette and volumetric flask.		
Unit – II	Separation techniques	Periods	6
	Precipitation and Solvent extraction, Chromatography – Adsorption, Partition, Column and thin-layer.		
Unit – III	Chromatography	Periods	6
	HPLC– Principle, instrumentation and advantages. ICPMS – Principle, instrumentation, advantages and applications.		
Unit - IV	Theory cum lab practice: Precipitate and buffer solution	Periods	6
	Precipitation and co-precipitation, Preparation of acidic and basic buffer solution, Preparation of solution pH ranges from 3 to 12. Dilute acids and bases.		

Unit - V	Lab practice: Chromatography	Periods	6
	Chromatography: Column and TLC for organic compounds (any two) Separation techniques: Soxhlet extraction (any two)		
Extended Professional Component	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved		
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.		
Total Periods			30

Text Books	
1	R. Gopalan, P.S. Subramanian and K. Rengarajan, Elements of analytical chemistry, Sultan Chand & Sons, New Delhi, 2016.
2	B.K. Sharma, Analytical Chemistry, Krishna Prakashan Publication, Meerut, 2014.
3	D.A. Skoog, D.M. West and F.J. Holler, Analytical Chemistry: An Introduction, 5th edition, Saunders college publishing, Philadelphia, 1990.
4	B U.N. Dash, Analytical Chemistry: Theory and Practice, Sultan Chand and sons Educational Publishers, New Delhi, 1995.
5	Joseph Wang, Analytical Electrochemistry, 2 nd edition, Wiley, 2004.
References	
1	V.K. Srivastava, K.K. Srivastava, Introduction to Chromatography: Theory and Practice, S. Chand and company, New Delhi, 1987.
2	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, 2010.
3	H. Kaur, Instrumental Methods of Chemical Analysis Pragati Prakashan, Meerut, 2010.
4	Puri B.R., Sharma L.R., Pathania M.S., Principles of Physical Chemistry, (47th edition) Vishal Publishing Co., New Delhi, 2017
E-References	
1	https://www.britannica.com/science/chromatography/Elution-chromatography
2	https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_(Analytical_Chemistry)/Instrumentation_and_Analysis/Chromatography

CO-PO Mapping (Course Articulation Matrix)



	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S
CO 5	M	S	M	S	S	M	S	M	S	S

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO /PO	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

3 – Strong, 2 – Medium, 1 - Low

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FORWOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.								
Programme	M.Sc	Programme Code	PCH		Regulations	2023-2024			
Department	Chemistry		Semester		II				
Course Code	Course Name	Periods per Week		Credit	Maximum Marks				
		L	T	P	C	CA	ESE	Total	
23P2CHSP01	SEC 1: Preparation of Consumer Products		2	-		2	40	60	100
Prerequisites	Basics of organic chemistry (structural aspects), spectroscopy, basics of computers and internet								
Course Objectives	<ul style="list-style-type: none"> To understand the basics of floor cleaner, toilet cleaner To know the handling of Soaps and liquid wash products To have practical experience on sanitizer 								

Content of the Syllabus			
Practice I	Preparation of various cleaning products using green practices	Periods	15
	a. Preparation of disinfectant floor cleaner b. Preparation of disinfectant toilet cleaner c. Preparation of dish wash gel (lemon based) d. Preparation of naphthalene balls (various flavored)		
Practice II	Preparation of Soaps and liquid wash products	Periods	15
	a. Preparation of toilet soaps (various flavors such as beetroot, rose, neem, papaya, etc.) b. Preparation of face wash (orange and tomato based) c. Preparation of liquid hand wash (various flavored) d. Preparation of hand sanitizer		

Text Books	
1	R. Gopalan, P.S. Subramanian and K. Rengarajan, Elements of analytical chemistry, Sultan Chand & Sons, New Delhi, 2016.
2	B.K. Sharma, Analytical Chemistry, Krishna Prakashan Publication, Meerut, 2014.
3	S. M. Khopkar, Basic concepts of analytical chemistry, New Age International Limited, New

	Delhi, 2004.
4	B U.N. Dash, Analytical Chemistry: Theory and Practice, Sultan Chand and sons Educational Publishers, New Delhi, 1995.
5	Joseph Wang, Analytical Electrochemistry, 2 nd edition, Wiley, 2004.
References	
1	Dhruba Charan Das, Analytical Chemistry, PHI learning private limited, New Delhi, 2011.
2	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, 2010.
3	H. Kaur, Instrumental Methods of Chemical Analysis Pragati Prakashan, Meerut, 2010.
4	Puri B.R., Sharma L.R., Pathania M.S., Principles of Physical Chemistry, (47th edition) Vishal Publishing Co., New Delhi, 2017
E-References	
1	https://nptel.ac.in/content/storage2/courses/102103044/pdf/mod5.pdf
2	https://www.britannica.com/science/chemical-analysis/Electroanalysis

CO-PO Mapping (Course Articulation Matrix)


	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
Weightage	6	6	6	6	6
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 - Low

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637205.									
	Programme	M.Sc	Programme Code	PCH			Regulations	2023-2024		
Department	Chemistry			Semester			II			
Course Code	Course Name			Periods per Week			Credit	Maximum Marks		
				L	T	P	C	CA	ESE	Total
23P2CHC03	CORE COURSE III: ORGANIC REACTION MECHANISM-II			4	1		04	25	75	100
Pre requisites	Basic knowledge of organic chemistry									
Course Objectives	<ul style="list-style-type: none"> To understand the concept of aromaticity in benzenoid, non-benzenoid, Heterocyclic and annulene compounds. To understand the mechanism involved in various types of organic reactions with evidences. To understand the applications of synthetically important reagents. To correlate the reactivity between aliphatic and aromatic compounds. To design synthetic routes for synthetically used organic reactions. 									

Content of the Syllabus			
Unit-I	Elimination and Free Radical Reactions	Periods	15
	Mechanisms: E2, E1, and E1cB mechanisms. Syn- and anti-eliminations. Orientation of the double bond: Hoffmann and Saytzeff rules. Reactivity: Effect of substrate, attacking bases, leaving group and medium. Stereochemistry of eliminations in acyclic and cyclic systems, pyrolytic elimination. Long lived and short-lived radicals – Production of radicals by thermal and photochemical reactions, Detection and stability of radicals, characteristics of free radical reactions, reactions of radicals; polymerization, addition, halogenations, aromatic substitutions, rearrangements. Reactivity: Reactivity on aliphatic, aromatic substrates, reactivity in the attacking radical, effect of solvent.		
Unit-II	Oxidation and Reduction Reactions:	Periods	15
	Mechanisms: Direct electron transfer, hydride transfer, hydrogen transfer, displacement, addition-elimination, oxidative and reductive coupling reactions. Mechanism of oxidation reactions: Dehydrogenation by quinones, selenium dioxides, ferricyanide, mercuric acetate, lead tetraacetate, permanganate, manganese dioxide, osmium tetroxide, oxidation of saturated hydrocarbons, alkyl groups, alcohols, halides and amines. Reactions involving cleavage of C-C bonds-cleavage of double bonds, oxidative decarboxylation, allylic oxidation, oxidation by chromium trioxide-pyridine, DMSO-Oxalylchloride		

	(Swern oxidation) and Corey-Kimoxidation, dimethylsulphoxide-dicyclohexylcarbodiimide (DMSO-DCCD). Mechanism of reduction reactions: Wolff-Kishner, Clemmenson, Rosenmund, reduction with Trialkyl and triphenyl tin hydrides, Mc Fadyen-Steven's reduction, Homogeneous hydrogenation, Hydroboration with cyclic systems, MPV and Bouveault-Blanc reduction.		
Unit-III	Stereochemistry-II	Periods	15
	Conformation and reactivity of acyclic systems, intramolecular rearrangements, neighbouring group participation, chemical consequence of conformational equilibrium - Curtin-Hammett Principle. Stability of five and six-membered rings: mono-, di- and polysubstituted cyclohexanes, conformation and reactivity in cyclohexane systems. Fused and bridged rings: bicyclic, polycyclic systems, decalins and Brett's rule. Optical rotation and optical rotatory dispersion, conformational asymmetry, ORD curves, octant rule, configuration and conformation, Cotton effect, axial haloketone rule and determination of configuration.		
Unit-IV	Addition to Carbon Multiple Bonds	Periods	15
	Mechanisms:(a)Addition to carbon-carbon multiple bonds-Addition reactions involving electrophiles, nucleophiles, free radicals, carbenes and cyclic mechanisms-Orientation and reactivity, hydrogenation of double and triple bonds, Michael reaction, addition of oxygen and Nitrogen; (b) Addition to carbon-hetero atom multiple bonds: Mannich reaction, acids, esters, nitrites, addition of Grignard reagents, Wittig reaction, Prins reaction. Stereochemical aspects of addition reactions. Addition to Carbon-Hetero atom Multiplebonds: Addition of Grignard reagents, organozinc and organolithium reagents to carbonyl and unsaturated carbonyl compounds. Mechanism of condensation reactions involving enolates-Stobbe reactions. Hydrolysis of esters and amides, ammonolysis of esters.		
Unit-V	Reagents and Modern Synthetic Reactions	Periods	15
	Lithium diisopropyl amine (LDA), Azobisisobutyronitrile (AIBN), Sodium cyanoborohydride (NaBH ₃ CN), <i>meta</i> -Chloroperbenzoic acid (m-CPBA), Dimethylaminiopyridine (DMAP), Triethylamine (TEA), Diazobicyclo[5.4.0]undec-7-ene (DBU), Diisopropyl azodicarboxylate (DIAD), Diethylazo dicarboxylate (DEAD), <i>N</i> -bromosuccinimide(NBS), Trifluoroacetic acid (TFA), Tetramethylpiperiridin-1-oxyl (TEMPO), Phenyltrimethyl ammoniumtribromide (PTAB). Diazomethane and Zn-Cu, Diethyl maleate (DEM), Copper diacetylacetonate (Cu(acac) ₂), TiCl ₃ , NaIO ₄ , Pyridinium chlorochromate (PCC), Pyridinium dichromate(PDC), Meisenheimer complex. Suzuki coupling, Heck reaction, Negishi reaction, Baylis-Hillman reaction.		

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 / TRB / NET/ UGC-CSIR / GATE /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.
Total Periods	
75	

Text Books	
1	J.March and M.Smith, <i>Advanced Organic Chemistry</i> , 5th ed.,John-Wileyand Sons.2001.
2	E.S.Gould, <i>Mechanism and Structure in Organic Chemistry</i> ,Holt,RinehartandWinstonInc.,1959.
3	P.S.Kalsi, <i>Stereochemistry of carbon compounds</i> , 8 th edn, New Age International Publishers,2015.
4	P.Y.Bruice, <i>Organic Chemistry</i> ,7 th edn.,PrenticeHall,2013.
5	R.T.Morrison, R.N.Boyd, S.K.Bhattacharjee <i>Organic Chemistry</i> ,7 th edn., Pearson Education,2010.
References	
1	S.H.Pine, <i>Organic Chemistry</i> ,5 th edn,McGraw Hill International Editionn,1987.
2	L.F.Fieser and M.Fieser, <i>Organic Chemistry</i> ,Asia Publishing House, Bombay,2000.
3	E.S.Gould, <i>Mechanism and Structurein Organic Chemistry</i> ,Holt, Rinehart and Winston Inc.,1959.
4	T.L.Gilchrist, <i>Heterocyclic Chemistry</i> ,Longman Press,1989.
5	J.A.Joule and K.Mills, <i>Heterocyclic Chemistry</i> ,4 th ed.,John-Wiley,2010.
6	D.G.Morris, <i>Stereochemistry</i> , RSC Tutorial ChemistryText1,2001
7	E. L.Eliel, <i>Stereochemistry of Carbon Compounds</i> , Tata-McGraw Hill,2000.

E-References	
1	https://sites.google.com/site/chemistryebookscollection02/home/organic-chemistry/organic
2	https://www.organic-chemistry.org/

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S
CO 5	M	S	M	S	S	M	S	M	S	S

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO /PO	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

3 – Strong, 2 – Medium, 1 - Low



**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR
WOMEN (AUTONOMOUS)**
Elayampalayam, Tiruchengode-637 205.

Programme	M.Sc	Programme Code	PCH			Regulations	2023-2024		
Department	Chemistry		Semester				II		
Course Code	Course Name	Periods per Week			Credit	Maximum Marks			
		L	T	P		C	CA	ESE	Total
23P2CHC04	CORE COURSE IV: PHYSICAL CHEMISTRY-I		4	1		04	25	75	100
Prerequisites	Basic concepts of physical chemistry								
Course Objectives	<ul style="list-style-type: none"> To recall the fundamentals of thermodynamics and the composition of partialmolar quantities. To understand the classical and statistical approach of the functions To compare the significance of Maxwell-Boltzman, Fermi-Dirac and Bose-Einstein To correlate the theories of reaction rates for the evaluation of thermodynamicparameters. To study the mechanism and kinetics of reactions. 								

Content of the Syllabus			
Unit - I	Classical Thermodynamics	Periods	15
	Partial molar properties-Chemical potential, Variation of chemical potential with respect to temperature and pressure, Gibb's- Duhem equation-Thermodynamics of real gases - Fugacity- determination of fugacity by graphical and equation of state methods-dependence of temperature, pressure and composition. Thermodynamics of ideal and non-ideal binary mixtures, Duhem - Margulus equation applications of ideal and non-ideal mixtures. Activity and activity coefficients-standard states - determination-vapour pressure, EMF and freezing point methods.		
Unit - II	Statistical thermodynamics	Periods	15
	Introduction of statistical thermodynamics concepts of thermodynamic and mathematical probabilities-distribution of distinguishable and non-distinguishable particles. Assemblies, ensembles, canonical particles. Maxwell - Boltzmann, Fermi Dirac & Bose-Einstein Statistics- comparison and applications. Partition functions-evaluation of translational, vibrational and rotational partition functions for monoatomic, diatomic and polyatomic ideal		

	gases. Thermodynamic Functions in terms of partition Function, Statistical expression for equilibrium constant C. Calculation of Equilibrium Constant from Partition function. Heat capacity of solids-Einstein and Debye models.		
Unit - III	Irreversible Thermodynamics	Periods	15
	Theories of conservation of mass and energy entropy production in open systems by heat, matter and current flow, force and flux concepts. Onsager theory-validity and verification- Onsager reciprocal relationships. Electro kinetic and thermo mechanical effects-Application of irreversible thermodynamics to biological systems.		
Unit - IV	Kinetics of Reactions	Periods	15
	Theories of reactions-effect of temperature on reaction rates, Arrhenius equation-Derivation of Arrhenius equation, collision theory of reaction rates, collision cross sections, effectiveness of collisions, Potential energy surfaces. Transition state theory-evaluation of thermodynamic parameters of activation-applications of ARRT to reactions between atoms and molecules, time and true order-kinetic parameter evaluation. Factors determine the reaction rates in solution - primary salt effect and secondary salt effect, Homogeneous catalysis-acid- base catalysis- mechanism of acid base catalyzed reactions-Bronsted catalysis law, enzyme catalysis-Michelis-Menton catalysis.		
Unit - V	Kinetics of complex and fast reactions	Periods	15
	Kinetics of complex reactions, reversible reactions, consecutive reactions, parallel reactions, chain reactions. Chain reactions-chain length, kinetics of $H_2 - Cl_2$ & $H_2 - Br_2$ reactions (Thermal and Photochemical reactions) - Rice Herzfeld mechanism. Study of fast reactions-relaxation methods- temperature and pressure jump methods electric and magnetic field jump methods -stopped flow flash photolysis methods and pulse radiolysis.		
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 / TRB / NET/ UGC-CSIR / GATE /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.		
Total Periods			75

Text Books	
1	Rajaram and J.C. Kuriacose, Thermodynamics for Students of Chemistry, 2nd edition, S.L.N.Chand and Co., Jalandhar, 1986.
2	I.M. Klotz and R.M. Rosenberg, Chemical thermodynamics, 6th edition, W.A. Benjamin Publishers, California, 1972.
3	M.C. Gupta, Statistical Thermodynamics, New Age International, Pvt. Ltd., New Delhi, 1995.
4	K.J. Laidler, Chemical Kinetics, 3rd edition, Pearson, Reprint - 2013.
5	J. Rajaram and J.C. Kuriokose, Kinetics and Mechanisms of chemical transformation, Macmillan India Ltd, Reprint - 2011.
References	
1	D.A. Mcquarrie And J.D. Simon, Physical Chemistry - A Molecular Approach, Viva Books Pvt. Ltd., New Delhi, 1999.
2	R.P. Rastogi and R.R. Misra, Classical Thermodynamics, Vikas Publishing, Pvt. Ltd., New Delhi, 1990.
3	S.H. Maron and J.B. Lando, Fundamentals of Physical Chemistry, Macmillan Publishers, New York, 1974
4	K.B. Ytsiimiriski, "Kinetic Methods of Analysis", Pergamom Press, 1996.
5	Gurdeep Raj, Phase rule, Goel Publishing House, 2011.
E-References	
1	https://nptel.ac.in/courses/104/103/104103112/
2	https://bit.ly/3tL3GdN

CO-PO Mapping (Course Articulation Matrix)


	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S
CO 5	M	S	M	S	S	M	S	M	S	S

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO /PO	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

3 – Strong, 2 – Medium, 1 - Low

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FORWOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.									
	Programme	M.Sc	Programme Code	PCH			Regulations	2023-2024		
Department	Chemistry			Semester			II			
Course Code	Course Name	Periods per Week			Credit	Maximum Marks				
		L	T	P	C	CA	ESE	Total		
23P2CHCP02	CORE PRACTICAL II: INORGANIC CHEMISTRY PRACTICAL				1	4	04	40	60	100
Prerequisites	Basic principles of gravimetric and qualitative analysis									
Course Objectives	<ul style="list-style-type: none"> To understand and enhance the visual observation as an analytical tool for the quantitative estimation of ions. To recall the principle and theory in preparing standard solutions. To train the students for improving their skill in estimating the amount of ion accurately present in the solution To estimate metal ions, present in the given solution accurately without using instruments. To determine the amount of ions, present in a binary mixture accurately. 									

Content of the Syllabus			
Unit - I	Analysis of mixture of cations	Periods	25
	Analysis of a mixture of four cations containing two common cations and two rare cations. Cations to be tested. Group-I : W, Tl and Pb. Group-II : Se, Te, Mo, Cu, Bi and Cd. Group-III : Tl, Ce, Th, Zr, V, Cr, Fe, Ti and U. Group-IV : Zn, Ni, Co and Mn. Group-V : Ca, Ba and Sr. Group-VI : Li and Mg.		
Unit - II	Preparation of metal complexes:	Periods	25
	Preparation of inorganic complexes: a. Preparation of trithiourea copper(I) sulphate b. Preparation of potassium trioxalato chromate(III) c. Preparation of tetrammine copper(II) sulphate d. Preparation of sodium trioxalato ferrate(III) e. Preparation of hexathiourea lead(II) nitrate		
Unit - III	Complexometric Titration:	Periods	25
	a. Estimation of mixture of metal ions-pH control, masking and demasking agents. b. Determination of calcium and lead in a mixture (pH control). c. Determination of manganese in the presence of iron.		

	d. Determination of nickel in the presence of iron.
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 / TRB / NET/ UGC-CSIR / GATE /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.
Total Periods	
75	

Text Books	
1	A. JeyaRajendran, Microanalytical Techniques in Chemistry: Inorganic Qualitative Analysis, United global publishers, 2021.
2	V. V. Ramanujam, <i>Inorganic Semimicro Qualitative Analysis</i> ; 3rded., The National Publishing Company, Chennai, 1974.
3	<i>Vogel's Text book of Inorganic Qualitative Analysis</i> , 4thed., ELBS,
References	
1	G. Pass, and H. Sutcliffe, <i>Practical Inorganic Chemistry</i> ; Chapman Hall, 1965.
2	W. G. Palmer, <i>Experimental Inorganic Chemistry</i> ; Cambridge
E-References	
1	https://ocw.mit.edu/courses/3-091-introduction-to-solid-state-chemistry-fall-2018/video_galleries/lecture-videos/

CO-PO Mapping (Course Articulation Matrix)


	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S
CO 5	M	S	M	S	S	M	S	M	S	S

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO /PO	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

3 – Strong, 2 – Medium, 1 - Low

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FORWOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.									
	Programme	M.Sc	Programme Code	PCH			Regulations	2023-2024		
Department	Chemistry			Semester			II			
Course Code	Course Name	Periods per Week			Credit	Maximum Marks				
		L	T	P	C	CA	ESE	Total		
23P2CHDE03	DISCIPLINE ELECTIVE-III: MEDICINAL CHEMISTRY			4	1		03	25	75	100
Prerequisites	Basic knowledge of medicinal chemistry									
Course Objectives	<ul style="list-style-type: none"> To study the chemistry behind the development of pharmaceutical materials. To gain knowledge on mechanism and action of drugs. To understand the need of antibiotics and usage of drugs. To familiarize with the mode of action of diabetic agents and treatment of diabetes. To identify and apply the action of various antibiotics. 									

Content of the Syllabus			
Unit – I	Introduction to receptors	Periods	15
	Introduction, targets, Agonist, antagonist, partial agonist. Receptors, Receptor types, Theories of Drug – receptor interaction, Drug synergism, Drug resistance, physicochemical factors influencing drug action.		
Unit – II	Antibiotics	Periods	15
	Introduction, Targets of antibiotics action, classification of antibiotics, enzyme-based mechanism of action, SAR of penicillins and tetracyclins, clinical application of penicillins, tetracyclins. Current trends in antibiotic therapy.		
Unit – III	Antihypertensive agents and diuretics	Periods	15
	introduction to hypertension, types, classification of antihypertensive agents, classification and mechanism of action of diuretics, SAR and Mechanism of action of Furosemide, Hydrochlorothiazide, Amiloride.		
Unit - IV	Antiviral and Antibacterial	Periods	15
	Classification of antiviral agents, Mechanism of action - Chloroquine Phosphate, Amodiaquine hydrochloride and Pyrimethamine. Antibacterial: Classification and mechanism of action, Sulphanilamide, Sulphapyridine, Sulphadiazine and Sulphisoxazole.		
Unit - V	Analgesics, Antipyretics and Anti-inflammatory Drugs	Periods	15

	Introduction, Mechanism of inflammation, classification and mechanism of action and paracetamol, Ibuprofen, Diclofenac, naproxen, indomethacin, phenylbutazone. Medicinal Chemistry of Antidiabetic Agents Introduction, Types of diabetics, Drugs used for the treatment, chemical classification, Mechanism of action, Treatment of diabetic mellitus. Chemistry of insulin, sulfonyl urea.
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 / TRB / NET/ UGC-CSIR / GATE /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.
Total Periods	
75	

Text Books	
1	Wilson and Gisvold's textbook of organic medicinal and pharmaceutical chemistry,
2	Wilson, Charles Owens: Beale, John Marlowe; Block, John H, Lipincott William, 12th edition, 2011.
3	Graham L. Patrick, An Introduction to Medicinal Chemistry, 5th edition, Oxford University Press, 2013. Jayashree Ghosh, A text book of Pharmaceutical Chemistry, S. Chand and Co. Ltd, 1999, 1999 edn.
4	O. LeRoy, Natural and synthetic organic medicinal compounds, Ealemi, 1976.
5	S. Ashutosh Kar, Medicinal Chemistry, Wiley Eastern Limited, New Delhi, 1993, New edn.
References	
1	Foye's Principles of Medicinal Chemistry, Lipincott Williams, Seventh Edition, 2012
2	Burger's Medicinal Chemistry, Drug Discovery and Development, Donald J. Abraham, David P. Rotella, Alfred Burger, Academic press, 2010.
3	Wilson and Gisvold's Textbook of Organic Medicinal and Pharmaceutical Chemistry, John M. Beale Jr and John M. Block, Wolters Kluwer, 2011, 12 th edn.
4	P. Parimoo, A Textbook of Medical Chemistry, New Delhi: CBS Publishers. 1995.
	S. Ramakrishnan, K. G. Prasannan and R. Rajan, Textbook of Medical Biochemistry, Hyderabad: Orient Longman. 3 rd edition, 2001.

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1.	https://www.ncbi.nlm.nih.gov/books/NBK482447/
2.	https://training.seer.cancer.gov/treatment/chemotherapy/types.html
3.	https://www.classcentral.com/course/swayam-medicinal-chemistry-12908

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S
CO 5	M	S	M	S	S	M	S	M	S	S

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO /PO	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

3 – Strong, 2 – Medium, 1 - Low



**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES
FORWOMEN (AUTONOMOUS)**
Elayampalayam, Tiruchengode-637 205.

Programme	M.Sc	Programme Code	PCH			Regulations	2023-2024			
Department	Chemistry			Semester			II			
Course Code	Course Name	Periods per Week			Credit	Maximum Marks				
		L	T	P	C	CA	ESE	Total		
23P2CHDE03	DISCIPLINE ELECTIVE-III: GREEN CHEMISTRY			4	1		03	25	75	100
Prerequisites	Basic knowledge of general chemistry									
Course Objectives	<ul style="list-style-type: none"> • To discuss the principles of green chemistry. • To propose green solutions for chemical energy storage and conversion. • Propose green solutions for industrial production of Petroleum and Petrochemicals. • Propose solutions for pollution prevention in Industrial chemical and fuel production, Automotive industry and Shipping industries. • Propose green solutions for industrial production of Surfactants, Organic and inorganic chemicals. 									

Content of the Syllabus			
Unit – I	Introduction and principle of green chemistry	Periods	15
	Introduction, targets, Agonist, antagonist, partial agonist. Receptors, Receptor Introduction- Need for Green Chemistry. Goals of Green Chemistry. Limitations/ of Green Chemistry. Chemical accidents, terminologies, International green chemistry organizations and Twelve principles of Green Chemistry with examples.		
Unit – II	Green synthesis	Periods	15
	Choice of starting materials, reagents, catalysts and solvents in detail, green chemistry in day today life. Designing green synthesis-green reagents: dimethyl carbonate. Green solvents: Water, Ionic liquids-criteria, general methods of preparation, effect on organic reaction. Supercritical carbon dioxide- properties, advantages, drawbacks and a few examples of organic reactions in scCO ₂ . Green synthesis-adipic acid and catechol.		
Unit – III	Green catalysis	Periods	15
	Environmental pollution, Green Catalysis-Acid catalysts, Oxidation catalysts, Basic catalysts, Polymer supported catalysts-Poly styrene aluminum chloride, polymeric super acid catalysts, Poly supported photosensitizers.		
Unit - IV	Applications of Green synthesis	Periods	15
	Phase transfer catalysis in green synthesis-oxidation using hydrogenperoxide, crown ethers-esterification, saponification, anhydride formation, Elimination reaction, Displacement reaction. Applications in organic synthesis.		

	Instrumentation	Periods	15
Unit - V	Micro wave induced green synthesis-Introduction, Instrumentation, Principle and applications. Sonochemistry – Instrumentation, Cavitation theory - Ultra sound assisted green synthesis and Applications.		
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 / TRB / NET/ UGC-CSIR / GATE /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.		
Total Periods			75

Text Books	
1	Ahluwalia, V.K. and Kidwai, M.R. New Trends in Green Chemistry, Anamalaya Publishers, 2005.
2	W. L. McCabe, J.C. Smith and P. Harriott, Unit Operations of Chemical Engineering, 7 th edition, McGraw-Hill, NewDelhi,2005.
3	J. M. Swan and D. St. C. Black, Organometallics in Organic Synthesis, Chapman Hall,1974.
4	V. K. Ahluwalia and R. Aggarwal, Organic Synthesis: Special Techniques, Narosa Publishing House, New Delhi,2001.
5	A. K. De, Environmental Chemistry, New Age Publications, 2017.
References	
1	Anastas, P.T. and Warner, J.K. Oxford Green Chemistry -Theory and Practical, University Press, 1998
2	Matlack, A.S. Introduction to Green Chemistry, Marcel Dekker, 2001
3	Cann, M.C. and Connely, M.E. Real-World Cases in Green Chemistry, American Chemical Society, Washington, 2000
4	Ryan, M.A. and Tinnesand, M., Introduction to Green Chemistry, American Chemical Society Washington, 2002.
5	Chandrakanta Bandyopadhyay, An Insight into Green Chemistry, Books and Allied (P) Ltd, 2019.

E-References	
1	https://www.organic-chemistry.org/
2	https://www.studyorgo.com/summary.php

CO-PO Mapping (Course Articulation Matrix)


	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S
CO 5	M	S	M	S	S	M	S	M	S	S

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO /PO	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

3 – Strong, 2 – Medium, 1 - Low

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.									
	Programme	M.Sc	Programme Code	PCH			Regulations	2023-2024		
Department	Chemistry			Semester			II			
Course Code	Course Name	Periods per Week			Credit	Maximum Marks				
		L	T	P	C	CA	ESE	Total		
23P2CHDE04	DISCIPLINE ELECTIVE-IV: BIO-INORGANIC CHEMISTRY			4	1		03	25	75	100
Prerequisites	Basic knowledge of chemistry									
Course Objectives	<ul style="list-style-type: none"> To understand the role of trace elements. To understand the biological significance of iron, Sulphur. To study the toxicity of metals in medicines. To have knowledge on diagnostic agents. To discuss on various metalloenzymes properties. 									

Content of the Syllabus			
Unit – I	Essential trace elements	Periods	15
	Selective transport and storage of metal ions: Ferritin, Transferrin and siderophores; Sodium and potassium transport, Calcium signalling proteins. Metalloenzymes: Zinc enzymes–carboxypeptidase and carbonic anhydrase. Iron enzymes–catalase, peroxidase. Copper enzymes – superoxide dismutase, Plastocyanin, Ceruloplasmin, Tyrosinase. Coenzymes - Vitamin-B12 coenzymes.		
Unit – II	Transport Proteins	Periods	15
	Oxygen carriers -Hemoglobin and myoglobin - Structure and oxygenation Bohr Effect. Cytochromes-Classification, cytochrome a, b and c. Cytochrome P-450. Non-heme oxygen carriers-Hemerythrin and hemocyanin. Iron-sulphur proteins- Rubredoxin and Ferredoxin- Structure and classification.		
Unit – III	Nitrogen fixation	Periods	15
	Introduction, types of nitrogen fixing microorganisms. Nitrogenase enzyme - Metal clusters in nitrogenase- redox property - Dinitrogen complexes transition metal complexes of dinitrogen - nitrogen fixation via nitride formation and reduction of dinitrogen to ammonia. Photosynthesis: photosystem-I and photosystem-II-chlorophylls structure and function.		
Unit - IV	Metals in medicine	Periods	15
	Metal Toxicity of Hg, Cd, Zn, Pb, As, Sb. Therapeutic Compounds: Vanadium-Based Diabetes Drugs; Platinum-Containing Anticancer Agents. Chelation therapy; Cancer treatment. Diagnostic Agents: Technetium Imaging Agents; Gadolinium MRI Imaging Agents. temperature and critical magnetic Field.		

	Enzymes	Periods	15
Unit - V	Enzyme kinetics, free energy of activation and the effects of catalysis. Michelis - Menton equation - Effect of pH, temperature on enzyme reactions. Factors contributing to the efficiency of enzyme.		
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 / TRB / NET/ UGC-CSIR / GATE /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.		
Total Periods			75

Text Books	
1	D.R. Williams, -Introduction to Bioinorganic chemistry.
2	F.M. Fiabre and D.R. Williams - The Principles of Bioinorganic Chemistry, Royal Society of Chemistry, Monograph for Teachers-31
3	K.F. Purcell and Kotz., Inorganic chemistry, WB Saunders Co., USA.
4	G.N. Mughjerjea and Arabinda Das, Elements of Bioinorganic Chemistry - 1993.
5	R. Gopalan, V. Ramalingam, <i>Concise Coordination Chemistry</i> , S. Chand, 2001 .
References	
1	M.Satake and Y.Mido, Bioinorganic Chemistry- Discovery Publishing House, New Delhi (1996)
2	M.N. Hughes, 1982, The Inorganic Chemistry of Biological processes, II Edition, Wiley London.
3	R. W. Hay, Bio Inorganic Chemistry, Ellis Horwood, 1987.
4	R. M. Roat-Malone, Bio Inorganic Chemistry, John Wiley, 2002.
5	T. M. Loehr, Iron carriers and Iron proteins, VCH, 1989.

E-References	
1	https://www.pdfdrive.com/instant-notes-in-inorganic-chemistry-the-instant-notes-chemistry-series-d162097454.html
2	https://www.pdfdrive.com/shriver-and-atkins-inorganic-chemistry-5th-edition-d161563417.html

CO-PO Mapping (Course Articulation Matrix)



	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S
CO 5	M	S	M	S	S	M	S	M	S	S

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO /PO	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

3 – Strong, 2 – Medium, 1 - Low

		VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FORWOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.							
Programme	M.Sc	Programme Code	PCH		Regulations	2023-2024			
Department	Chemistry		Semester			II			
Course Code	Course Name	Periods per Week			Credit	Maximum Marks			
		L	T	P	C	CA	ESE	Total	
23P2CHDE04	ELECTIVE PAPER-IV: MATERIAL SCIENCE		4	1		03	25	75	100
Prerequisites	Basic knowledge of solid-state chemistry								
Course Objectives	<ul style="list-style-type: none"> To understand the crystal structure, growth methods and X-ray scattering. To explain the optical, dielectric and diffusion properties of crystals. To recognize the basis of semiconductors, superconductivity materials and magnets. To study the synthesis, classification and applications of nanomaterials. To learn about the importance of materials used for renewable energy conversion. 								

Content of the Syllabus			
Unit – I	Crystallography	Periods	15
	symmetry - unit cell and Miller indices - crystal systems - Bravais lattices - point groups and space groups - X-ray diffraction-Laue equations-Bragg's law-reciprocal lattice and its application to geometrical crystallography. Crystal structure—powder and single crystal applications. Electron charge density maps, neutron diffraction-method and applications. Crystal Defects: Point defects-types of point defects-thermodynamics of point defects. Geometry of dislocations, evidence of dislocations. Grain boundaries-atoms structure of grain boundaries.		
Unit – II	Crystal growth methods	Periods	15
	Nucleation—equilibrium stability and metastable state. Single crystal –Low and high temperature, solution growth– Gel and sol-gel. Crystal growth methods-nucleation– equilibrium stability and metastable state. Single crystal–Low and high temperature, solution growth– Gel and sol-gel. Melt growth - Bridgeman-Stockbarger, Czochralski methods. Flux technique, physical and chemical vapour transport. Lorentz and polarization factor - primary and secondary extinctions.		
Unit – III	Properties of crystals	Periods	15
	Optical studies - Electromagnetic spectrum (qualitative) refractive index – reflectance – transparency, translucency and opacity. Types of luminescence – photo-electro-, and injection luminescence, LEDs – organic, Inorganic and polymer LED materials - Applications. Dielectric studies- Polarisation - electronic, ionic, orientation, and space charge polarisation. Effect of temperature. dielectric constant, dielectric loss. Types of dielectric breakdown—intrinsic, thermal, discharge, electrochemical and defect breakdown.		

Unit - IV	Special Materials	Periods	15
	Superconductivity: Meissner effect, Critical temperature and critical magnetic Field, Type I and II superconductors, BCS theory-Cooper pair, Applications. Soft and hard magnets – Domain theory Hysteresis Loop-Applications. Magneto and giant magneto resistance. Ferro, ferri and antiferromagnetic materials-applications, magnetic parameters for recording applications. Ferro-, Piezo-, and pyro electric materials – properties and applications. Shape memory Alloys-characteristics and applications.		
Unit - V	Materials for Renewable Energy Conversion	Periods	15
	Solar Cells: Organic, bilayer, bulk heterojunction, polymer, perovskite based. Solar energy conversion: lamellar solids and thin films, dye-sensitized photo voltaic cells, coordination compounds anchored onto semiconductor surfaces - Ru(II) and Os(II) polypyridyl complexes. Photochemical activation and splitting of water, CO ₂ and N ₂ .		
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 / TRB / NET/ UGC-CSIR / GATE /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.		
Total Periods			75

Text Books	
1	S. Mohan and V. Arjunan, Principles of Materials Science, MJP Publishers, 2016.
2	Arumugam, Materials Science, Anuradha Publications, 2007.
3	Giacavazzo et. al., Fundamentals of Crystallography, International Union of Crystallography. Oxford Science Publications, 2010
4	Woolfson, An Introduction to Crystallography, Cambridge University Press, 2012.
5	James F. Shackelford and Madanapalli K. Muralidhara, Introduction to Materials Science for Engineers. 6th ed., PEARSON Press, 2007.
References	
1	M.G. Arora, Solid State Chemistry, Anmol Publications, New Delhi, 2001.

2	R.K. Puri and V.K. Babbar, Solid State Physics, S Chand and Company Ltd, 2001.
3	C. Kittel, Solid State Physics, John-Wiley and sons, NY, 1966.
4	H.P. Meyers, Introductory Solid State Physics, Viva Books Private Limited, 1998.
5	A.R. West, Solid State Chemistry and Applications, John-Wiley and sons, 1987.

E-References

1	http://xrayweb.chem.ou.edu/notes/symmetry.html .
2	http://www.uptti.ac.in/classroom-content/data/unit%20cell.pdf .
3	https://bit.ly/3QyVg2R

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S
CO 5	M	S	M	S	S	M	S	M	S	S

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO /PO	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

3 – Strong, 2 – Medium, 1 - Low



**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES
FORWOMEN (AUTONOMOUS)**
Elayampalayam, Tiruchengode-637 205.

Programme	M.Sc	Programme Code	PCH			Regulations	2023-2024			
Department	Chemistry			Semester			II			
Course Code	Course Name	Periods per Week			Credit	Maximum Marks				
		L	T	P	C	CA	ESE	Total		
23P1CHAC02	AECC 2: ANALYTICAL CHEMISTRY - II			2	-		2	25	75	100
Prerequisites	Basic knowledge of analytical and electro analytical chemistry									
Course Objectives	<ul style="list-style-type: none"> • To understand the laboratory safety and hygiene. • To classify the types of precipitations. • To gain knowledge on amperometric titrations. • To apply the electrolytic separation of metals. • To analyze the thermal stability of the compounds. 									

Content of the Syllabus

Unit – I	Laboratory Hygiene and Safety	Periods	6
	Storage and handling of chemicals-handling of toxic and poisonous chemicals, General precautions, first aid techniques - acid and alkali on eye - acid and alkali burn - bromine burns - cut by glasses - heat burns - Inhalation of toxic vapours. Poisoning - Treatment for specific poisons - acids, alkalis, acetone, arsenic, copper compounds and cyanides.		
Unit – II	Gravimetric analysis	Periods	6
	Precipitation – Methods of obtaining the precipitate- condition of precipitate - choice of precipitants- organic Precipitants - Types of organic precipitants - chelating and ion associating precipitants - Advantages and Disadvantages of using organic precipitants. Coprecipitation and post-precipitation-precipitation from homogeneous solution-digestion, filtration and washing-drying and ignition.		

Unit – III	Amperometry	Periods	6
	Amperometry - principle, amperometric titration curves, amperometric indicators, instrumentation, techniques for amperometric titrations, advantages and disadvantages. Applications of amperometry titration. Biamperometric titrations- theory, - Instrumentation, Techniques, advantages and applications.		
Unit - IV	Electrogravimetry	Periods	6
	Electrogravimetry- theory, important terms used in electrogravimetric analysis- voltaic and electrolytic cells, cathode, anode, polarized electrode, current density, current efficiency, decomposition potential and over potential - advantages. Electrogravimetric methods, instrumentation- electrolysis- principle - Determination of Cu and Co by constant current electrolysis.		
Unit - V	Thermal Analysis	Periods	6
	Principle of thermogravimetric analysis (TGA). Differential thermal analysis (DTA): instrumentation and applications. Factors affecting TGA and DTA curves. TGA of AgNO ₃ , CaC ₂ O ₄ .H ₂ O and DTA of sulphur.		
Extended Professional Component	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved		
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.		
Total Periods	30		

Text Books	
1	R. Gopalan, P.S. Subramanian and K. Rengarajan, Elements of analytical chemistry, Sultan Chand & Sons, New Delhi, 2016.
2	B.K. Sharma, Analytical Chemistry, Krishna Prakashan Publication, Meerut, 2014.
3	S. M. Khopkar, Basic concepts of analytical chemistry, New Age International Limited, New Delhi, 2004.
4	B U.N. Dash, Analytical Chemistry: Theory and Practice, Sultan Chand and sons Educational Publishers, New Delhi, 1995.
5	Joseph Wang, Analytical Electrochemistry, 2 nd edition, Wiley, 2004.
References	
1	Dhruba Charan Das, Analytical Chemistry, PHI learning private limited, New Delhi, 2011.
2	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, 2010.

3	H. Kaur, Instrumental Methods of Chemical Analysis Pragati Prakashan, Meerut, 2010.
4	Puri B.R., Sharma L.R., Pathania M.S., Principles of Physical Chemistry, (47th edition) Vishal Publishing Co., New Delhi, 2017
E-References	
1	https://nptel.ac.in/content/storage2/courses/102103044/pdf/mod5.pdf
2	https://www.britannica.com/science/chemical-analysis/Electroanalysis

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S
CO 5	M	S	M	S	S	M	S	M	S	S

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO /PO	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

3 – Strong, 2 – Medium, 1 - Low



**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES
FORWOMEN (AUTONOMOUS)**
Elayampalayam, Tiruchengode-637 205.

Programme	M.Sc	Programme Code	PCH			Regulations	2023-2024		
Department	Chemistry		Semester			II			
Course Code	Course Name	Periods per Week			Credit	Maximum Marks			
		L	T	P		C	CA	ESE	Total
23P2CHSP02	SEC 2: Research Tools and Techniques		2	-		2	40	60	100
Prerequisites	Basics of organic chemistry (structural aspects), spectroscopy, basics of computers and internet								
Course Objectives	<ul style="list-style-type: none"> To understand the basics of literature survey and gain insights on various search engines and databases. To know the handling of chemical software's such as Chemdraw, chems ketch, etc. To have practical experience on various kinds of plotting by using Orgin software. 								

Content of the Syllabus			
Unit – I	Tools and Techniques in Literature Survey	Periods	12
	Basics of Literature Survey: searching of primary, secondary and tertiary literatures through American Chemical Society (ACS), Royal Society of Chemistry (RSC), Wiley, Elsevier, Springer and Tailor & Francis publishers – DOI, crossmark, Reference format (of ACS, RSC and Elsevier), impact factor, citations, H-index, i10index – Search engines: Google scholar, sciencedirect, web of science, researchgate and PubMed		
Unit – II	Hands-on Practice I: Chemdraw	Periods	08
	Chemdraw: drawing of chemical structures, identification of IUPAC name from structure, drawing structures from the name, calculation of molecular weight from the structure – systematic hands-on practice on various tools of chemdraw for smart drawing of structure and schemes – types of arrows – aromatic structures – various apparatus - stereochemical representations - carbohydrate structures – text options with colored background		
Unit – III	Hands-on Practice II: Origin	Periods	10

	Origin: need of the software – transferring of ASCII file to origin – plotting – normalization – spectral plotting of UV-Visible, photoluminescence and FT/IR – spectral overlapping (of UV-Visible and photoluminescence spectra) – picking and marking of peaks/bands and its values such as λ_{ex} and λ_{em} and IR frequencies – inner plot (inset) – axes title – axes scale – fine tuning the plot – exporting origin graph/plot to MS word
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Text Books	
1	R. Gopalan, P.S. Subramanian and K. Rengarajan, Elements of analytical chemistry, Sultan Chand & Sons, New Delhi, 2016.
2	B.K. Sharma, Analytical Chemistry, Krishna Prakashan Publication, Meerut, 2014.
3	S. M. Khopkar, Basic concepts of analytical chemistry, New Age International Limited, New Delhi, 2004.
4	B U.N. Dash, Analytical Chemistry: Theory and Practice, Sultan Chand and sons Educational Publishers, New Delhi, 1995.
5	Joseph Wang, Analytical Electrochemistry, 2 nd edition, Wiley, 2004.
References	
1	Dhruba Charan Das, Analytical Chemistry, PHI learning private limited, New Delhi, 2011.
2	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, 2010.
3	H. Kaur, Instrumental Methods of Chemical Analysis Pragati Prakashan, Meerut, 2010.
4	Puri B.R., Sharma L.R., Pathania M.S., Principles of Physical Chemistry, (47th edition) Vishal Publishing Co., New Delhi, 2017
E-References	
1	https://nptel.ac.in/content/storage2/courses/102103044/pdf/mod5.pdf
2	https://www.britannica.com/science/chemical-analysis/Electroanalysis

CO-PO Mapping (Course Articulation Matrix)


	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
Weightage	9	9	9	9	9
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 - Low

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637205.									
	Programme	M.Sc	Programme Code	PCH			Regulations	2023-2024		
Department	Chemistry			Semester			III			
Course Code	Course Name	Periods per Week			Credit	Maximum Marks				
		L	T	P	C	CA	ESE	Total		
23P3CHC05	CORE COURSE-V: ORGANIC SYNTHESIS AND PHOTOCHEMISTRY			5	1		05	25	75	100
Pre requisites	Basic knowledge of organic chemistry									
Course Objectives	<ul style="list-style-type: none"> To understand the molecular complexity of carbon skeletons and the presence of functional groups and their relative positions. To study various synthetically important reagents for any successful organic synthesis. To apply disconnection approach and identifying suitable synthons to effect successful organic synthesis. To learn the concepts of pericyclic reaction mechanisms. To gain the knowledge of photochemical organic reactions. 									

Content of the Syllabus			
Unit-I	Planning an Organic Synthesis and Control elements:	Periods	15
	Preliminary Planning – knowns and unknowns of the synthetic system studied, analysis of the complex and interrelated carbon framework into simple rational precursors, retrosynthetic analysis, alternate synthetic routes, key intermediates that would be formed, available starting materials and resulting yield of alternative methods. Linear Vs convergent synthesis. Synthesis based on umpolung concepts of Seebach, regiospecific control elements. Use of protective groups, activating groups and bridging elements. Examples on retrosynthetic approach, calculation of yield, advantages of convergent synthesis, synthesis of stereochemistry-controlled products.		
Unit-II	Organic Synthetic Methodology	Periods	15
	Retrosynthetic analysis; Alternate synthetic routes. Synthesis of organic mono and bifunctional compounds via disconnection approach. Key intermediates, available starting materials and resulting yields of alternative methods. Convergent and divergent synthesis, Synthesis based on umpolung concepts of Seebach. Protection of hydroxyl, carboxyl, carbonyl, thiol and amino groups.		

	Illustration of protection and deprotection in synthesis. Control elements: Regiospecific control elements. Use of protective groups, activating groups, and bridging elements. Stereospecific control elements. Functional group alterations and transposition.		
Unit-III	Pericyclic Reactions	Periods	15
	Wood ward Hoffmann rules; The Mobius and Huckel concept, FMO, PMO method and correlation diagrams. Cycloaddition and retrocycloaddition reactions; [2+2], [2+4], [4+4, Cationic, anionic, and 1,3-dipolar cycloadditions. Cheletropic reactions.; Electrocyclization and ring opening reactions of conjugated dienes and trienes. Sigmatropic rearrangements:(1,3),(1,5),(3,3) and (5,5) carbon migrations, degenerate rearrangements. Ionicsigmatropic rearrangements. Group transfer reactions. Regioselectivity, stereoselectivity and periselectivity in pericyclic reactions.		
Unit-IV	Organic Photochemistry-I	Periods	15
	Photochemical excitation: Experimental techniques; electronic transitions; Jablonskii diagrams; intersystem crossings; energy transfer processes; Stern Volmer equation. Reactions of electronically excited ketones; $\pi \rightarrow \pi^*$ triplets; Norrish type-I and type-II cleavage reactions; photo reductions; Paterno-Buchi reactions;		
Unit-V	Organic Photochemistry-II	Periods	15
	Photochemistry of α,β -unsaturated ketones; cis-trans isomerisation. Photon energy transfer reactions, Photo cycloadditions, Photochemistry of aromatic compounds; photochemical rearrangements; photo-stationary state; di- π -methane rearrangement; Reaction of conjugated cyclohexadienone to 3,4-diphenylphenols; Barton's reactions.		
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/ TRB/ NET/ UGC-CSIR /GATE /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.		
Total Periods			75

Text Books	
1	F.A.Carey and Sundberg, Advanced Organic Chemistry, 5 th ed, Tata McGraw-Hill, New York, 2003.
2	J.March and M.Smith, Advanced Organic Chemistry, 5 th ed., John-Wiley and sons, 2007.
3	R.E. Ireland, Organic synthesis, Prentice Hall India, Goel publishing house, 1990.
4	Clayden, Greeves, Warren, Organic Chemistry, Oxford University Press, Second Edition, 2016.
5	M.B.Smith, Organic Synthesis 3 rd edn, McGraw Hill International Edition, 2011.
References	
1	Gill and Wills, Pericyclic Reactions, Chapman Hall, London, 1974.
2	J.A.Joule, G.F.Smith, Heterocyclic Chemistry, Garden City Press, Great Britain, 2004.
3	W.Caruthers, Some Modern Methods of Organic Synthesis 4 th edn, Cambridge University Press, Cambridge, 2007.
4	H.O.House. Modern Synthetic reactions, W.A.Benjamin Inc, 1972.
5	Jagdamba Singh and Jaya Singh, Photochemistry and Pericyclic Reactions, New Age International Publishers, New Delhi, 2012.
E-References	
1	https://rushim.ru/books/praktikum/Monson.pdf

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S
CO 5	M	S	M	S	S	M	S	M	S	S

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO /PO	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

3 – Strong, 2 – Medium, 1 - Low



**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR
WOMEN (AUTONOMOUS)**
Elayampalayam, Tiruchengode-637 205.

Programme	M.Sc	Programme Code	PCH			Regulations	2023-2024		
Department	Chemistry			Semester			III		
Course Code	Course Name	Periods per Week			Credit	Maximum Marks			
		L	T	P		C	CA	ESE	Total
23P3CHC06	CORE COURSE VI: COORDINATION CHEMISTRY – I	5	1		05	25	75	100	
Prerequisites	Basic knowledge of inorganic chemistry								
Course Objectives	<ul style="list-style-type: none"> To gain insights into the modern theories of bonding in coordination compounds. To learn various methods to determine the stability constants of complexes. To understand and construct correlation diagrams and predict the electronic transitions that are taking place in the complexes. To describe various substitution and electron transfer mechanistic pathways of reactions in complexes. To evaluate the reactions of octahedral and square planar complexes. 								

Content of the Syllabus

Unit - I	Modern theories of coordination compounds	Periods	15
	Crystal field theory splitting of d orbitals in octahedral, tetrahedral and square planar symmetries measurement of $10Dq$ factors affecting $10Dq$ spectrochemical series crystal field stabilisation energy for high spin and low spin complexes evidences for crystal field splitting site selections in spinels and antispinel Jahn Teller distortions and its consequences. Molecular Orbital Theory and energy level diagrams concept of Weak and strong fields, Sigma and pi bonding in octahedral, square planar and tetrahedral complexes.		
Unit - II	Spectral characteristics of complexes	Periods	15
	Term states for d ions characteristics of d-d transitions charge transfer spectra selection rules for electronic spectra – spin selection rule-Laporte selection rule; Orgel correlation diagrams – metal ions in octahedral and tetrahedral ligand environment, spectrochemical series -nephelauxetic series Racha parameter and calculation of inter-electronic repulsion parameter.		
Unit - III	Stability and Magnetic property of the complexes	Periods	15

	Stability of complexes: Factors affecting stability of complexes, Thermodynamic aspects of complex formation, Stepwise and overall formation constants, Stability correlations, statistical factors and chelate effect, Determination of stability constant and composition of the complexes: Formation curves and Bjerrum's half method, Potentiometric method, Magnetic property of complexes: Spin-orbit coupling, effect of spin-orbit coupling on magnetic moments, quenching of orbital magnetic moments.		
Unit - IV	Kinetics and mechanisms of substitution reactions of octahedral and square planar complexes	Periods	15
	Inert and Labile complexes; Associative, Dissociative and SNCB mechanistic pathways for substitution reactions; acid and base hydrolysis of octahedral complexes; Classification of metal ions based on the rate of water replacement reaction and their correlation to Crystal Field Activation Energy; Substitution reactions in square planar complexes: Trans effect, theories of trans effect and applications of trans effect in synthesis of square planar compounds; Kurnakov test.		
Unit - V	Electron Transfer reactions in octahedral complexes	Periods	15
	Outer sphere electron transfer reactions and Marcus-Hush theory; inner sphere electron transfer reactions; nature of the bridging ligand in inner sphere electron transfer reactions. Photo-redox, photo-substitution and photo- isomerisation reactions in complexes and their applications.		
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 / TRB / NET/ UGC-CSIR / GATE /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.		
Total Periods			75

Text Books	
1	J E Huheey, EA Keiter, RL Keiter and OK Medhi, Inorganic Chemistry – Principles of structure and reactivity, 4th Edition, Pearson Education Inc., 2006
2	G L Meissler and D ATarr, Inorganic Chemistry, 3rd Edition, Pearson Education Inc., 2008
3	D. Bannerjea, Co-ordination Chemistry, TATA Mcgraw Hill, 1993.
4	B. N. Figgis, Introduction to Ligand Fields, Wiley Eastern Ltd, 1976.
5	F. A. Cotton, G. Wilkinson.; C. A. Murillo; M. Bochmann, Advanced Inorganic Chemistry, 6th ed.; Wiley Inter-science: New York, 1988
References	
1	Keith F. Purcell and John C. Kotz, Inorganic Chemistry, Saunders Publications, USA, 1977.
2	Peter Atkins and Tina Overton, Shriver and Atkins' Inorganic Chemistry, 5th Edition, Oxford University Press, 2010.
3	Basic Inorganic Chemistry, F. A. Cotton, G. Wilkinson, P. L. Guas, John Wiley, 2002, 3rd edn.
4	Concepts and Models of Inorganic Chemistry,
5	Inorganic Chemistry, D. F. Shriver, P. W. Atkins, W. H. Freeman and Co, London, 2010
E-References	
1	https://ocw.mit.edu/courses/5-04-principles-of-inorganic-chemistry-ii-fall-2008/pages/syllabus/

CO-PO Mapping (Course Articulation Matrix)


	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S
CO 5	M	S	M	S	S	M	S	M	S	S

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO /PO	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

3 – Strong, 2 – Medium, 1 - Low

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FORWOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.									
	Programme	M.Sc	Programme Code	PCH			Regulations	2023-2024		
Department	Chemistry			Semester			III			
Course Code	Course Name	Periods per Week			Credit	Maximum Marks				
		L	T	P	C	CA	ESE	Total		
23P3CHCP03	CORE PRACTICAL-III: PHYSICAL CHEMISTRY PRACTICAL				1	4	04	40	60	100
Prerequisites	Basic knowledge of physical chemistry									
Course Objectives	<ul style="list-style-type: none"> To understand the principle of conductivity experiments through conductometric titrations. To evaluate the order of the reaction, temperature coefficient, and activation energy of the reaction by following pseudo first order kinetics. To construct the phase diagram of two component system forming congruent melting solid and find its eutectic temperatures and compositions. To determine the kinetics of adsorption of oxalic acid on charcoal. To develop the potential energy diagram of hydrogen ion, charge density distribution and Maxwell's speed distribution by computational calculation. 									

Content of the Syllabus			
Unit - I	Conductivity Experiments	Periods	25
	1. Determination of equivalent conductance of a strong electrolyte & the verification of DHO equation. 2. Verification of Ostwald's Dilution Law & Determination of pKa of a weak acid. 3. Verification of Kohlrausch's Law for weak electrolytes. 4. Determination of solubility of a sparingly soluble salt. 5. Acid-base titration (strong acid and weak acid vs NaOH). 6. Precipitation titrations (mixture of halides only). 7. Conductometric titration of NH ₄ Cl Vs NaOH 8. Conductometric titration of CH ₃ COONa Vs HCl		
Unit - II	Kinetics	Periods	25
	1. Study the kinetics of acid hydrolysis of an ester, determine the temperature coefficient and also the activation energy of the reaction. 2. Study the kinetics of the reaction between acetone and iodine in acidic medium by half-life method and determine the order with respect to iodine and acetone.		

	Phase diagram	Periods	25
Unit - III	Construction of phase diagram for a simple binary system 1. Naphthalene 2. e- Diphenyl amine Adsorption Adsorption of oxalic acid on charcoal (Freundlich isotherm only).		
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 / TRB / NET/ UGC-CSIR / GATE /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.		
Total Periods			75

Text Books	
1.	B. Viswanathan and P.S.Raghavan, Practical Physical Chemistry, Viva Books, New Delhi, 2009.
2.	Sundaram, Krishnan, Raghavan, Practical Chemistry (Part II), S. Viswanathan Co. Pvt., 1996.
3.	V.D. Athawale and Parul Mathur, Experimental Physical Chemistry, New Age International (P) Ltd., New Delhi, 2008.
4.	E.G. Lewers, Computational Chemistry: Introduction to the Theory
References	
1.	J. B. Yadav, Advanced Practical Physical Chemistry, Goel Publishing House, 2001.
2.	G.W. Garland, J.W. Nibler, D.P. Shoemaker, Experiments in Physical Chemistry, 8th edition, McGraw Hill, 2009.
3.	J. N. Gurthu and R. Kapoor, Advanced Experimental Chemistry, S. Chand and Co., 1987.
4.	Shailendra K Sinha, Physical Chemistry: A laboratory Manual, Narosa Publishing House Pvt, Ltd., New Delhi, 2014.
5.	F. Jensen, Introduction to Computational Chemistry, 3 rd Ed., Wiley-Blackwell.
E-References	
1.	https://web.iitd.ac.in/~nkurur/2015-16/Isem/cmp511/lab_handout_new.pdf

CO-PO Mapping (Course Articulation Matrix)


	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S
CO 5	M	S	M	S	S	M	S	M	S	S

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO /PO	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

3 – Strong, 2 – Medium, 1 - Low

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.							
	Programme	M.Sc	Programme Code	PCH			Regulations	2023-2024
Department	Chemistry			Semester			III	
Course Code	Course Name	Periods per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
23P3CHDE05	ELECTIVE PAPER V: PHARMOCOGNOSY AND PHYTOCHEMISTRY	4	1		04	25	75	100
Prerequisites	Basic knowledge of chemistry							
Course Objectives	<ul style="list-style-type: none"> To develop the knowledge of natural products, biological functions and pharmacological uses. To develop knowledge on primary and secondary metabolites and their sources. To understand the concepts of isolation methods and separation of bioactive compounds. To provide the knowledge on selected glycosides and marine drugs. To familiarize the guidelines of WHO and different sampling techniques. 							

Content of the Syllabus			
Unit – I	Pharmacognosy and Standardization of Herbal drugs	Periods	15
	Introduction, definition, development classification and Source of Drugs: Biological, mineral, marine, and plant tissue cultures. Study of pharmacognostic of a crude drug. Biosynthesis: Shikimic acid pathway and acetate pathway. Systematic analysis of Crude drugs. Standardization of Herbal drugs. WHO guidelines, Sampling of crude drug, Methods of drug evaluation. Determination of foreign matter, moisture Ash value. Phytochemical investigations-General chemical tests.		
Unit – II	Extraction Techniques	Periods	15
	General methods of extraction, types – maceration, Decoction, percolation, Immersion and soxhlet extraction. Advanced techniques- counter current, steam distillation, supercritical gases, sonication, Micro waves assisted extraction. Factors affecting the choice of extraction process.		
Unit – III	Drugs containing Terpenoids and volatile oils	Periods	15
	Terpenoids: Classification, Isoprene rule, Isolation and separation techniques, General properties Camphor, Menthol, Eucalyptol. Volatile Oils or Essential Oils: Method of Preparations, Classifications of Volatile oils, Camphor oil, Geranium oil, Citral- Structure, preparation, properties and uses.		

Unit - IV	Drugs containing alkaloids	Periods	15
	Occurrence, function of alkaloids in plants, pharmaceutical applications. Isolation, Preliminary Qualitative tests and general properties. General methods of structural elucidation. Morphine, Reserpine, papaverine - chemical properties, structure and uses. Papaverine, quinine - structure, chemical properties and uses.		
Unit - V	Plant Glycosides and Marine drugs:	Periods	15
	Glycosides: Basic ring system, classification, isolation, properties, qualitative analysis. Pharmacological activity of Senna glycosides, Cardiac glycosides- Digoxin, digitoxin, Steroidal saponins glycosides- Diosgenin, hecogenin. Plant pigments: Occurrence and general methods of structure determination, isolation and synthesis of quercetin and cyanidin chloride.		
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 / TRB / NET/ UGC-CSIR / GATE /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.		
Total Periods			75

Text Books	
1	Gurdeep R Chatwal (2016), Organic chemistry of Natural products, Volume I&II, 5th edition, Himalaya publishing House.
2	S.V.Bhat, B.A. Nagasampagi, M.Sivakumar (2014), Chemistry of Natural Products, Revised edition, Narosa Publishers.

References	
1	Jeffrey B. Harborne (2012), Phytochemical methods: A Guide to Modern Techniques of Plant Analysis, 4th edition, Indian reprint, Springer.
2	Ashutoshkar (2007), Pharmacognosy and Pharmacobiotechnology, 2 nd edition, New age international (P) limited, New Delhi.
E-References	
1	https://nbri.res.in/r-d-areas/pharmacognosy-phytochemistry-and-product-development/

CO-PO Mapping (Course Articulation Matrix)


	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S
CO 5	M	S	M	S	S	M	S	M	S	S

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO /PO	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

3 – Strong, 2 – Medium, 1 - Low

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FORWOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.									
	Programme	M.Sc	Programme Code	PCH			Regulations	2023-2024		
Department	Chemistry			Semester			III			
Course Code	Course Name	Periods per Week			Credit	Maximum Marks				
		L	T	P	C	CA	ESE	Total		
23P3CHDE06	DISCIPLINE ELECTIVE-V: BIOMOLECULES AND HETEROCYCLIC COMPOUNDS			4	1		04	25	75	100
Prerequisites	Basic knowledge of chemistry									
Course Objectives	<ul style="list-style-type: none"> To learn the basic concepts and biological importance of biomolecules and natural products. To explain various of functions of carbohydrates, proteins, nucleic acids, steroids and hormones. To understand the functions of alkaloids and terpenoids. To elucidate the structure determination of biomolecules and natural products. To extract and construct the structure of new alkaloids and terpenoids from different methods. 									

Content of the Syllabus			
Unit – I	Chemistry and metabolism of carbohydrates	Periods	15
	Definition, classification and biological role of carbohydrates. Monosaccharides: Linear and ring structures (Haworth formula) of ribose, glucose, fructose and mannose (structure determination not required), physical and chemical properties of glucose and fructose. Disaccharides: Ring structures (Haworth formula) – occurrence, physical and chemical properties of maltose, lactose and sucrose.		
Unit – II	Steroids and Hormones	Periods	15
	Steroids-Introduction, occurrence, nomenclature, configuration of substituents. Diels' hydrocarbon, stereochemistry, classification, Diels' hydrocarbon, biological importance, colour reactions of sterols, cholesterol-occurrence, tests, physiological activity, biosynthesis of cholesterol from squalene. Hormones-Introduction, classification, functions of sex hormones- androgens and estrogens, adrenocortical hormones-cortisone and cortisol structure and functions of non-steroidal hormones-adrenaline and thyroxin.		

Unit – III	Terpenoids	Periods	15
	Classification - General structural elucidation. Structural elucidation and synthesis of α -Pinene, Camphor and Zingiberene. Alkaloids: Classification - General structural elucidation. Structural elucidation and synthesis of Morphine, Quinine, Cinchonine and Papaverine.		
Unit - IV	Proteins and nucleic acids	Periods	15
	Separation and purification of proteins – dialysis, gel filtration and electrophoresis. Catabolism of amino acids - transamination, oxidative deamination and decarboxylation. Biosynthesis of proteins: Role of nucleic acids. Amino acid metabolism and urea cycle. Structure, methods for the synthesis of nucleosides - direct combination, formation of heterocyclic base and nucleoside modification, conversion of nucleoside to nucleotides. Primary and secondary structure of RNA and DNA, Watson-Crick model, solid phase synthesis of oligo nucleotides.		
Unit - V	Fused Ring Heterocyclic Compounds	Periods	15
	Benzofused five membered rings: Indole, isoindole, benzofuran and benzothiophene, Preparation and properties. Benzofused six membered rings: Quinoline and isoquinoline: Preparation by ring closure reactions, Reactions: Mechanism of electrophilic and nucleophilic substitutions, oxidation and reduction reactions.		
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 / TRB / NET/ UGC-CSIR / GATE /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.		
Total Periods			75

Text Books	
1	T. K Lindhorst, Essentials of Carbohydrate Chemistry and Biochemistry, Wiley VCH, North America, 2007.
2	I. L. Finar, Organic Chemistry Vol-2, 5 edition, Pearson Education Asia, 1975.
3	V. K. Ahluwalia and M. Goyal, Textbook of Heterocyclic compounds, Narosa Publishing, New Delhi, 2000.

4	M. K. Jain and S. C. Sharma, Modern Organic Chemistry, Vishal Publishing Co., Jalandhar, Delhi, 2014.
5	V. K. Ahluwalia, Steroids and Hormones, Ane books pub., New Delhi, 2009.
References	
1	I. L. Finar, Organic Chemistry Vol-1, 6 th edition, Pearson Education Asia, 2004.
2	Pelletier, Chemistry of Alkaloids, Van Nostrand Reinhold Co, 2000.
3	Shope, Chemistry of the steroids, Butterworths, 1994.
4	I. A. Khan, and A. Khanum. Role of Biotechnology in medicinal & aromatic plants, Vol 1 and Vol 10, Ukkaz Publications, Hyderabad, 2004.
5	M. P. Singh. and H. Panda, Medicinal Herbs with their formulations, Daya Publishing House, Delhi, 2005.
E-References	
1	https://www.organic-chemistry.org/
2	https://www.studyorgo.com/summary.php
3	https://www.clutchprep.com/organic-chemistry

CO-PO Mapping (Course Articulation Matrix)


	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S
CO 5	M	S	M	S	S	M	S	M	S	S

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO / PO	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

3 – Strong, 2 – Medium, 1 - Low

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.									
	Programme	M.Sc	Programme Code	PCH			Regulations	2023-2024		
Department	Chemistry			Semester				IV		
Course Code	Course Name	Periods per Week			Credit	Maximum Marks				
		L	T	P	C	CA	ESE	Total		
23P4CHC07	CORE COURSE-VII: COORDINATION CHEMISTRY – II			4	1		04	25	75	100
Prerequisites	Basic knowledge of inorganic chemistry									
Course Objectives	<ul style="list-style-type: none"> To recognize the fundamental concepts and structural aspects of organometallic compounds. To learn reactions of organometallic compounds and their catalytic behavior. To identify or predict the structure of coordination compounds using spectroscopic tools. To understand the structure and bonding in coordination complexes. To evaluate the spectral characteristics of selected complexes. 									

Content of the Syllabus			
Unit - I	Chemistry of organometallic compounds	Periods	15
	Classification of organometallic compounds based on M-C bond – 18 and 16 electron rule; Bonding in metal – olefin complexes (example: Ziese's salt), metal-acetylene and metal-allyl complexes; Metal-cyclopentadienyl complexes – Examples and MO approach to bonding in metallocenes; fluxional isomerism. Metal – carbonyl complexes: Carbonyl clusters: Low nuclearity- $Mn_2(CO)_{10}$, $Fe_2(CO)_9$, $Co_2(CO)_8$ and high nuclearity carbonyl clusters- $Fe_5C(CO)_{15}$, $Ru_6C(CO)_{17}$, $H_3Ru_4(CO)_{12}$ – Structures based on polyhedral skeleton electron pair theory or Wade's rule.		
Unit - II	Reactions and catalysis of organometallic compounds	Periods	15
	Reactions of organometallic compounds: Oxidative addition, reductive elimination (α and β eliminations), migratory insertion reaction and metathesis reaction. Organo-metallic catalysis: Hydrogenation of olefins (Wilkinson's catalyst), hydroformylation of olefins using cobalt or rhodium catalysts (oxo process), oxidation of olefin (Wacker process), olefin isomerisation, water gas shift reaction, cyclo-oligomerisation of acetylenes using Reppe's catalysts, Monsanto process.		

Unit - III	Inorganic spectroscopy -I	Periods	15
	IR spectroscopy: Effect of coordination on the stretching frequency-sulphato, carbonato, sulphito, aqua, nitro, thiocyanato, cyano, thiourea, DMSO complexes; IR spectroscopy of carbonyl compounds. NMR spectroscopy-Introduction, applications of ^1H , ^{15}N , ^{19}F , ^{31}P -NMR spectroscopy in structural identification of inorganic complexes, fluxional molecules, quadrupolar nuclei-effect in NMR spectroscopy.		
Unit - IV	Inorganic spectroscopy-II:	Periods	15
	Introductory terminologies: g and A parameters-definition, explanation and factors affecting g and A; Applications of ESR to coordination compounds with one and more than one unpaired electrons – hyperfine and secondary hyperfine splitting and Kramer's doublets; ESR spectra of V(II), Mn(II), Fe(II), Co(II), Ni(II), Cu(II) complexes, bis(salicylaldimine)copper(II) and $[(\text{NH}_3)_5\text{Co}-\text{O}_2-\text{Co}(\text{NH}_3)_5]^{5+}$ Mossbauer spectroscopy – Mossbauer effect, Recoil energy, Mossbauer active nuclei, Doppler shift, Isomer shift, quadrupole splitting and magnetic interactions. Applications of Mössbauer spectra to Fe and Sn compounds.		
Unit - V	Photo Electron Spectroscopy	Periods	15
	Theory, Types, origin of fine structures - shapes of vibrational fine structures – adiabatic and vertical transitions, PES of homonuclear diatomic molecules (N_2 , O_2) and heteronuclear diatomic molecules (CO , HCl) and polyatomic molecules (H_2O , CO_2 , CH_4 , NH_3) – evaluation of vibrational constants of the above molecules. Koopman's theorem- applications and limitations. Optical Rotatory Dispersion – Principle of CD and ORD; Δ and λ isomers in complexes, Assignment of absolute configuration using CD and ORD techniques.		
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 / TRB / NET/ UGC-CSIR / GATE /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.		
Total Periods			75

Text Books	
1	J E Huheey, EA Keiter, RL Keiter and OK Medhi, Inorganic Chemistry – Principles of structure and reactivity, 4th Edition, Pearson Education Inc., 2006
2	G L Meissler and D ATarr, Inorganic Chemistry, 3rd Edition, Pearson Education Inc., 2008
3	D. Bannerjea, Co-ordination Chemistry, TATA Mcgraw Hill, 1993.
4	B D Gupta and A K Elias, Basic Organometallic Chemistry: Concepts, Syntheses and Applications, University Press, 2013.
5	F. A. Cotton, G. Wilkinson.; C. A. Murillo; M. Bochmann, Advanced Inorganic Chemistry, 6th ed.; Wiley Inter-science: New York, 1988.
References	
1	Crabtree, Robert H. The Organometallic Chemistry of the Transition Metals. 3rd ed. New York, NY: John Wiley, 2000.
2	P Gütllich, E Bill, A X Trautwein, Mossbauer Spectroscopy and Transition Metal Chemistry: Fundamentals and Applications, 1 st edition, Springer-Verlag Berlin Heidelberg, 2011.
3	Concepts and Models of Inorganic Chemistry,
4	K. F. Purcell, J. C. Kotz, Inorganic Chemistry; Saunders: Philadelphia, 1976.
5	R. S. Drago, Physical Methods in Chemistry; Saunders: Philadelphia, 1977.
E-References	
1	https://archive.nptel.ac.in/courses/104/101/104101100/

CO-PO Mapping (Course Articulation Matrix)


	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S
CO 5	M	S	M	S	S	M	S	M	S	S

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO /PO	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

3 – Strong, 2 – Medium, 1 - Low

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.									
	Programme	M.Sc	Programme Code	PCH			Regulations	2023-2024		
Department	Chemistry			Semester			IV			
Course Code	Course Name	Periods per Week			Credit	Maximum Marks				
		L	T	P	C	CA	ESE	Total		
23P4CHC08	CORE COURSE VIII: PHYSICAL CHEMISTRY-II			4	1		04	25	75	100
Prerequisites	Basic knowledge of physical chemistry									
Course Objectives	<ul style="list-style-type: none"> To understand the essential characteristics of wave functions and need for the quantum mechanics. To know the importance of quantum mechanical models of particle in a box, rigid rotor and harmonic oscillator. To apply the quantum mechanics to hydrogen and polyelectronic systems. To familiarize the symmetry in molecules and predict the point groups. To predict the vibrational modes, hybridization using the concepts of group theory. 									

Content of the Syllabus			
Unit - I	Quantum mechanics	Periods	15
	Quantum theory of radiation, Schrodinger wave equation- Normalized, Orthogonal, orthonormal, Eigen values and Eigen functions - Statistical interpretation of wave function. Operators- Commutative and Hermitian operators. Introduction to quantum mechanics, -black body radiation, photoelectric effect, , Postulates of Quantum Mechanics,.		
Unit - II	Quantum models	Periods	15
	Solution of the schrodinger wave equation for simple system: free particles, Particle in a box-1D, and three-dimensional, Simple Harmonic Oscillator-1D- and Rigid Rotor -wave equation and solution, Theorems of quantum mechanics (11 Theorems).		
Unit - III	Applications to Hydrogen and Poly electron atoms	Periods	15
	Hydrogen atom and hydrogen like ions, wave equation and solutions, radial and angular functions, representation of radial distribution functions. Approximation methods: -variation methods: - trial wave function, variation integral and application to helium atom Perturbation method – degenerate and non-degenerate perturbation theory - first order applications to helium atom. Hartree and Hartree fock self-consistent field method, Hohenberg-Kohn theorem and Kohn-Sham equation,		

Unit - IV	Group theory	Periods	15
	Groups, sub groups, symmetry elements, operations, classification-axial and non-axial. Dihedral point groups- C_n , C_{nh} , D_n , D_{nh} , and Oh. Matrix representation and classes of symmetry operations, reducible irreducible and direct product representation. The Great orthogonality theorem – irreducible representation and reduction formula, construction of character table for C_{2v} and C_{3v} point groups.		
Unit - V	Applications of quantum and group theory	Periods	15
	Hydrogen Molecule-Molecular orbital theory and Heitler London (VB) treatment, Energy level diagram, Hydrogen molecule ion; Use of linear variation function and LCAO methods. Electronic conjugated system: Huckel method to Ethylene butadiene, and Benzene. Applications of group theory to molecular vibrations, electronic spectra of ethylene.		
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 / TRB / NET/ UGC-CSIR / GATE /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.		
Total Periods			75

Text Books	
1	R.K. Prasad, Quantum Chemistry, New Age International Publishers, New Delhi, 2010, 4th revised edition.
2	F. A. Cotton, Chemical Applications of Group Theory, John Wiley & Sons, 2003, 2 nd edition.
3	A. Vincent, Molecular Symmetry and Group Theory. A Programmed Introduction to Chemical Applications, John and Willy & Sons Ltd., 2013, 2 nd Edition.
4	T. Engel & Philip Reid, Quantum Chemistry and Spectroscopy, Pearson, New Delhi, 2018, 4 th edition.
5	G. K. Vemulapalli, Physical Chemistry, Prentice Hall of India Pvt. Ltd. 2001. 6. D.A. McQuarrie, Quantum Chemistry, Viva Books PW. Ltd, 2013, 2 nd edition.

References	
1	N. Levine, Quantum Chemistry, Allyn & Bacon Inc, 1983, 4th edition.
2	D.A. McQuarrie and J. D. Simon, Physical Chemistry, A Molecular Approach, Viva Books Pvt. Ltd, New Delhi, 2012.
3	R. P. Rastogi & V. K. Srivastava, An Introduction to Quantum Mechanics of Chemical Systems, Oxford & IBH Publishing Co., New Delhi, 1999.
4	R.L. Flurry. Jr, Symmetry Group Theory and Chemical applications, Prentice Hall. Inc, 1980
5	J. M. Hollas, Symmetry in Molecules, Chapman and Hall, London, 2011, Reprint.
E-References	
1	https://archive.nptel.ac.in/courses/104/101/104101100/
2	https://ipc.iisc.ac.in/~kls/teaching.html

CO-PO Mapping (Course Articulation Matrix)


	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S
CO 5	M	S	M	S	S	M	S	M	S	S

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO /PO	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

3 – Strong, 2 – Medium, 1 - Low

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FORWOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.									
	Programme	M.Sc	Programme Code	PCH			Regulations	2023-2024		
Department	Chemistry			Semester			IV			
Course Code	Course Name	Periods per Week		Credit	Maximum Marks					
		L	T	P	C	CA	ESE	Total		
23P4CHCP04	CORE PRACTICAL- IV: ANALYTICAL INSTRUMENTATION TECHNIQUES					05	04	40	60	100
Prerequisites	Basic knowledge of analytical instrumentation techniques									
Course Objectives	<ul style="list-style-type: none"> To design chromatographic methods for identification of species. To analyze different constituents through instrumental methods of analysis. To evaluate different contaminants in materials using turbidimetry and conductivity measurements. To design experiments for analysis of inorganic and organic materials. To analyze constituents in materials using emission and absorption techniques. 									

Content of the Syllabus			
Unit - I	Potentiometric Experiments	Periods	40
	1. Potentiometric titration of a mixture of HCl and CH ₃ COOH Vs NaOH 2. Determination of pK _a of weak acid by EMF method. 3. Potentiometric titration of FAS Vs K ₂ Cr ₂ O ₇ 4. Potentiometric titration of KI Vs KMnO ₄ . 5. Potentiometric titration of a mixture of Chloride and Iodide Vs AgNO ₃ . 6. Determination of the pH of buffer solution by EMF method using Quinhydrone and Calomel electrode.		
Unit - II	Estimations	Periods	40
	1. Estimation of Fe by colorimetric method. 2. Estimation of Cu by colorimetric method. 3. Estimation of Ni by colorimetric method. 4. Estimation of Na and K by flame photometric method. 5. Estimation of the amount of nitrate present in the given solution using spectrophotometric method. 6. Analysis of water quality through COD, DO, BOD measurements. 7. Estimation of Fe(II) by 1,10 phenanthroline using spectrophotometry		

	Interpretation and identification of various organic compounds	Periods	10
Unit - III	Interpretation and identification of the given spectra of various organic compounds arrived at from the following instruments 1.UV-Visible 2.IR		
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 / TRB / NET/ UGC-CSIR / GATE /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.		
Total Periods			75

Text Books	
1.	Vogel's Text book of Practical Organic Chemistry, 5th Ed, ELBS/Longman, England, 2003.
2.	G. H. Jeffery, J. Bassett, J. Mendham and R. C. Denney, <i>Vogel's Textbook of Quantitative Chemical Analysis</i> ; 6th ed., ELBS, 1989.
3.	J. D. Woollins, <i>Inorganic Experiments</i> ; VCH: Weinheim, 1995.
4.	B. Viswanathan and P.S.Raghavan, <i>Practical Physical Chemistry</i> , Viva Books, New Delhi, 2009.
5.	Sundaram, Krishnan, Raghavan, <i>Practical Chemistry (Part II)</i> , S.Viswanathan Co. Pvt., 1996.
References	
1.	N. S. Gnanapragasam and G. Ramamurthy, <i>Organic Chemistry – Labmanual</i> , S. Viswanathan Co. Pvt. Ltd, 2009.
2.	J. N. Gurthu and R. Kapoor, <i>Advanced Experimental Chemistry</i> , S. Chand and Co., 2011.
3.	J. B. Yadav, <i>Advanced Practical Physical Chemistry</i> , Goel Publishing House, 2001.
4.	G.W. Garland, J.W. Nibler, D.P. Shoemaker, <i>Experiments in Physical Chemistry</i> , 8th edition, McGraw Hill, 2009.
5.	J. N. Gurthu and R. Kapoor, <i>Advanced Experimental Chemistry</i> , S. Chand and Co., 1987.
E-References	
1.	https://bit.ly/3QESF7t

CO-PO Mapping (Course Articulation Matrix)


	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S
CO 5	M	S	M	S	S	M	S	M	S	S

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO / PO	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

3 – Strong, 2 – Medium, 1 - Low

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FORWOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.									
	Programme	M.Sc	Programme Code	PCH			Regulations	2023-2024		
Department	Chemistry			Semester			IV			
Course Code	Course Name			Periods per Week		Credit	Maximum Marks			
				L	T					P
23P4CHDE06	DISCIPLINE ELECTIVE-VI: CHEMISTRY OF NATURAL PRODUCTS			4	1		03	25	75	100
Prerequisites	Basic knowledge of general chemistry									
Course Objectives	<ul style="list-style-type: none"> To learn the basic concepts and biological importance of biomolecules and natural products. To explain various of functions of carbohydrates, proteins, nucleic acids, steroids and hormones. To understand the functions of alkaloids and terpenoids. To elucidate the structure determination of biomolecules and natural products. To extract and construct the structure of new alkaloids and terpenoids from different methods. 									

Content of the Syllabus			
Unit – I	Alkaloids	Periods	15
	Introduction, occurrence, classification, isolation and functions of alkaloids. Classification, general methods of structural elucidation. Chemical methods of Structure determination of Coniine, Piperine, Nicotine, Papaverine. Atropine, Quinine, Cocaine, Reserpine, Papaverine and Morphine.		
Unit – II	Terpenoids	Periods	15
	Introduction, occurrence, Isoprene rule, classification. General methods of determining structure. Structure determination of Camphor, α -pinene Zingiberine. Carotenoids: Introduction, geometrical isomerism, Structure, functions and synthesis of β -carotene and vitamin-A.		
Unit – III	Anthocyanines and flavones: Anthocyanines	Periods	15
	Introduction to anthocyanines. Structure and general methods of synthesis of anthocyanines. Cyanidine chloride: structure and determination. Flavones: Biological importance of flavones. Structure and determination of flavone and flavonoids. Quercetin: Structure determination and importance.		

Unit - IV	Purines and Steroids	Periods	15
	Purines: Introduction, occurrence and isolation of purines. Steroids- Introduction, Classification and spectral properties of steroids. Structure and synthesis of Uric acid and Caffeine. Diels' hydrocarbon, stereochemistry, colour reactions of sterols, classification, structural elucidation of cholesterol (synthesis not required), stigmasterol (synthesis not required), structure and synthetic aspects of estrone and progesterone.		
Unit - V	Natural Dyes	Periods	15
	Occurrence, classification, isolation, purification, properties, colour and constitution. Structural determination and synthesis of indigoitin and alizarin.		
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 / TRB / NET/ UGC-CSIR / GATE / 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.		
Total Periods			75

Text Books	
1	G. K. Chatwal, Organic Chemistry on Natural Products, Vol. 1, Himalaya Publishing House, Mumbai, 2009.
2	G. K. Chatwal, Organic Chemistry on Natural Products, Vol. 2, Himalaya Publishing House, Mumbai, 2009.
3	O. P. Agarwal, Chemistry of Organic Natural Products, Vol. 1, Goel Publishing House, Meerut, 1997.
4	O. P. Agarwal, Chemistry of Organic Natural Products, Vol. 2, Goel Publishing House, Meerut, 1997.
5	I. L. Finar, Organic Chemistry Vol-2, 5 th edition, Pearson Education Asia, 1975.
References	
1	I. L. Finar, Organic Chemistry Vol-1, 6 th edition, Pearson Education Asia, 2004.
2	Pelletier, Chemistry of Alkaloids, Van Nostrand Reinhold Co, 2000.
3	Shoppe, Chemistry of the steroids, Butterworths, 1994.
4	I. A. Khan, and A. Khanum. Role of Biotechnology in medicinal & aromatic plants, Vol 1 and Vol 10, Ukkaz Publications, Hyderabad, 2004.
E-References	
	https://sites.google.com/site/chemistryebookscollection02/home/organic-chemistry/organic

CO-PO Mapping (Course Articulation Matrix)


	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S
CO 5	M	S	M	S	S	M	S	M	S	S

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO /PO	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

3 – Strong, 2 – Medium, 1 - Low

		VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FORWOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.							
Programme	M.Sc	Programme Code	PCH		Regulations	2023-2024			
Department	Chemistry		Semester			IV			
Course Code	Course Name	Periods per Week		Credit	Maximum Marks				
		L	T	P	C	CA	ESE	Total	
23P4CHDE07	DISCIPLINE ELECTIVE-VI: POLYMER CHEMISTRY		4	1		03	25	75	100
Prerequisites	Basic knowledge of general chemistry								
Course Objectives	<ul style="list-style-type: none"> To learn the basic concepts and bonding in polymers. To explain various types of polymerization reactions and kinetics. To understand the importance of industrial polymers and their synthetic uses. To determine the molecular weight of polymers. To predict the degradation of polymers and conductivities. 								

Content of the Syllabus			
Unit – I	Characterization, Molecular weight and its Determination	Periods	15
	Primary and secondary bond forces in polymers; cohesive energy, molecular structure, chemical tests, thermal methods, T _g , molecular distribution, stability. Determination of Molecular mass of polymers: molecular weight – Average molecular weight -Number average, weight average and viscosity average molecular weights. Measurement of molecular weights- Viscosity, light scattering, osmotic and ultracentrifugation methods.		
Unit – II	Mechanism and kinetics of Polymerization	Periods	15
	Chain growth polymerization: Cationic, anionic, free radical polymerization, Ziegler Natta polymerization. Reaction kinetics. Step growth polymerization, Degree of polymerization.		
Unit – III	Techniques of Polymerization and Polymer Degradation:	Periods	15
	Bulk, Solution, Emulsion, Suspension, solid, interfacial and gas phase polymerization. Types of Polymer Degradation, Thermal degradation, mechanical degradation, photo-degradation, Photo stabilizers, Solid and gas phase polymerization.		
Unit - IV	Industrial Polymers	Periods	15
	Preparation of fibre forming polymers, elastomeric material. Thermoplastics: Polyethylene, polystyrene, Polyacrylonitrile, Poly Vinyl Chloride, nylon and polyester. Thermosetting		

	Plastics: Phenol formaldehyde and epoxide resin. Elastomers: Natural rubber and synthetic rubber - Buna - N, Buna-S and neoprene. Conducting Polymers: Elementary ideas; examples: poly sulphur nitriles, poly phenylene, poly pyrrole and poly acetylene. Polymethylmethacrylate, polyamides, polyurethanes, and polypropylene glycols.		
Unit - V	Polymer Processing	Periods	15
	Compounding: Polymer Additives: Fillers, Plasticizers, antioxidants, thermal stabilizers, fire retardants and colourants. Processing Techniques: Calendaring, die casting, compression moulding, injection moulding, blow moulding and reinforcing. Film casting, Thermofoaming, Foaming. Catalysis and catalysts – Polymerization catalysis, catalyst support, clay compounds, basic catalyst, auto-exhaust catalysis, vanadium, heterogeneous catalysis and active centres.		
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 / TRB / NET/ UGC-CSIR / GATE /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.		
Total Periods			75

Text Books	
1	V.R. Gowariker, <i>Polymer Science</i> , Wiley Eastern, 1995.
2	G.S. Misra, <i>Introductory Polymer Chemistry</i> , New Age International (Pvt) Limited, 1996.
3	M.S. Bhatnagar, <i>A Text Book of Polymers</i> , vol-I & II, S.Chand & Company, New Delhi, 2004.
References	
1	F. N. Billmeyer, <i>Textbook of Polymer Science</i> , Wiley Interscience, 1971.
2	A. Kumar and S. K. Gupta, <i>Fundamentals and Polymer Science and Engineering</i> , Tata McGraw-Hill, 1978.
E-References	
1	https://sites.google.com/site/chemistryebookscollection02/home/organic-chemistry/organic

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S
CO 5	M	S	M	S	S	M	S	M	S	S

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
C01	3	3	3	3	3
C02	3	3	3	3	3
C03	3	3	3	3	3
C04	3	3	3	3	3
C05	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

3 – Strong, 2 – Medium, 1 - Low

Title of the Course	CHEMISTRY FOR LIFE SCIENCES						
Paper No.	NME - VII						
Category	Non-Major Elective	Year	II	Credits	2	Course Code	23UPCHE1N07
		Semester	III				
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total		
	3	1	-		4		
Prerequisites	Basic knowledge on chemistry						
Objectives of the course	1) To understand the basic concepts of inorganic chemistry. 2) To understand the basic concepts of physical chemistry 3) To understand the basic concepts of organic chemistry.						
Course Outline	UNIT 1: Inorganic Chemistry Introduction to Atomic and Molecular Concepts: Matter, atoms and elements; Molecules and compounds; Equations and stoichiometry						
	UNIT 2: Physical Chemistry Foundation Physical Concepts in Chemistry: Atomic structure, electronic configurations of elements; Bonding and structure; Orbitals and hybridization; Gases						
	UNIT 3: Organic Chemistry Introduction to Organic Chemistry: Organic nomenclature, saturated compounds - Alkanes and cycloalkanes; Unsaturated compounds - Alkenes and alkynes; Aromatic compounds - Benzene; Organic functional groups; Introduction to IR spectroscopy						
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 / TRB / NET/ UGC-CSIR / GATE / 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.						
Recommended Text	1. J. G. Dawber , A. T. Moore, Chemistry for the Life Sciences, Red Globe Press London, 1980						
Reference Books	1. P. Atkins, J.D. Paula, Physical Chemistry for the Life Sciences, W H Freeman & Co; 2nd edition, 2011.						
Website and e-learning source							
Course Learning Outcomes (for Mapping with POs and PSOs)							
Students will be able:							
CO1: To understand the basic concepts of inorganic chemistry.							
CO2: To understand the basic concepts of physical chemistry							
CO3: To understand the basic concepts of organic chemistry.							

CO-PO Mapping (Course Articulation Matrix)

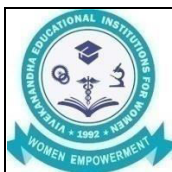
	PO1	PO2	PO3	PO4	PO5
CO 1	S	S	S	S	M
CO 2	M	S	S	S	S
CO 3	S	S	M	S	S

S-Strong, M-Medium, L-Low

Level of Correlation between PSO's and CO'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
Weightage	9	9	9	9	9
Weighted percentage of Course Contribution to PSOs	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 – Low



VIVEKANANDHACOLLEGE OF ARTS AND SCIENCES FOR WOMEN
(AUTONOMOUS)
Elayampalayam, Tiruchengode-637205.



Programme	M.Sc	Programme Code	PCH			Regulations	2022-2024				
Department	Chemistry			Semester			4				
Course Code	Course Name			Hours per Week			Credit		Maximum Marks		
				L	T	P	C	CA	ESE	Total	
23P4CHPR01	PROJECT				9		04	40	60	100	
Course Objectives	<ul style="list-style-type: none"> . To inculcate the habit of literature survey among the students. . To offers skill based knowledge to the students. . To facilitate the students towards basic research and development. 										