PONNAIYAH RAMAJAYAM INSTITUTE OF SCIENCE & TECHNOLOGY (PRIST)

Declared as DEEMED-TO-BE-UNIVERSITY
U/s 3 of UGC Act, 1956

SCHOOLOFARTS AND SCIENCE

DEPARTMENT OF CHEMISTRY

REGULATION 2023

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SCHOOL OF ARTS OF SCIENCE

DEPARTMENT OF CHEMISTRY

B.Sc CHEMISTRY CURRICULUM

REGULATION 2023

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B.Sc CURRICULUM – REGULATION 2023

B.Sc. Graduate Attributes

- Domain knowledge
- Critical thinking
- Effective Communication
- Reflective learning
- Critical thinking

B.Sc Programme Educational Objectives – PEO

- PE01- Acquired the knowledge with facts and figures related to various subjects in pure Sciences.
- PE02- Understood the basic concepts, fundamental principles, and the scientific theories Related to various scientific phenomena and their relevancies in the day-to-day life.
- PE03- Acquired the skills in handling scientific instruments, planning and performing in Laboratory experiments.
- PE04- The skills of observations and drawing logical inferences from the scientific Experiments.
- PE05- Analyzed the given scientific data critically and systematically and the ability to draw The objective conclusions.
- PE06- Been able to think creatively (divergently and convergent) to propose novel ideas in Explaining facts and figures or providing new solution to the problems.
- PE07-Realized how developments in any science subject helps in the development of other Science subjects and vice-versa and how interdisciplinary approach helps in providing better solutions and new ideas for the sustainable developments.
- PE08- Developed scientific outlook not only with respect to science subjects but also in all Aspects related to life.
- PE09- Realized that knowledge of subjects in other faculties such as humanities, performing Arts, social sciences etc.
- PE10- Can have greatly and effectively influence which inspires in evolving new scientific Theories and inventions.
- PE11- Imbibed ethical, moral and social values in personal and social life leading to highly Cultured and civilized personality.
- PE12- Developed various communication skills such as reading, listening, speaking, etc., which we will help in expressing ideas and views clearly and effectively.
- PE13- Realized that pursuit of knowledge is a lifelong activity and in combination with Untiring efforts and positive attitude and other necessary qualities leads towards a successful Life.

B.Sc Programme Outcome – PO

- PO1- To understand basic facts and concepts in Chemistry while retaining the exciting aspects of Chemistry so as to develop interest in the study of chemistry as a discipline.
- PO2- To develop the ability to apply the principles of Chemistry.
- PO3- To appreciate the achievements in Chemistry and to know the role of Chemistry in nature and in society. To develop problem solving skills.
- PO4- To be familiarized with the emerging areas of Chemistry and their applications in various spheres of Chemical sciences and to apprise the students of its relevance in future studies.
- PO5- To develop skills in the proper handling of apparatus and chemicals.
- PO6- To be exposed to the different processes used in industries and their applications.

B.Sc. Course – C

- C1- General Chemistry – I
- C2- Quantitative Inorganic Estimation (Titrimetric) and Inorganic Preparation
- C3- Mathematics – I
- C4- Mathematics – II
- C5-Role of Chemistry in daily life
- C6- General Chemistry – II
- C7- Quantitative Organic Analysis and Preparation of Organic Compounds
- C8- Mathematics - III
- C9- Mathematics – IV
- C10- General Chemistry – III
- C11- Qualitative Inorganic Analysis
- C12- Physics - I & II
- C13- Physics Lab – I & II
- C14- Research Methodology
- C15- General Chemistry - IV
- C16- Physical Chemistry Practical I
- C17- Inorganic Chemistry – I
- C18- Organic Chemistry – I
- C19- Physical Chemistry – I
- C20- Physical Chemistry Practical II
- C21- Industrial Chemistry Practical
- C22-Participation in Bounded Research
- C23- Inorganic Chemistry – II
- C24- Organic Chemistry – II
- C25- Industrial chemistry
- C26- Project Work

B.Sc Curriculum Mapping
Programme Educational Objectives Vs Programme Outcome

Programme Outcome-PO Programme Educational Outcome - PEO	PO1	PO2	PO3	PO4	PO5	PO6
PE01	✓					
PE02						
PE03		✓				
PE04			✓			
PE05						
PE06					✓	
PE07				✓		
PE08						✓
PE09	✓			✓		
PE10		✓	✓			
PE11						
PE12				✓		
PE13	✓		✓		✓	

B.Sc Curriculum Mapping
Programme Outcome vs Courses Outcome

Programme Outcome-PO Courses Outcome-CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1			*	*		*
CO2		*		*	*	*
CO3	*	*			*	
CO4			*	*		*
CO5			*	*		*
CO6		*		*	*	*
CO7	*	*			*	
CO8		*	*		*	
CO9	*	*			*	*
CO10		*	*	*		*
CO11		*		*	*	
CO12	*	*		*	*	
CO13		*	*	*	*	
CO14		*	*	*	*	*
CO15	*		*		*	
CO16		*		*		*
CO17	*		*		*	
CO18		*		*	*	
CO19	*	*		*		*
CO20			*	*	*	
CO21	*		*	*		*
CO22	*	*		*		*
CO23			*	*	*	
CO24	*	*	*		*	*
CO25	*	*		*		*
CO26	*	*		*	*	

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COURSE STRUCTURE

SEMESTER – I					
Course Code	**Course Title**	**L**	**T**	**P**	**C**
THEORY					
23110AEC11/ 23111AEC11/ 23132AEC11/ 23135AEC11	Tamil – I/ Advanced English-I/ Hindi-I/ French – I	3	1	0	3
23111AEC12	English-I	3	1	0	3
23114AEC13	General Chemistry –I	4	1	0	3
23112GEC14	Mathematics –I	3	1	0	3
23112GEC15	Mathematics –II	3	1	0	3
PRACTICAL					
23114SEC16L	Quantitative Inorganic Estimation (Titimetry) and Inorganic Preparation lab	0	0	3	3
Skill Enhancement Course					
23114SEC17	Role of Chemistry in daily life (Non Major Elective)	2	0	0	2
23114SEC18	Foundation Course (FC)	2	0	0	2
Ability Enhancement Compulsory course (AECC1)					
231AECC01	Indian Constitution	2	0	0	2
AUDIT COURSE					
231LSCUV	Universal Human Values	-	-	-	1
	Total	**2 2**	**5**	3	**25**
SEMESTER – II					
Course Code	**Course Title**	**L**	**T**	**P**	**C**
THEORY					
23110AEC21/ 23111AEC21/ 23132AEC21/ 23135AEC21	Tamil – II/ Advanced English-II/ Hindi-II/ French - II	3	1	0	3
23111AEC22	English-II	3	1	0	3
23114AEC23	General Chemistry –II	4	1	0	3
23114GEC24	Mathematics –III	3	1	0	3
23114GEC25	Mathematics –IV	3	1	0	3
	PRACTICAL				
23114SEC26L	Quantitative Organic Analysis and Preparation of Organic Compounds lab	0	0	3	3
Skill Enhancement Course					
23114SEC27	Dairy Chemistry (Non Major Elective)	2	0	0	2
23114SEC28	Functional Cosmetics	2	0	0	2
Ability Enhancement Compulsory course (AECC1)					
231AECCCMS	Communication Skills	2	0	0	2
AUDIT COURSE					
231SSCBE	Basic Behavioural Etiquette	-	-	-	1
	Total	**2 2**	5	3	**25**
SECOND YEAR					
SEMESTER – III					

23110AEC31/ 23132AEC31/ 23111AEC31/ 23135AEC31	Tamil – III/ Hindi-III/ Advanced English-III/ French – III	3	0	0	3
23111AEC32	English-III	3	1	0	3
23114AEC33	General Chemistry –III	4	1	0	3
23113GEC34	Physics-I	4	1	0	3
	PRACTICAL				
23114SEC35L	Qualitative Inorganic Analysis	0	0	3	3
23113GEC36L	Physics Lab-I	0	0	3	2
Skill Enhancement Course					
23114SEC37	Entrepreneurial Skills in Chemistry	2	0	0	2
23114SEC38	Pesticide Chemistry	2	0	0	2
Ability Enhancement Compulsory course					
23114RMC39	Research Methodology	2	0	0	2
AUDIT COURSE					
231ACLSOAN	Office Automation	-	-	-	1
	Total	**2 1**	**3**	**6**	**24**
SEMESTER – IV					
23110AEC41/ 23111AEC41/ 23132AEC41/ 23135AEC41	Tamil-IV/ Advanced English-IV / Hindi-IV/ French – IV	3	0	0	3
23111AEC42	English-IV	3	0	0	3
23114AEC43	General Chemistry –IV	4	1	0	3
23116GEC44	Physics II	4	1	0	3
23114SEC45L	Physical Chemistry Practical I	0	0	3	3
23116GEC46L	Physics Lab-II	0	0	3	2
Skill Enhancement Course					
23114SEC47	Instrumental methods of chemical analysis	2	0	0	2
23114SEC48	Forensic science	2	0	0	2
Ability Enhancement Compulsory course (AECC1)					
23114BRC49	Participation in Bounded Research	2	0	0	2
231AECCEVS	Environmental Studies-II	2	0	0	2
AUDIT COURSE					
231LSCLS	Leadership and Management Skills	-	-	-	1
	Total	**22**	**2**	**6**	**27**
SEMESTER – V					
23114AEC51	Organic Chemistry - I	4	1	0	4
23114AEC52	Inorganic Chemistry - I	4	1	0	4
231145AEC53	Physical Chemistry - I	4	1	0	4
23114DSC54	Discipline Specific Elective –I	3	0	0	3
23114SEC55L	Industrial Chemistry lab	0	0	5	3
23114SEC56L	Physical Chemistry Practical II	0	0	5	3
Skill Enhancement Course					
23114SEC57	Internship/Industrial Visit/Field Visit	**-**			**2**
231ACLSPSL	Professional Skills	-	-	-	1

231AECCVED	Value Education	2	0	0	2
	Total	**17**	**3**	**10**	**26**
Third year					
SEMESTER – VI					
23114AEC61	Organic Chemistry II	5	0	0	4
23114AEC62	Inorganic Chemistry II	5	0	0	4
23114DSC63A	Discipline Specific Elective Courses-II	5	0	0	3
23114PRW64	Project with Viva	0	0	13	4
23114SEC65	General awareness for competitive examination	2	0	0	2
231EXACT	Extension activity	-	-	-	1
AUDIT COURSE					
231ACSIKWS	Indian Knowledge System	-	-	-	2
	Total	**17**	**0**	**13**	**20**
Total Credits -Programme					**140**
Total Credits - Audit Courses					**07**
Total Credits					**147**

Semester	**Discipline Specific Elective Courses-I**
V	a) 23114DSC54A – Green Chemistry b) 23114DSC54B – Industrial Chemistry c) 23114DSC54C - Disaster Management
	Discipline Specific Elective Courses-II
VI	a) 23114DSC63A- Polymer Chemistry b) 23114DSC63B –Chemi informatics c) 23114DSC63C- Entrepreneurship

Credit Distribution

SEM	**AEC**	**SEC**	**GEC**	**DSC**	**AECC**	**Research**	**Others**	**Total**
I	9	10	3	-	2	-	-	24
II	9	10	3	-	2	-	-	24
III	9	9	3	-	-	2	-	23
IV	12	10	-	-	2	2	-	26
V	12	8	-	3	2	-	-	25
VI	8	2	-	3	-	4	1	18
Total	**59**	**49**	**9**	**6**	**8**	**8**	**1**	**140**

AUDIT COURSE CREDIT DISTRIBUTION

Sem	**Audit**
I	1
II	1
III	1
IV	1
V	1
VI	2
Total	**7**

B.Sc CHEMISTRY Syllabus

Course Code	Course Title	L	T	P	C
23110AEC11	Tamil-I	3	1	0	3

இக்கால இலக்கியம்

1. இக்கால இலக்கியம்

பாடநோக்கங்கள்

1. இக்கால தமிழ் இலக்கிய வகைகளின் மாதிரிகளை கற்பித்தல்.
2. தமிழின் இனிமையை உணரச் செய்தல்
3. தமிழின் ஈடுபாட்டையும் சுவைக்கும் திறனையும் ஏற்படுத்துதல்.
4. கவிதை எழுதும் திறனை உருவாக்குதல்
5. படைப்பாளர்களாக உருவாக்கும் திறனை ஏற்படுத்துதல்.

பயன்கள்

மொழி ஆளுமைத் திறன் பெறுதல்.
சமூக சிந்தனையை வளர்த்துக் கொள்ளுதல்.
படைப்பாளர்களாக உருவாகும் திறனைப் பெறுதல்.
இலக்கியங்களின் அறிவை மேம்படுத்துதல்.
கவிதை எழுதும் முறையை புரிந்துக்கொள்ளுதல்

அலகு -1

மரபுக்கவிதை

1. பாரதியார்--விடுதலை, வந்தே மாதரம்,காற்று
2.பாரதிதாசன் - அழகின் சிரிப்பு ,தமிழனுக்கு வீழ்ச்சி இல்லை
3.கவிமணி தேசியவிநாயகம் பிள்ளை-- தொழிலாளியின் முறையீடு
4.நாமக்கல் கவிஞர்-- தருணம் இதுவே,
5.கண்ணதாசன்-- அனுபவம்

அலகு -2

புதுக்கவிதைகள்

1.அப்துல் ரகுமான் --வெற்றி,
2.அறிவுமதி--நட்புக் காலம்
3.வைரமுத்து-- குரி, சிற்பி-- ஒடு ஒடு சங்கிலி
4.மு.மேத்தா--வெளிச்சம் வெளியே இல்லை

அலகு - 3

நாட்டுப்புறப்பாடல்

1.தாலாட்டு பாடல்
2.தொழில் பாடல்
3.ஒப்பாரிப்பாடல்

அலகு-- 4

சிறுகதை

1. தடயம்-- மா. ஜெயபிரகாசம்,
2. எதார்த்தம் - சு. தமிழ்ச்செல்வி
3.நீதி-- பூமணி

அலகு- 5

இலக்கியவரலாறு

கவிதை, சிறுகதை நாட்டுப்புறப்பாடல்

பொதுக்கட்டுரை - மனித நேயம், வாழ்வியல் அறங்கள்

மனப்பாடப் பகுதி : பாரதியார் கவிதை-- வேண்டும்,பாரதிதாசன் கவிதை-- செந்தாமரை

பார்வை நூல்கள் :

1. பாரதியார் கவிதைகள் -மணிவாசகர் பதிப்பகம் சென்னை
2.பாரதிதாசன் கவிதைகள் பாரி நிலையம், சென்னை
4. நாட்டுப்புறவியல்
3. தமிழ் இலக்கிய வரலாறு மு வரதராஜன் சாகித்திய அகாதெமி,சென்னை
முனைவர். ஆறு. ராமநாதன்,மணிவாசகர் பதிப்பகம், சென்னை
5. தமிழ் சிறுகதையும் தோற்றம் வளர்ச்சி - தமிழ் புத்தக நிலையம், சென்னை

இணையதளம்

-www.tamilvu.org

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CLO1	3	2	3	3	3	2	2	2	3	2	3	2
CLO2	3	3	2	2	2	3	2	3	3	2	2	2
CLO3	3	2	3	3	2	2	2	3	2	3	3	2

CLO4	3	3	3	2	2	2	3	2	3	2	3	3
CLO5	3	3	2	2	2	2	3	2	2	2	3	3

Course Code	Course Title	L	T	P	C
23111AEC12	English-I	3	1	0	3

Learning Objectives	
LO1	To enable learners to acquire the linguistic competence necessarily required in various life situations.
LO2	To help them understand the written text and able to use skimming, scanning skills
LO3	To assist them in creative thinking abilities
LO4	To enable them become better readers and writers
LO5	To assist them in developing correct reading habits, silently, extensively and intensively

Unit No.	Unit Title & Text
I	**Poetry** 1.1 A Patch of Land - Subramania Bharati 1.3 A Nation's Strength – Ralph Waldo Emerson 1.4 Love Cycle - Chinua Achebe
II	**Prose** 2.1 JRD- Harish Bhat 2.2 Us and Them - David Sedaris From Dress Your Family in Corduroy and Denim
III	**Short Stories** 3.1 The Faltering Pendulum- Bhabani Bhattacharya 3.2 How I Taught my Grandmother to Read- Sudha Murthy 3.3 The Gold Frame- R.K. Laxman
IV	**Language Competency** 4.1 Vocabulary: Synonyms, Antonyms, Word Formation 4.2 Appropriate use of Articles and Parts of Speech 4.3 Error correction
V	**English for Workplace** 5.1 Self - introduction, Greetings 5.2 Introducing others 5.3 Listening for General and Specific Information 5.4 Listening to and Giving Instructions / Directions

Course Outcomes		
Course Outcomes	On completion of this course,students will;	
CO1	Develop and integrate the use of the four language skills i.e. Reading, Listening, Speaking and Writing	PO1
CO2	Understand the total content and underlying meaning in the context.	PO1,PO2
CO3	Form the habit of reading for pleasure and for information	PO4,PO6

CO4	Comprehend material other than the prescribed text	PO4,PO5,PO6
CO5	Develop the linguistic competence that enables them, in the future, to present the culture and civilization of their nation.	PO3,PO8

	Text books (Latest Editions)
1	Steel Hawk and other stories by Bhattacharya, Bhabani, New Delhi: Sahitya Akademi, 1967
2	How I taught my Grandmother to Read and other Stories, Murthy, Sudha,Penguin Books, India, 2004

WebResources	
1	A patch of land by Subramania Bharati translated by Usha Rajagoplan : https://books.google.co.in/books?id=iSHvOmXuvLMC&printsec=frontcover&dq=subramania+bharati+poems&hl=en&newbks=1&newbks_redir=0&source=gb_mobile_search&sa=X&redir_esc=y#v=onepage&q=subramania%20bharati%20poems&f=false
2	The Sparrow by Paul Laurence Dunbar https://poets.org/poem/sparrow-0
3	A Nation's Strength by Emerson https://poets.org/poem/nations-strength
4	Love cycle by Chinua Achebe : https://www.best-poems.net/chinua-achebe/love-cycle.html
5	JRD by Harish Bhat https://www.tata.com/newsroom/heritage/coffee-tea-jrd-tata-stories

Title of the Course	**GENERAL CHEMISTRY-I**						
Paper No.	**Core III**						
Category	**Core**	**Year**	I	**Credits**	5	**Course Code**	23114AEC13
		Semester	I				
Instructional hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	4	1	-			5	
Prerequisites	General Chemistry I						
Objectives ofthe course	This course aims at providing an overall view of the • chemistry of acids, bases and ionic equilibrium • properties of s and p-block elements • chemistry of hydrocarbons • applications of acids and bases • compounds of main block elements and hydrocarbons						
Course Outline	**UNIT-I Acids, bases and Ionic equilibria** Concepts of Acids and Bases - Arrhenius concept, Bronsted-Lowry concept,						

	Lewis concept; Relative strengths of acids, bases and dissociation constant;dissociation of poly basic acids, ionic product of water, pH scale, pH of solutions; Degree of dissociation, common ion effect, factors affecting degreeof dissociation; acid base indicators, theory of acid base indicators – action of phenolphthalein and methyl orange, titration curves - use of acid base indicators; *Buffer solutions – types, mechanism of buffer action in acid and basic buffer, Henderson-Hasselbalch equation;* *Salt hydrolysis - salts of weak acids and strong bases, weak bases and strong acids, weak acids and weak bases - hydrolysis constant, degree of hydrolysis and relation between hydrolysis constant and degree of hydrolysis;* *Solubility product - determination and applications; numerical problems*
	involving the core concepts.
	Unit-II
	Chemistry of s - Block Elements *Hydrogen: Position of hydrogen in the periodic table. Alkali metals: Comparative study of the elements with respect to oxides, hydroxides, halides, carbonates and bicarbonates. Diagonal relationship of Li with Mg. Preparation, properties and uses of NaOH, Na_2CO_3, KBr, $KClO_3$ alkaline earth metals. Anomalous behaviour of B*
	Chemistry of p- Block Elements (Group 13 & 14) *preparation and structure of diborane and borazine. Chemistry of borax. Extraction of Al and its uses. Alloys of Al.* *comparison of carbon with silicon. Carbon-di-sulphide – Preparation, properties, structure and uses. Percarbonates, per monocarbonates and per dicarbonates.*
	UNIT-III
	Chemistry of p- Block Elements (Group 15-18) *General characteristics of elementsof Group 15; chemistry of H_2N-NH_2, NH_2OH, HN_3 and HNO_3. Chemistry of PH_3, PCl_3, PCl_5, $POCl_3$, P_2O_5 and oxy acids of phosphorous (H_3PO_3 and H_3PO_4).*
	General properties of elements of group16 - Structure and allotropy of elements - chemistry of ozone - Classification and properties of oxides - oxides of sulphur and selenium – Oxy acids of sulphur (Caro's and Marshall's acids).
	Chemistry of Halogens: General characteristics of halogen with reference to electro-negativity, electron affinity, oxidation states and oxidizing power. Peculiarities of fluorine. Halogen acids (HF, HCl, HBr and HI), oxides and oxy acids ($HClO_4$). Inter-halogen compounds (ICl, ClF_3, BrF_5 and IF_7), pseudo halogens [$(CN)_2$ and $(SCN)_2$] and basic nature of Iodine.
	Noble gases: Position in the periodic table. Preparation, properties and structure of XeF_2, XeF_4, XeF_6 and $XeOF_4$; uses of noble gases - clathrate compounds.

	UNIT-IV **Hydrocarbon Chemistry-I** **Petroproducts:** Fractional distillation of petroleum; cracking, isomerisation, alkylation, reforming and uses **Alkenes**-Nomenclature, general methods of preparation – Mechanism of □-elimination reactions – E1 and E2 mechanism - factors influencing – stereochemistry – orientation – Hofmann and Saytzeff rules. Reactions of alkenes – addition reactions – mechanisms – Markownikoff's rule, Kharasch effect, oxidation reactions – hydroxylation, oxidative degradation, epoxidation, ozonolysis; polymerization. **Alkadienes** Nomenclature - classification – isolated, conjugated and cumulated dienes; stability of conjugated dienes; mechanism of electrophilic addition to conjugated dienes - 1, 2 and 1, 4 additions; free radical addition to conjugated dienes– Diels–Alder reactions – polymerisation – polybutadiene, polyisoprene (natural rubber), vulcanisation, polychloroprene. **Alkynes** Nomenclature; general methods of preparation, properties and reactions; acidicnature of terminal alkynes and acetylene, polymerisation and isomerisation. **Cycloalkanes:** Nomenclature, Relative stability of cycloalkanes, Bayer'sstrain theory and its limitations. Conformational analysis of cyclohexane, mono and di substituted cyclohexanes. Geometrical isomerism in cyclohexanes.
	UNIT-V **Hydrocarbon Chemistry - II** **Benzene:** Source, structure of benzene, stability of benzene ring, molecularorbital picture of benzene, aromaticity, Huckel's (4n+2) rule and its applications. Electrophilic substitution reactions - General mechanism of aromatic electrophilic substitution - nitration, sulphonation, halogenation, Friedel-Craft's alkylation and acylation. Mono substituted and disubstituted benzene - Effect of substituent – orientation and reactivity. **Polynuclear Aromatic hydrocarbons**: Naphthalene – nomenclature, Haworth synthesis; physical properties, reactions – electrophilic substitution reaction, nitration, sulphonation, halogenation, Friedel – Crafts acylation & alkylation, preferential substitution at □ - position – reduction, oxidation – uses. Anthracene – synthesis by Elbs reaction, Diels – Alder reaction and Haworth synthesis; physical properties; reactions - Diels-Alder reaction, preferential substitution at C-9 and C-10; uses.
Extended Professional Component (is a part of internal	Questions related to the above topics, from various competitive examinations UPSC/JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)

component only, Not to be included in the external examination question paper)	
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Madan R D, Sathya Prakash, (2003), Modern Inorganic Chemistry, 2nd ed, S.Chand and Company, New Delhi. Sathya Prakash, Tuli G D,Basu S K and Madan R D, (2003), Advanced Inorganic Chemistry, 17th ed., S.Chand and Company, New Delhi. Bahl B S, Arul Bhal, (2003), Advanced Organic Chemistry, 3rd ed., S.Chand and Company, New Delhi. Tewari K S, Mehrothra S N and Vishnoi N K, (1998), Text book of Organic Chemistry, 2nd ed., Vikas Publishing House, New Delhi. Puri B R, Sharma L R, (2002), Principles of Physical Chemistry,38th ed., Vishal Publishing Company, Jalandhar.
Reference Books	1. Maron S H and Prutton C P, (1972), Principles of Physical Chemistry, 4th ed., The Macmillan Company, Newyork. Barrow G M, (1992), Physical Chemistry, 5th ed., Tata McGraw Hill, New Delhi. Lee J D, (1991), Concise Inorganic Chemistry, 4thed., ELBS William Heinemann, London. Huheey J E, (1993), Inorganic Chemistry: Principles of Structure and Reactivity, 4th ed., Addison Wesley Publishing Company, India. Gurudeep Raj, (2001), Advanced Inorganic Chemistry Vol – I, 26th ed., Goel Publishing House, Meerut. Agarwal O P, (1995), Reactions and Reagents in Organic Chemistry,8thed., Goel Publishing House,Meerut.
Website and e-learning source	https://onlinecourses.nptel.ac.inhttp://cactus.dixie.edu/smblack/chem1010/lecture_notes/4B.html http://www.auburn.edu/~deruija/pdareson.pdfhttps://swayam.gov.in/course/64-atomic-structure-and-chemical-bonding **MOOC components** http://nptel.ac.in/courses/104101090/ Lecture 1: Classification of elements and periodic properties http://nptel.ac.in/courses/104101090/

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: explain the concept of acids, bases and ionic equilibria; periodic properties of s and p block elements, preparation and properties of aliphatic and aromatic hydrocarbons

CO2: discuss the periodic properties of sand p- block elements, reactions of aliphatic and aromatic hydrocarbons and strength of acids

CO3: classify hydrocarbons, types of reactions, acids and bases, examine the properties s and p-block elements, reaction mechanisms of aliphatic and aromatic hydrocarbons

CO4: explain theories of acids, bases and indicators, buffer action and important compounds of s-block elements

CO5: assess the application of hard and soft acids indicators, buffers, compounds of s and p-

	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

Course Code	Course Title	L	T	P	C
23112GEC14	Allied Mathematics - I	3	1	0	3

Objectives of the Course	• The basic skills of differentiation, successive differentiation, and their applications. • Basic knowledge on the notions of curvature, evolutes, involutes and polar co-ordinates and in solving related problems.

Unit – I

Leibnitz theorem (Proof not needed) and its applications – curvature and radius of curvature in Cartesian only (Proof not needed) – total differential coefficient (Proof not needed) – Jacobians of two & three variables – Simple problems in all these.

Unit – II

Reduction formula (when n is a +ve integer) for (i)

i. $\int_a^b e^{ax}x^n dx$

ii. $\int_a sin^n x\ dx$

iii. $\int_a cos^n x\ dx$

iv. $\int_0^x e^{ax}x^n dx$

v. $\int_0 sin^n x\ dx$

vi. without proof $\int_0 sin^n x\, cos^n x\, dx$ and illustrations

Unit – III

Beta and Gamma functions

Unit – IV

Evaluation of double and triple integrals in simple cases – changing the order and evaluating of the double integration (Cartesian only)

Unit – V

Definition of Fourier series – Finding fourier coefficients for a given periodic function with period 2π and with period 2l – use of odd and even functions in evaluating fourier coefficients – half range sine and cosine series.

Recommended Text	**1.** Courant and F. John, Introduction to Calculus and Analysis (Volumes I & II), Springer- Verlag, New York, Inc., 1989. 2. Apostol, Calculus, Volumes I and II. 3. G oldberg, Calculus and mathematical analysis.
Reference Books	1. Calculus – T.K.M. Pillai 2. Trigonometry & Fourier series – T.K.M. Pillai.
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Determine Leibnitz theorem and its applications and Jacobians of two & three variables

CLO 2: Evaluate Reduction formula (when n is a +ve integer)

CLO 3: Solve Beta and Gamma functions

CLO 4: Evaluation of double and triple integrals in simple cases

CLO 5: Finding Fourier coefficients for a given periodic function

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	-	-	-	3	2	1
CLO2	3	1	3	-	-	-	3	2	1
CLO3	3	1	3	-	-	-	3	2	1
CLO4	3	1	3	-	-	-	3	2	1
CLO5	3	1	3	-	2	1	3	2	1

Course Code	**Course Title**	**L**	**T**	**P**	**C**
23112GEC15	Allied Mathematics - II	3	1	0	3

Objectives of the Course	• Knowledge on Euler's formula and hyperbolic functions, and the Expansions of of sines and cosines. • Knowledge about the Expansion of inverse hyperbolic function and Separation of real and imaginary parts.

Unit – I Binomial, Exponential & Logarithmic series (Formulae only) – Summation
Unit – II Nonsingular, symmetric, skew symmetric, orthogonal, Hermitian, skew Hermitian and unitary matrices – Characteristics equation, eigen values, eigen vector – Cayley Hamilton's theorem (proof not needed) Simple application only.
Unit – III Expansion of sinnθ, cosnθ, tannθ(n being a positive integer) – Expansion of $sin^n\theta, cos^n\theta, sin^n\theta\, cos^m\theta$ in a series of sines and cosines of multiples of θ (θ – given in radius) Expansion of sinθ, cosθ and tanθ in terms of powers of θ (only problems in all the above)
Unit – IV Euler's formula for $e^{i\theta}$ – definition of hyperbolic functions – formulae involving hyperbolic functions – relation between hyperbolic and circular function – expansion of sinhx, coshx, tanhx in power of x.
Unit – V Expansion of inverse hyperbolic function – sinh-1x, cosh-1x and tanh-1x - Separation of real and imaginary parts of sin(x+iy), cos(x+iy), tan(x+iy), sinh(x+iy), cosh(x+iy), tanh(x+iy)

Recommended Text	1. T.K.M. Pillai, T.Natarajan, K.S. Ganapathi, Algebra, Vol I. S.Viswanathan Pvt.Ltd., Chennai – 2004 2. S.Narayanan, T.K.M.Pillai, S.Viswanathan Pvt.Ltd. & Vijay Nicole imprint Pvt. Ltd. 2004
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)
Students will be able to

CLO 1: Determine the Binomial, Exponential & Logarithmic series
CLO 2: Evaluate Nonsingular, symmetric, skew symmetric, orthogonal, Hermitian, skew Hermitian and unitary matrices and Hamilton's theorem
CLO 3: Solve Expansion of $\sin n\theta$, $\cos n\theta$, $\tan n\theta$ and the Expansion of $\sin\theta$, $\cos\theta$ and $\tan\theta$ in terms of powers of θ
CLO 4: Explain Euler's formula and relation between hyperbolic and circular function
CLO 5: Explain the inverse hyperbolic function and Separation of real and imaginary parts of sine, cosine and tan.

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	-	-	-	3	2	1
CLO2	3	1	3	-	-	-	3	2	1
CLO3	3	1	3	-	-	-	3	2	1
CLO4	3	1	3	-	-	-	3	2	1
CLO5	3	1	3	-	2	1	3	2	1

Title of the Course	**QUALITATIVE ORGANIC ANALYSIS AND PREPARATION OF ORGANIC COMPOUNDS**						
Paper No.	**Core IV**						
Category	**Core**	**Year**	I	**Credits**	2	**Course Code**	23114GEC16
		Semester	II				

Instructional hours per week	Lecture	Tutorial	Lab Practice	Total
	-	-	3	3
Prerequisites				
Objectives of the course	This course aims at providing knowledge on laboratory safety handling glass wares analysis of organic compounds preparation of organic compounds			

UNIT I

Separation and Purification Techniques (Not for Examination)

1. Purification of organic compounds by crystallization (from water / alcohol) and distillation.

2. Determination of melting and boiling points of organic compounds.

3. **Steam distillation** - Extraction of essential oil from citrus fruits/eucalyptus leaves.

Unit II

4. Chromatography (any one) (Group experiment)

(i) Separation of amino acids by Paper Chromatography

(ii) Thin Layer Chromatography - mixture of sugars / plant pigments

(iii) Column Chromatography - extraction of carotene, chlorophyll and xanthophyll from leaves / separation of anthracene - anthracene picrate.

5. **Electrophoresis** - Separation of amino acids and proteins. **(Demonstration)**

6. Isolation of casein from milk/Determination of saponification value of oil or fat/Estimation of acetic acid from commercial vinegar. (Any one Group experiment) (4,5& 6–not for ESE)

Qualitative Organic Analysis

Preliminary examination, detection of special elements - nitrogen, sulphur andhalogens

Aromatic and aliphatic nature, Test for saturation and unsaturation,identification of functional groups using solubility tests

Confirmation of functional groups

- monocarboxylic acid, dicarboxylic acid
- monohydric phenol, polyhydric phenol
- aldehyde, ketone, ester
- carbohydrate (reducing and non-reducing sugars)
- primary, secondary, tertiary amine
- monoamide, diamide, thioamide
- anilide, nitro compound
- Preparation of derivatives for functional groups

UNIT III

Preparation of Organic Compounds

Nitration - picric acid from Phenol

Halogenation - p-bromo acetanilide from acetanilide

Oxidation - benzoic acid from Benzaldehyde

Microwave assisted reactions in water:

Methyl benzoate to Benzoic acid

Salicylic acid from Methyl Salicylate

Rearrangement - Benzil to Benzilic Acid

Hydrolysis of benzamide to Benzoic Acid

ReferenceBooks	Venkateswaran, V.; Veeraswamy, R.; Kulandaivelu, A.R. *Basic Principlesof Practical Chemistry*, 2nd ed.; Sultan Chand: New Delhi, 2012. Manna, A.K. *Practical Organic Chemistry*, Books and Allied: India 2018. Gurtu, J. N; Kapoor, R. *Advanced Experimental Chemistry (Organic)*,Sultan Chand: New Delhi, 1987. Furniss,B. S.; Hannaford, A. J.; Smith, P. W. G.; Tatchell, A.R. *Vogel'sTextbook of Practical Organic Chemistry*, 5th ed.; Pearson: India,1989.
Website ande-learning source	https://www.vlab.co.in/broad-area-chemical-sciences
Course Outline	

Course Learning Outcomes (for Mapping with POs and

PSOs)On completion of the course the students should be

able to

CO1: observe the physical state, odour, colour and solubility of the given organic compound.

CO2: identify the presence of special elements and functional group in an unknown organic compound performing a systematic analysis.

CO3: compare mono and dicarboxylic acids, primary, secondary and tertiary amines, mono and diamides, mono and polyhydric phenols, aldehyde and ketone, reducing and non-reducing sugars and explain the reactions behind it.

CO4: exhibit a solid derivative with respect to the identified functional group.

	PO 1	**PO 2**	**PO3**	**PO4**	**PO 5**	**PO6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M

CO-PO Mapping (Course Articulation Matrix)

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
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

UNITS	**COURSE DETAILS**
UNIT-I	vectors, scalars –examples for scalars and vectorsfrom physical quantities – addition, subtraction of vectors – resolution and resultant of vectors – units and dimensions– standard physics constants
UNIT-II	different types of forces–gravitational, electrostatic, magnetic, electromagnetic, nuclear –mechanical forces like, centripetal, centrifugal, friction, tension, cohesive, adhesive forces
UNIT-III	different forms of energy– conservation lawsof momentum, energy – typesof collisions –angular momentum– alternate energy sources–real life examples
UNIT-IV	types of motion– linear, projectile, circular, angular, simple harmonic motions – satellite motion – banking of a curved roads – stream line and turbulent motions –

	wave motion – comparisonof light and sound waves – free, forced, damped oscillations
UNIT-V	surface tension – shape of liquid drop – angle of contact – viscosity –lubricants – capillary flow – diffusion – real life examples– properties and types of materials in daily use- conductors, insulators – thermal and electric
UNIT-VI	**PROFESSIONAL COMPONENTS:**expert lectures –seminars — webinars – industry inputs – social accountability – patriotism
TEXT BOOKS	1. D.S. Mathur, 2010, Elements of Properties of Matter, S.Chand and Co 2. BrijLaland N. Subrahmanyam, 2003, Properties of Matter, S.Chand and Co.
REFERENCEBOOKS	1. H.R. Gulati, 1977, Fundamental of General Properties of Matter, Fifth edition, S.Chand and Co.
WEB RESOURCES	1. http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.htmlhttps://science.nasa.gov/ems/ 2. https://eesc.columbia.edu/courses/ees/climate/lectures/radiation_hays/

COURSEOUTCOMES:

At the end of the course, the student will be able to:

COURSEOUTCOMES	**CO1**	Apply concept of vectors to understand concepts of Physics and solve problems
	CO2	Appreciate different forces present in Nature while learning about phenomena related to these different forces.
	CO3	Quantify energy in different process and relate momentum, velocity and energy
	CO4	Differentiate different types of motions they would encounter in various courses and understand their basis
	CO5	Relate various properties of matter with their behaviour and connect them with different physical parameters involved.

MAPPING WITH PROGRAM OUT COMES:

Mapcourseoutcomes**(CO)**foreachcoursewithprogramoutcomes**(PO)**inthe3-pointscale of STRONG (**3**), MEDIUM (**2**) and LOW(**1**).

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**
CO 1	3	3	3	3	3	3	3	2	3	2
CO 2	2	3	3	3	2	3	3	2	2	2
CO 3	3	3	3	2	3	3	3	2	3	2
CO 4	3	3	3	3	3	3	3	2	2	2
CO 5	3	2	3	3	3	3	3	2	2	3

23114SEC17	Role of Chemistry in daily life (Non Major Elective)	2	0	0	2

Objectives of the course	This course aims at providing an overall view of the • importance of Chemistry in everyday life • chemistry of building materials and food • chemistry of Drugs and pharmaceuticals
Course Outline	**UNIT-I** General survey of chemicals used in everyday life. Air - components and their importance; photosynthetic reaction, air pollution, green - house effect and the impact on our life style. Water - Sources of water, qualities of potable water, soft and hard water, methods of removal of hardness-water pollution
	Unit-II Building materials - cement, ceramics, glass and refractories - definition, composition and application only. Plastics - polythene, PVC, bakelite, polyesters, melamine-formaldehyde resins -preparation and uses only.
	UNIT-III Food and Nutrition - Carbohydrates, Proteins, Fats - definition and their importance as food constituents – balanced diet – Calories minerals and vitamins (sources and their physiological importance). Cosmetics – tooth paste, face powder, soaps and detergents, shampoos, nail polish, perfumes - general formulation and preparations - possible hazards of cosmetic use.

	UNIT-IV Chemicals in food production – fertilizers - need, natural sources; urea,NPK fertilizers and super phosphate. Fuel – classification - solid, liquid and gaseous; nuclear fuel examples and uses.
	UNIT-V Pharmaceutical drugs - analgesics and antipyretics - paracetamol and aspirin. Colour chemicals - pigments and dyes - examples and applications. Explosives - classification and examples.

Recommended Text	1.Food chemistry, H. K. Chopra, P. S. Panesar, Narosa publishing house, 2010. 2.A textbook of pharmaceutical chemistry by Jayashree Ghosh, S Chand publishing, 2012. 3.S. Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur, 2006. 4.B. K, Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014.Introduction to forensic chemistry, Kelly M. Elkins, CRC Press Taylor & Francis Group, 2019. 5. Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, S. Chand & Co.Publishers, second edition, 2006.
ReferenceBooks	1.Randolph. Norris Shreve, Chemical Process Industries, McGraw-Hill, Texas, fourthedition, 1977. 2.W.A.Poucher,JosephA.Brink,Jr.Perfumes,Cosmetics and Soaps,Springer,2000. 3. A.K.De,EnvironmentalChemistry,NewAge InternationalPublicCo.,1990.
Website and e-learningsource	

Course Learning Outcomes (for Mapping with POs and PSOs)On completion of the course the students should be able to

CO1: learn about the chemicals used in everyday life as well as air pollution and waterpollution.

CO2: get knowledge on building materials cement, ceramics, glass and plastics, polythene,PVC bakelite, polyesters,

CO3: acquire information about Food and Nutrition. Carbohydrates, Proteins, Fats Alsohave an awareness about Cosmetics Tooth pastes, face powder, soaps and detergents.

CO4: discuss about the fertilizers like urea, NPK fertilizers and super phosphate. Fuelclassification solid, liquid and gaseous; nuclear fuel - examples and uses

CO5: have an idea about the pharmaceutical drugs analgesics and antipyretics likeparacetamol and aspirin and also about pigments and dyes and its applications.

	PO 1	PO 2	PO 3	PO4	PO 5	PO6	PO 7	PO 8	PO 9	PO1 0
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

Course Code	Course Title	L	T	P	C
231AECCICN	Indian Constitution	2	-	-	2

Aim:

The aim of the constitution is mentioned in the *preamble that is to constitute* India into a sovereign, socialist, democratic republic and it's the provision of the rights of citizens.it's primary objective is to provide economic, social & political justice.

Course Objectives:

- To make the students understand about the democratic rule and parliamentarian administration
- To appreciate the salient features of the Indian constitution
- To know the fundamental rights and constitutional remedies
- To make familiar with powers and positions of the union executive, union parliament and the supreme court
- To exercise the adult franchise of voting and appreciate the electoral system of Indian democracy.

Course outcome:

Democratic values and citizenship training are gained
Awareness on fundamental rights are established
The function of union government and state government are learnt
The power and functions of the judiciary are learnt thoroughly
Appreaciation of democratic parliamentary rule is learnt

Unit I: The making of Indian constitution
The constitution assembly organization - character - work salient features of the constitution- written and detailed constitution -socialism - secularism-democracy and republic.

Unit II: Fundamental rights and fundamental duties of the citizens
Right of equality -right of freedom- right against exploitation -right to freedom of religion- cultural and educational rights -right to constitutional remedies -fundamental duties.

Unit III: Directive principles of state policy
Socialistic Principles-Gandhi a principles-liberal and general principles -differences between fundamental rights and directive principles

Unit IV: The union executive, union parliament and Supreme Court
Powers and positions of the president -qualification _method of election of president and vice president -prime minister -Rajya Sabah -Lok Sabah. The supreme court -high court -functions and position of supreme court and high court

Unit V: State council -election system and parliamentary democracy in India
State council of ministers -chief minister -election system in India-main features election commission-features of Indian democracy.

References:

1) Palekar.S.A. Indian constitution government and politics, ABD publications, India
2) Aiyer, Alladi krishnaswami, Constitution and fundamental rights 1955.
3) Markandan. k.c.directive Principles in the Indian constitution 1966.
4) Kashyap. Subash C, Our parliament, National book trust, New Delhi 1989

Course Code	Course Title	L	T	P	C
231LSCUV	**Universal Human Values**	-	-	-	1

Aim:

This course aims at making learners conscious about universal human values in an integral manner, without ignoring other aspects that are needed for learner's personality development.

Course Objectives :

The present course deals with meaning, purpose and relevance of universal human values and how to inculcate and practice them consciously to be a good human being and realize one's potentials.

Course Outcomes :

By the end of the course the learners will be able to:

1. Know about universal human values and understand the importance of values in individual, social circles, career path, and national life.
2. Learn from case studies of lives of great and successful people who followed and practiced human values and achieved self-actualisation.
3. Become conscious practitioners of human values.
4. Realize their potential as human beings and conduct themselves properly in the ways of the world.

Unit I

- Introduction:What is love? Forms of love for self, parents, family, friend, spouse, community, nation, humanity and other beings, both for living and non-living
- Love and compassion and inter-relatedness
- Love, compassion, empathy, sympathy and non-violence
- Individuals who are remembered in history for practicing compassion and love.
- Narratives and anecdotes from history, literature including local folklore
- Practicing love and compassion: What will learners learn gain if they practice love and compassion? What will learners lose if they don't practice love and compassion?
- Sharing learner's individual and/or group experience(s)
- Simulated Situations
- Case studies

Unit II

- Introduction: What is truth? Universal truth, truth as value, truth as fact (veracity, sincerity, honesty among others)
- Individuals who are remembered in history for practicing this value
- Narratives and anecdotes from history, literature including local folklore
- Practicing Truth: What will learners learn/gain if they practice truth? What will learners lose if they don't practice it?
- Learners' individual and/or group experience(s)
- Simulated situations
- Case studies

Unit III

- Introduction: What is non-violence? Its need. Love, compassion, empathy, sympathy for others as pre-requisites for non-violence
- Ahimsa as non-violence and non-killing
- Individuals and organisations that are known for their commitment to non- violence
- Narratives and anecdotes about non-violence from history, and literature including local folklore
- Practicing non-violence: What will learners learn/gain if they practice non- violence? What will learners lose if they don't practice it?
- Sharing learner's individual and/or group experience(s) about non-violence
- Simulated situations
- Case studies

Unit IV

- Introduction: What is righteousness?
- Righteousness and *dharma*, Righteousness and Propriety
- Individuals who are remembered in history for practicing righteousness
- Narratives and anecdotes from history, literature including local folklore
- Practicing righteousness: What will learners learn/gain if they practice righteousness? What will learners lose if they don't practice it?
- Sharing learners' individual and/or group experience(s)
- Simulated situations
- Case studies

Unit V

- Introduction: What is peace? Its need, relation with harmony and balance
- Individuals and organisations that are known for their commitment to peace
- Narratives and Anecdotes about peace from history, and literature including local folklore
- Practicing peace: What will learners learn/gain if they practice peace? What will learners lose if they don't practice it?
- Sharing learner's individual and/or group experience(s) about peace
- Simulated situations
- Case studies

Unit VI

- Introduction: What is service? Forms of service for self, parents, family, friend, spouse, community, nation, humanity and other beings—living and non-living, persons in distress or disaster.
- Individuals who are remembered in history for practicing this value.
- Narratives and anecdotes dealing with instances of service from history, literature including local folklore
- Practicing service: What will learners learn/gain gain if they practice service? What will learners lose if they don't practice it?
- Sharing learners' individual and/or group experience(s) regarding service
- Simulated situations
- Case studies

Unit VII

- Introduction: What is renunciation? Renunciation and sacrifice. Self-restrain and Ways of overcoming greed. Renunciation with action as true renunciation
- Individuals who are remembered in history for practicing this value.
- Narratives and anecdotes from history and literature,including local folklore about individuals who are remembered for their sacrifice and renunciation.
- Practicing renunciation and sacrifice: What will learners learn/gain if they practice Renunciation and sacrifice? What will learners lose if they don't practice it?
- Sharing learners' individual and/or group experience(s)
- Simulated situations
- Case studies

FIRST YEAR
SEMESTER – II

Course Code	Course Title	L	T	P	C
THEORY					
23110AEC21/ 23111AEC21/ 23132AEC21/ 23135AEC21	Tamil – II/ Advanced English-II/ Hindi-II/ French - II	3	1	0	3
23111AEC22	English-II	3	1	0	3
23114AEC23	General Chemistry –II	4	1	0	3
23114GEC24	Mathematics –III	4	1	0	3
23114GEC25	Mathematics –IV	4	1	0	3
	PRACTICAL				
23114SEC26L	Quantitative Organic Analysis and Preparation of Organic Compounds	0	0	3	3
Skill Enhancement Course					
23114SEC27	Dairy Chemistry (Non Major Elective)	2	0	0	2
23114SEC28	Functional Cosmetics	2	0	0	2
Ability Enhancement Compulsory course (AECC1)					
231AECC02	Communication Skills	2	0	0	2
AUDIT COURSE					
231SSCBE	Basic Behavioural Etiquette	-	-	-	1
	Total	**24**	**4**	**6**	**25**

Course Code	Course Title	L	T	P	C
23110AEC21	Tamil-II	**3**	**1**	**0**	**3**

பக்தி இலக்கியம்

பாடநோக்கங்கள்

- காலந்தோறும் பக்தி இலக்கியம் வளர்ந்துள்ள தன்மையைக் கற்பித்தல்.
- நாயன்மார்கள், ஆழ்வார்களின் பக்திச் சிறப்பை அறிய செய்தல்.
- ஆழ்வார்களின் பக்தி உணர்வை ஊட்டுதல்
- பாடல்களில் இசை இன்பம், ஓசை நயம் ஆகியவற்றை உணரச்செய்தல்
- குழந்தைப் பருலத்தின் தன்மையை உணர்த்துதல்

பயன்கள்

- நாயன்மார்கள் பக்திச் சிறப்பை அறிதல்.
- ஆழ்வார்களின் பக்தி நெறியை உணர்தல்.
- பக்தி இலக்கியம் காலம் தோறும் வளர்ந்ததை அறிதல்.
- பாடல்களில் இசை இன்பம், ஓசை நயம் அறிதல்.
- குழந்தைப் பருலத்தின் தன்மையை உணர்தல்.

அலகு- 1

பன்னிரு திருமுறைகள்

1.திருஞானசம்பந்தர்- திருத்தில்லைப் பதிகம்
2.திருநாவுக்கரசர் - திருநீற்றுப் பதிகம்

3.சுந்தரர் - திருவெண்ணைநல்லூர்
4.திருமூலர் – திருமந்திரம் (இளமை நிலையாமை)

அலகு- 2

பன்னிரு ஆழ்வார்கள்

1.ஆண்டாள் - திருப்பாவை
2.பெரியாழ்வார்- மூன்றாம் திருமுறை (பத்து பாடல்கள்)
3.மதுரகவியாழ்வார் - கண்ணின் நுண் சிறு தாம்பு

அலகு- 3

சிற்றிலக்கியங்கள்

1.மீனாட்சியம்மைப் முத்துக்குமாரசாமி பிள்ளைத்தமிழ்- செங்கீரை பருவம், அம்புலி பருவம்
நந்திக்கலம்பகம்
குற்றால குறவஞ்சி- குறத்தி நகர்வளம் கூறுதல்
காளமேகப்புலவர் பாடல்கள்

அலகு- 4

புதினம்

1. நா. பார்த்தசாரதியின்- குறிஞ்சி மலர்
சீதை பதிப்பகம் சென்னை.

அலகு-5

தமிழ் இலக்கிய வரலாறு

1. பக்தி இலக்கியங்கள்
2. சைவமும் தமிழும்
3.வைணவ சமயம் போற்றி வளர்த்த தமிழ்
4. சிற்றிலக்கியங்கள்
5. நாவல் இலக்கியம்

பார்வை நூல்கள் :

1. தேவாரம் மணிவாசகர் பதிப்பகம் சென்னை
2. நாலாயிர திவ்ய பிரபந்தம் - வர்த்தமான பதிப்பகம் சென்னை
3. தமிழ் இலக்கிய வரலாறு - முனைவர் ச சுபாஷ் சந்திர போஸ், இயல் வெளியீடு,தஞ்சாவூர
4. தமிழ் நாவல் இலக்கியம் -கா கைலாசபதி- தமிழ் புத்தக,நிலையம், சென்னை
1. இணையதளம் www.tamilvu.org, www.noolulagam.com

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CLO1	3	2	3	3	3	2	2	2	3	2	3	2
CLO2	3	3	2	2	2	3	2	3	3	2	2	2
CLO3	3	2	3	3	2	2	2	3	2	3	3	2
CLO4	3	3	3	2	2	2	3	2	3	2	3	3
CLO5	3	3	2	2	2	2	3	2	2	2	3	3

Course Code	Course Title	L	T	P	C
23111AEC22	English-II	3	1	0	3

Learning Objectives	
LO1	To introduce learners to the essential skills of communication in English
LO2	To enable them use these skills effectively in academic and non-academic contexts
LO3	To help them identify and eliminate common mistakes in writing and speaking
LO4	To enable them use various business communication strategies and to use advanced vocabulary
LO5	To familiarize them in writing descriptive essays and respond to arguments orally and in writing

Unit No.	Unit Title & Text
I	**Poetry** 1.1Very Indian Poem in Indian English - Nissim Ezekiel 1.2 Still I Rise - Maya Angelou 1.3 On Killing a Tree - Gieve Patel
II	**Prose** 2.1 If You Are Wrong Admit it- Dale Carnegie 2.2 Kindly Adjust Please - Shashi Tharoor 2.3 The Spoon-fed Age- W.R. Inge
III	**Fiction** Alchemist - Paulo Coelho
IV	**Language Competency** 4.1 Homonyms, Homophones, Homographs Portmanteau words 4.2 Subject Verb Agreement
V	**English in the Workplace** 5.1 Reading for General and Specific information [charts, tables, schedules, graphs etc] 5.2 Reading news and weather reports 5.3 Writing paragraphs 5.4 Taking and making notes

TextBooks(LatestEditions)

1	The Alchemist - Paulo Coelho Harper - 2005
ReferencesBooks **(Latest editions,and the style as given below must be strictly adhered to)**	
1	Advanced English Grammar. Martin Hewings. Cambridge University Press, 2000
2	Descriptive English. SP Bakshi, Richa Sharma · 2019, Arihant Publications (India) Ltd.
3	The Reading Book: A Complete Guide to Teaching Reading. Sheena Cameron, Louise Dempsey, S & L. Publishing, 2019.
4	Skimming and Scanning Techniques, Barbara Sherman, Liberty University Press, 2014
5	Brilliant Speed Reading: Whatever you need to read, however ...Phil Chambers, Pearson, 2013.
6	The Archer, Paulo Coelho. Penguin Viking, 2020.
WebResources	
1	Very Indian poem by Nissim Ezekiel http://econtent.in/pacc.in/admin/contents/40_%20_2020103001102714.pdf
2	Still I Rise by Maya Angelou https://www.poetryfoundation.org/poems/46446/still-i-rise
3	The Flower by Tennyson: https://www.poemhunter.com/poem/the-flower-2/
4	On Killing a tree by Gieve Patel: https://www.poemhunter.com/poem/on-killing-a-tree/
5	If you are wrong, admit it: https://www.tbr.fun/if-youre-wrong-admit-it/

Course Outcomes	On completion of this course, students will;	
CO1	Learn to introduce themselves and talk about everyday activities confidently	PO1
CO2	Be able to write short paragraphs on people, places and events	PO1, PO2
CO3	Identify the purpose of using various tenses and effectively employ them in speaking and writing	PO4, PO6
CO4	Gain knowledge to write subjective and objective descriptions	PO4, PO5,PO6
CO5	Identify and use their skills effectively in formal contexts.	PO3,PO8

23114AEC23	General Chemistry –II	4	1	0	3

Instructional hours per week	**Lecture**	**Tutorial**	**Lab Practice**	**Total**
	-	-	3	3
Prerequisites	General Chemistry II			
Objectives of the course	This course aims at providing knowledge on • laboratory safety • handling glass wares • analysis of organic compounds • preparation of organic compounds			
Course Outline	**UNIT I** Safety rules, symbols and first-aid in chemistry laboratory Basic ideas about Bunsen burner, its operation and parts of the flame. Chemistry laboratory glassware –basis information and uses			
	Unit II **Qualitative Organic Analysis** Preliminary examination, detection of special elements - nitrogen, sulphur and halogens Aromatic and aliphatic nature, Test for saturation and unsaturation, identification of functional groups using solubility tests Confirmation of functional groups • monocarboxylic acid, dicarboxylic acid • monohydric phenol, polyhydric phenol • aldehyde, ketone, ester • carbohydrate (reducing and non-reducing sugars) • primary, secondary, tertiary amine • monoamide, diamide, thioamide • anilide, nitro compound • Preparation of derivatives for functional groups			

	UNIT III **Preparation of Organic Compounds** ix. Nitration - picric acid from Phenol x. Halogenation - p-bromo acetanilide from acetanilide xi. Oxidation - benzoic acid from Benzaldehyde xii. Microwave assisted reactions in water: xiii. Methyl benzoate to Benzoic acid xiv. Salicylic acid from Methyl Salicylate xv. Rearrangement - Benzil to Benzilic Acid xvi. Hydrolysis of benzamide to Benzoic Acid

	Separation and Purification Techniques (Not for Examination) 7. Purificationof organic compounds by crystallization (from water / alcohol) and distillation 8. Determination of melting and boiling points of organic compounds. 9.**Steam distillation** - Extraction of essential oil from citrus fruits/eucalyptus leaves. **10. Chromatography (any one) (Group experiment)** (i) Separation of amino acids by Paper Chromatography (ii)Thin Layer Chromatography - mixture of sugars / plant pigments /permanganatedichromate. (iii) Column Chromatography - extraction of carotene, chlorophyll and xanthophyll from leaves / separation of anthracene - anthracene picrate. 11. **Electrophoresis –** Separation of amino acids and proteins. **(Demonstration)** 12. Isolation of casein from milk/Determination of saponification value of oil orfat/Estimation of acetic acid from commercial vinegar. (Any one Group experiment) (4,5& 6–not for ESE)
Reference Books	5. Venkateswaran, V.; Veeraswamy, R.; Kulandaivelu, A.R. *Basic Principles of Practical Chemistry*, 2nd ed.; Sultan Chand: New Delhi, 2012. 6. Manna, A.K. *Practical Organic Chemistry*, Books and Allied: India,2018. 7. Gurtu, J. N; Kapoor, R. *Advanced Experimental Chemistry (Organic)*, Sultan Chand: New Delhi, 1987. 8. Furniss,B. S.; Hannaford, A. J.; Smith, P. W. G.; Tatchell, A.R. *Vogel's Textbook of Practical Organic Chemistry*, 5th ed.; Pearson: India,1989.
Website and e-learning source	https://www.vlab.co.in/broad-area-chemical-sciences

Course Learning Outcomes (for Mapping with POs and PSOs) On

completion of the course the students should be able to

CO1: observe the physical state, odour, colour and solubility of the given organic compound.

CO2: identify the presence of special elements and functional group in an unknown organic compound performing a systematic analysis.

CO3: compare mono and dicarboxylic acids, primary, secondary and tertiary amines, mono and diamides, mono and polyhydric phenols, aldehyde and ketone, reducing and non- reducing sugars and explain the reactions behind it.

CO4: exhibit a solid derivative with respect to the identified functional group.

	PO 1	**PO 2**	**PO3**	**PO4**	**PO 5**	**PO6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M

CO-PO Mapping (Course Articulation Matrix)

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
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

Course Code	Course Title	L	T	P	C
23114SEC27	**DAIRY CHEMISTRY**	2	0	0	2

Objectives ofthe course	This course aims at providing an overall view of the • chemistry of milk and milk products • processing of milk • Preservation and formation of milk products.
Course Outline	**UNIT I** **Composition of Milk** Milk-definition-general composition of milk- constituents of milk - lipids, proteins, carbohydrates, vitamins and minerals - physical properties of milk - colour, odour, acidity, specific gravity, viscosity and conductivity -Factors affecting the composition of milk - adulterants, preservatives with neutralizer- examples and their detection- estimation of fat, acidity and total solids in milk.
	Unit II **Processing of Milk** Microbiology of milk - destruction of micro - organisms in milk, physico – chemical changes taking place in milk due to processing - boiling, pasteurization – types of pasteurization -Bottle, Batch and HTST (High Temperature Short Time) – Vacuum pasteurization – Ultra High Temperature Pasteurization.
	UNIT III **Major Milk Products** Cream - definition - composition - chemistry of creaming process - gravitational and centrifugal methods of separation of cream - estimation of fatin cream. Butter - definition -composition - theory of churning – desi butter - salted butter, estimation of acidity and moisture content in butter. Ghee - major constituents - common adulterants added to ghee and their detection - rancidity - Definition - prevention - antioxidants and synergists - natural and synthetic.
	UNIT IV: **Special Milk** Standardised milk - definition - merits - reconstituted milk - definition - flow diagram of manufacture - Homogenised milk - flavoured milk - vitaminised milk - toned milk -Incitation milk - Vegetable toned milk - humanized milk -

	condensed milk - definition, composition and nutritive value. **UNIT V** **Fermented and other Milk Products** Fermented milk products – fermentation of milk - definition, conditions, cultured milk - definition of culture - example, conditions - cultured cream, butter milk - Bulgarious milk -acidophilous milk – Yoheer Indigeneous products- khoa and chhena definition - Ice cream -definition-percentage composition-types-ingredients-manufacture of ice–cream, stabilizers - emulsifiersandtheirrole-milkpowder-definition-needformakingmilkpowder-dryingprocess-types of drying.
Recommended Text	1. K. Bagavathi Sundari, Applied Chemistry, MJP Publishers, first edition,2006. 2. K. S. Rangappa and K.T. Acharya, Indian Dairy Products, Asia Publishing House New Delhi, 1974. 3.Text book of dairy chemistry, M.P. Mathur, D. Datta Roy, P. Dinakar, Indian Council of Agricultural Research, 1 st edition, 2008. 4. A Text book of dairy chemistry, Saurav Singh, Daya Publishing house, 1 st edition,2013. 5. Text book of dairy chemistry, P. L. Choudhary, Bio-Green book publishers, 2021.
ReferenceBooks	1. Robert Jenness and S. Patom, Principles of Dairy Chemistry, S.Wiley, New York, 2005. 2. F.P.Wond, Fundamentals of Dairy Chemistry,Springer,Singapore,2006. 3. Sukumar De, Outlines of Dairy Technology, Oxford University Press, New Delhi, 1980. 4. P.F.Fox and P.L.H. Mcsweeney, Dairy Chemistry and Biochemistry,Springer, Second edition, 2016. 5. Dairy chemistry and biochemistry, P. F. Fox, T. Uniacke-Lowe, P.L.H. McSweeney, J.A. OMahony, Springer, Second edition, 2015.
Website and e-learningsource	

Course Learning Outcomes (for Mapping with POs and PSOs)On

completion of the course the students should be able to

CO 1: understand about general composition of milk – constituents and its physical properties.

CO 2: acquire knowledge about pasteurization of Milk and various types of pasteurization -Bottle, Batch and HTST Ultra High Temperature Pasteurization.

CO 3: learn about Cream and Butter their composition and how to estimate fat in cream andGhee

CO 4: explain about Homogenized milk, flavored milk, vitaminised milk and toned milk.

CO 5: have an idea about how to make milk powder and its drying process - types of

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

CO-PO Mapping (Course Articulation Matrix)

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 P os	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

23114SEC28	FOUNDATION COURSE (FC)	2	0	0	2

COURSE	**SECOND SEMESTER – FOUNDATION COURSE**
COURSE TITLE	**COSMETICS AND PERSONAL GROOMING**
CREDITS	2
COURSE OBJECTIVES	To help students get an overview of Physics before learning their core courses. To serve as a bridge between the school curriculum and the degree programme.

Objectives of the course	This course aims at familiarizing the students with • formulations of various types of cosmetics and their significance • hair, skin and dental care • makeup preparations and personal grooming
Course Outline	**Uni I Skin care** Nutrition of the skin, skin care and cleansing of the skin; face powder – ingredients; creams and lotions – cleansing, moisturizing all purpose, shavingand sunscreen (formulation only); Gels – formulation and advantages; astringent and skin tonics – key ingredients, skin lightness, depilatories.
	Unit II Hair care Shampoos – types – powder, cream, liquid, gel – ingredients; conditioner –types – ingredients **Dental care** Tooth pastes – ingredients – mouth wash
	Unit III Make up Base – foundation – types – ingredients; lipstick, eyeliner, mascara, eyeshadow, concealers, rouge
	Unit IV Perfumes Classification - Natural – plant origin – parts of the plant used, chief constituents; animal origin – amber gries from whale, civetone from civet cat, musk from musk deer; synthetic – classification emphasizing characteristics – esters – alcohols – aldehydes – ketones
	Unit V **Beauty treatments** Facials - types – advantages – disadvantages; face masks – types; bleach -types – advantages– disadvantages; shaping the brows; eyelash tinting; perming – types; hair colouring and dyeing ; permanent waving – hair straightening; wax – types – waxing; pedicure, manicure - advantages – disadvantages
Recommended Text	1. Thankamma Jacob, (1997) Foods, drugs and cometics – A consumer guide, Macmillan publication, London.
ReferenceBooks	1. Wilkinson J B E and Moore R J, (1997) Harry's cosmeticology, 7th ed.,Chemical Publishers, London. 2. George Howard, (1987) Principles and practiceof perfumes and cosmetics,

	Stanley Therones, Chettenham
Website and e-learning source	1. http://www.khake.com/page75.html 2. Net.foxsm/list/284

Course Learning Outcomes (for Mapping with POs and PSOs)On completion of the course the students should be able to

- **CO1:** know about the composition of various cosmetic products
- **CO2** understand chemical aspects and applications of hair care and dental care and skincare products.
- **CO3** understand chemical aspects and applications of perfumes and skin care products.
- **CO4** to understand the methods of beauty treatments their advantages and disadvantage
- **CO5** understand the hazards of cosmetic products.

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

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK GUIDELINES BASED REGULATIONS FOR UNDER GRADUATE PROGRAMME	
Programme:	**B.Sc. Chemistry**
Programme Outcomes:	**PO1: Disciplinary knowledge:** Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study **PO2: Communication Skills:** Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one's views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups. **PO3: Critical thinking:** Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development. **PO4: Problem solving: Capacity** to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations. **PO5: Analytical reasoning**: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints. **PO6: Research-related skills**: A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesising and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation **PO7: Cooperation/Team work:** Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team **PO8: Scientific reasoning**: Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective. **PO9: Reflective thinking**: Critical sensibility to lived experiences, with self awareness and reflexivity of both self and society. **PO10 Information/digital literacy:** Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data. **PO 11 Self-directed learning**: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion. **PO 12 Multicultural competence:** Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups. **PO 13: Moral and ethical awareness/reasoning**: Ability toembrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demonstratingthe ability to identify ethical issues related to one‟s work, avoid unethical behaviour such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to

	intellectual property rights; appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work. **PO 14: Leadership readiness/qualities:** Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, in a smooth and efficient way. **PO 15: Lifelong learning:** Ability to acquire knowledge and skills, including „learning how to learn", that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place through knowledge/skill development/reskilling.
Programme Specific Outcomes:	On successful completion of Bachelor of Physics with Computer Applications programme, the student should be able to: **PSO1: Disciplinary Knowledge:** Understand the fundamental principles, concepts, and theories related to physics and computer science. Also, exhibit proficiency in performing experiments in the laboratory. **PSO2: Critical Thinking:** Analyse complex problems, evaluate information, synthesize information, apply theoretical concepts to practical situations, identify assumptions and biases, make informed decisions and communicate effectively **PSO3: Problem Solving:** Employ theoretical concepts and critical reasoning ability with physical, mathematical and technical skills to solve problems, acquire data, analyze their physical significance and explore new design possibilities. **PSO4: Analytical & Scientific Reasoning:** Apply scientific methods, collect and analyse data, test hypotheses, evaluate evidence, apply statistical techniques and use computational models. **PSO5: Research related skills:** Formulate research questions, conduct literature reviews, design and execute research studies, communicate research findings and collaborate in research projects. **PSO6: Self-directed & Lifelong Learning:** Set learning goals, manage their own learning, reflect on their learning, adapt to new contexts, seek out new knowledge, collaborate with others and to continuously improve their skills and knowledge, through ongoing learning and professional development, and contribute to the growth and development of their field.

Course Code	Course Title	L	T	P	C
32112GEC24	Allied Mathematics - III	3	1	0	3

Objectives of the Course	• Knowledge on Ordinary differential equations and Formation of partial differential equation • Knowledge about the Lagrange's method, Laplace Transforms and Inverse Laplace transform.

UNIT I:

Ordinary differential equations of first order but of higher degree- Equations solvable for x and y – solvable for dy/dx, clairaut's form (simple case only)- homogeneous linear differential equation(Variable coefficients), variation of parameter.

UNIT II:

Formation of partial differential equation by eliminating constants and by eliminating of arbitrary functions- definition of general, particular and complete solution – singular integral(Geometrical meaning not required) solution of first order equations in the slandered forms f(p,q=0, f(x,p,q)=0, f(z,p,q)=0 f1(x,p=f_2(y,p) z=(x,p+yq=f(p,q).

UNIT III:

Lagrange's method for solving $P_p + Q_q = R$ where p,q,r functions of X, Y, Z- (geometrical meaning is not needed)- (only problem in all the above- No proof needed for any formula) Cherpit's method The four standard forms.

UNIT IV:

Laplace Trnsforms- Definitions-

L(e^{at}) L(cosat), L(sinat), L(t^n) where n is a positive integer – Basic theorem inlaplace (transform only) L (e^{-st} cosbt), L(e^{-st} sinbt), L[e^{-st} f(t)]-L[F(t), L[f(t)], L[f'(t)]

UNIT V:

Inverse Laplace transform related to the above standard forms- solving second order ODE with constant coefficients using laplace transforms and simultaneous equation, variable coeffiecients. Fourier series: Periodic functions — Dirichlet conditions (Without Proof) Odd and Even functions change of interval — Half range series.

Recommended Text	1. S. Narayanan – differential equations 2. T.K.M Pillai & S.Naranyanan- calculus 3. M.L.Khanna- differential calculus
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Determine Ordinary differential equations of first order but of higher degree and homogeneous linear differential equation

CLO 2: Evaluate Formation of partial differential equation by eliminating constants and by eliminating of arbitrary functions and singular integral

CLO 3: Solve the Expansion of sinnθ, cosnθ, tannθ and the Expansion of sinθ, cosθ and tanθ in terms of powers of θ

CLO 4: Explain Laplace Transforms and Basic theorem Inlaplace transforms

CLO 5: Explain Inverse Laplace transform and solving second order ODE with constant coefficients

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	-	-	-	3	2	1
CLO2	3	1	3	-	-	-	3	2	1
CLO3	3	1	3	-	-	-	3	2	1
CLO4	3	1	3	-	-	-	3	2	1
CLO5	3	1	3	-	2	1	3	2	1

Course Code	**Course Title**	**L**	**T**	**P**	**C**
23112GEC25	Allied Mathematics - IV	3	1	0	3

Objectives of the Course	• Knowledge on Vector differentiation, Divergence and Double operators. • Knowledge about Vector integration, Gauss divergence theorem and Equation of sphere.

UNIT – I Vector differentiation – velocity & acceleration vectors- Gradient of a vector directional derivative - Init normal vector- tangent plane.
Unit- II Divergence- Curl – Solenoidal & Irrotational vector- Double operators – Properties connecting grad, div & curl of a vector.
Unit –III Vector integration –Line integrals – Conservative force field – Scalar field- Scalar potential- work done by d Force- Surface integrals – Volume integrals.
Unit –IV Gauss divergence theorem , Stoke's theorem (statement, application & verification only)
Unit –V Equation of sphere – Target plane – plane section of a sphere – Finding the centre & radius of the circle of integration – sphere through the circle of integration (only problem in all above)

Recommended Text	T.K. Manickavasagem Pillai, Analytical Geometry (3D) & Vector calculus, Neq Gamma Publishing House, 1991.
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Determine Vector differentiation, velocity & acceleration vectors and tangent plane.

CLO 2: Evaluate Divergence**,** Solenoidal & Irrotational vector and Properties connecting grad, div & curl of a vector.

CLO 3: Explain the Vector integration, Line integrals Scalar field, Scalar potential and Volume integrals.

CLO 4: Explain the Gauss divergence theorem, Stoke's theorem

CLO 5: Explain Equation of sphere, Target plane, Finding the centre and radius of the circle of integration.

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	-	-	-	3	2	1
CLO2	3	1	3	-	-	-	3	2	1
CLO3	3	1	3	-	-	-	3	2	1
CLO4	3	1	3	-	-	-	3	2	1
CLO5	3	1	3	-	2	1	3	2	1

COMMUNICATION SKILLS

Course Code	Course Title	L	T	P	C
231AECCCMS	Communication Skills	2	0	0	2

Aim: The aim to develop communication skills

Course Objectives:

This course has been developed with the following objectives:

- Identify common communication problems that may be holding learners back
- Identify what their non-verbal messages are communicating to others
- Understand role of communication in teaching-learning process
- Learning to communicate through the digital media
- Understand the importance of empathetic listening
- Explore communication beyond language.

Course Outcome:

- By the end of this program, participants should have a clear understanding of what good communication skills are and what they can do to improve their abilities.

Unit I: Techniques of effective listening, Listening and comprehension, Probing questions, Barriers to listening, Pronunciation, Enunciation, Vocabulary, Fluency, Common Errors.

Unit II: Techniques of effective reading, gathering ideas and information from a given text, Identify the main claim of the text, Identify the purpose of the text, Identify the context of the text, Identify the concepts mentioned. Evaluating these ideas and information - Identify the arguments employed in the text, Identify the theories employed or assumed in the text. Interpret the text - To understand what a text says, to understand what a text does, To understand what a text means

Unit III: Clearly state the claims, Avoid ambiguity, vagueness, unwanted generalizations and over simplification of issues, Provide background information, Effectively argue the claim, Provide evidence for the claims, Use examples to explain concepts, Follow convention, Be properly sequenced, Use proper signposting techniques, Be well structured. Well-knit logical sequence - Narrative sequence, Category groupings, Different modes of Writing - E-mails, Proposal writing for Higher Studies, Recording the proceedings of meetings, Any other mode of writing relevant for learners

Unit IV: Role of Digital literacy in professional life, Trends and opportunities in using digital technology in the workplace, Internet Basics, Introduction to MS Office tools: Paint, Office, Excel, Power point. Introduction to social media websites, Advantages of social media, Ethics and etiquettes of social media, How to use Google search better, Effective ways of using Social Media, Introduction to l Marketing

Unit V: Meaning of non-verbal communication, Introduction to modes of non-verbal communication, Breaking the misbeliefs, Open and Closed Body language, Eye Contact and Facial Expression, Hand Gestures, Do's and Don'ts, Learning from experts, Activities-Based Learning

Reference:

1. Sen Madhu Chanda (2010), An Introduction to Critical Thinking, Pearson, Delhi
2. Silvia P. J. (2007), How to Read a Lot, American Psychological Association, Washington DC

AUDIT COURSE

Course Code	Course Title	L	T	P	C	
231SSCBE	Basic Behavioural Etiquette	-	-	-	1	

Objectives:

Training is mainly focused on discipline, grooming, career planning and building personality. As it is the first year of the university, students are given awareness about the job market right from the start so that they prepare accordingly at their own pace and potential.

Eliminating negative thought, developing enriching habits, unlocking individual potentials and well-versed communication is the aim of this program. The module consists of

a) Communication Skills

b) Goal Setting

c) Career Planning

d) Reaching your Potential

e) Time Management

f) Stress Management

g) Grooming and Discipline

h) Learning skills

i) Listening Skills

j) Team Building

Reference Book

1 Barbara Pachter, Marjorie Brody. Complete Business Etiquette Handbook. Prentice Hall, 2015.

2 Dhanavel, S.P. English and Soft Skills. Hyderabad: Orient BlackSwan, 2021.

3 Koneru, Aruna. Professional Communication. Delhi: McGraw, 2008.

4 Mahanand, Anand. English for Academic and Professional Skills. Delhi: McGraw, 2013. Print.

5 Nancy Mitchell. Etiquette Rules: A Field Guide to Modern Manners. Wellfleet Press, 2015.

Rani, D Sudha, TVS Reddy, D Ravi, and AS Jyotsna. A Workbook on English Grammar and Composition. Delhi: McGraw, 2016.

SECOND YEAR

SEMESTER – III

Course Code	Course Title	L	T	P	C
THEORY					
23110AEC31/ 23132AEC31/ 23111AEC31/ 23135AEC31	Tamil – III/ Hindi-III/ Advanced English-III/ French – III	3	0	0	3
23111AEC32	English-III	3	1	0	3
23114AEC33	General Chemistry –III	4	1	0	3
23113GEC34	Physics-I	4	1	0	3
	PRACTICAL				
23114SEC35L	Qualitative Inorganic Analysis	0	0	3	3
23113GEC36L	Physics Lab-I	0	0	3	2
Skill Enhancement Course					
23114SEC37	Entrepreneurial Skills in Chemistry	2	0	0	1
23114SEC38	Pesticide Chemistry	2	0	0	2
Ability Enhancement Compulsory course (AECC1)					
23114RMC039	Research Methodology	2	0	0	2
AUDIT COURSE					
231ACLSOAN	Office Automation	-	-	-	1
	Total	**21**	**3**	**6**	**23**

Course Code	Course Title	L	T	P	C
23110AEC31	Tamil-III	**3**	**1**	**0**	**3**

காப்பிய இலக்கியம்

பாடநோக்கங்கள்

- தமிழ்க் காப்பியங்களை அறிமுகப்படுத்துதல்.
- காப்பியங்கள் கூறும் வாழ்வியல் அறங்களை உணர்த்துதல்.
- காப்பிய இலக்கியங்களில் இலக்கியச் சுவையை பயிற்றுவித்தல்.
- நாடக இலக்கியத்தின் தனித்துவத்தைக் கற்பித்தல்.
- புராணச் செய்திகளை மேம்படுத்திக் கொள்ளச்செய்தல்.

பயன்கள்

இலக்கியங்களின் சிறப்புகளை அறிவர்
காப்பியக் கதைகள் வழி அறச் சிந்தனை பெறுவர்
பல்வேறு காப்பிய வடிவங்களை பற்றிய அறிவு பெறுவர்.
நாடக படைப்பாக்கத்திற்கான தூண்டுதலைப் பெறுவர்
புராணச் செய்திகள் வழி தமிழ் கலாச்சாரத்தை அறிவர்.

அலகு 1

1.சிலப்பதிகாரம் - மதுரை காண்டம் (வழக்குரை காதை)
2.மணிமேகலை - விழாவறை காதை
3.சீவக சிந்தாமணி - குணமாலையார் இலம்பகம்

அலகு 2

1.கம்பராமாயணம் - மந்தரை சூழ்ச்சி படலம்
2.மகாபாரதம் - ஆரண்ய பருவம்

அலகு 3

1.பெரியபுராணம் - இளையான்குடி மாற நாயனார் புராணம்
2. சீறாப்புராணம் - ஈத்தங்குழை வரவழைத்தப் படலம்
3.தேம்பாவணி - பிரிந்த மகனை காண்படலம்

அலகு 4

நாடகம் சாபம்? விமோசனம்
மு.இராமசுவாமி,
செண்பகம் இராமசுவாமி,
பாவை பதிப்பகம்,ஜானிஜான் சாலை
சென்னை-14

அலகு 5

இலக்கிய வரலாறு
காப்பியங்கள், இரட்டைக் காப்பியங்கள்
நாடக இலக்கியம்

பார்வை நூல்கள் :

1. காப்பியத்திறன் - மணிவாசகர் நூலகம், சிதம்பரம்.
2. தமிழ் காப்பியங்கள் - கி. வா .ஜெகன் ஜெகநாதன், அமுத நிலையம், சென்னை .

3. நவீன நாடக உருவாக்கம் - கோ பழனி, தமிழ் பல்கலைக்கழகம், தஞ்சாவூர்.
4. இணையதளம் -www.tamilvu.org, www.noolulagam.com
5. சாபம்? விமோசனம்
   மு. இராமசுவாமி,
   செண்பகம் இராமசுவாமி,
   பாவை பதிப்பகம்,ஜானிஜான் சாலை,
   சென்னை-14

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CLO1	3	2	3	3	3	2	2	2	3	2	3	2
CLO2	3	3	2	2	2	3	2	3	3	2	2	2
CLO3	3	2	3	3	2	2	2	3	2	3	3	2
CLO4	3	3	3	2	2	2	3	2	3	2	3	3
CLO5	3	3	2	2	2	2	3	2	2	2	3	3

Course Code	**Course Title**	**L**	**T**	**P**	**C**
23111AEC32	English-III	3	1	0	3

	Learning Objectives
LO1	To enhance the level of literary and aesthetic experience of students and to help them respond creatively.
LO2	To sensitize them to the major issues in the society and the world.
LO3	To provide them with an ability to build and enrich their communication skills
LO4	To equip them to utilize the digital knowledge resources effectively for their chosen fields of study
LO5	To help them think and write imaginatively and critically.

Unit No.	**Unit Title & Text**
I	**Poetry:** 1.1 The Voice of the Mountains - Mamang Dai 1.2 A Song of Hope - Oodgeroo Noonuccal 1.3 In an Artist's Studio - Christina Rossetti
II	**Scenes From Shakespeare:** 2.1 Romeo & Juliet -The Balcony Scene 2.2 Macbeth-Banquet Scene 2.3 Julius Caesar - Murder Scene
III	**Speeches of Famous personalities** 3.1 Yes, We Can-Barack Obama 3.2 You've Got to Find What You Love-Steve Jobs

IV	**Language Competency** 4.1 Writing letters and emails 4.2 Writing and messaging in social media platforms [blogs, twitter, instagram.facebook] 4.3 Learning netiquette, email etiquette
V	**English for Workplace** 5.1 Data Interpretation and Reporting 5.2 Data Presentation and analysis 5.3 Meeting Etiquettes - language, dress code, voice modulation. Online Meetings - Terms and expressions used 5.4 Conducting and participating in a meeting

Text Books (Latest Editions)	
1	**Arden Shakespeare Complete works by Shakespeare (Author), William (Author), Bloomsbury, 2011)**
References Books **(Latest Editions and the style as given below must be strictly adhered to)**	
1	The Shakespeare Book: Big Ideas Simply Explained, Stanley Wells et al. DK Publishing, 2015
3	Famous Speeches by Mahatma Gandhi, Createspace Independent Publishing Platform, 2016
4	How to Build a Professional Digital Profile Kindle Edition by Jeanne Kelly Bernish, Bernish Communications Associates, LLC; 1st edition (May 29, 2012)
5	Keys to Teaching Grammar to English Language Learners, Second Ed.: A Practical Handbook by Keith S Folse, Michigan Teacher Training, 2016.
6	Role Play-Theory and Practice.Krysia M Yardley-Matwiejczuk, SAGE publications ltd, 1997

Web Resources	
1	The Voice of the Mountains by Mamang Dai: https://www.scribd.com/document/558838656/The-Voice-of-the-Mountain-By-Mamang-Dai-Adivasi-Resurgence
2	A song of Hope by Kath Walker: http://www.wordslikethis.com.au/a-song-of-hope/

3	In an artist's studio by Christina Rossetti: https://www.poetryfoundation.org/poems/146804/in-an-artist39s-studio
4	Sita by Toru Dutt: https://www.poetrynook.com/poem/s%E2%94%9C%C2%ABta

Course Outcomes		
Course Outcomes	On completion of this course, students will;	
CO1	Broaden their outlook and sensibility and be acquainted with cultural diversity and divergence in perspectives.	PO1
CO2	Be updated with basic informatics skills and attitudes relevant to the emerging knowledge society	PO1,PO2
CO3	Produce grammatically and idiomatically correct language.	PO4,PO6
CO4	Gain knowledge in writing techniques to meet academic and professional needs.	PO4,PO5, PO6
CO5	Be equipped with sufficient practice in Vocabulary, Grammar, Comprehension and Remedial English from the perspective of career oriented tests.	PO3,PO8

23114AEC33	General Chemistry –III	4	1	0	3

Title of the Course	**GENERAL CHEMISTRY -III**						
Paper No.	**Core V**						
Category	**Core**	**Year**	II	**Credits**	5	**Course Code**	
		Semester	III				
Instructional hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	4	1	-			5	
Prerequisites	General Chemistry – I and II						
Objectives ofthe course	This course aims to provide a comprehensive knowledge on • the physical properties of gases, liquids, solids and X-ray diffraction of solids. • fundamentals of nuclear chemistry and nuclear waste management. • applications of nuclear energy • basic chemistry of halo-organic compounds, phenol and other aromatic alcohols. • preparation and properties of phenols and alcohols.						

Course Outline	**UNIT I Gaseous state.** Kinetic molecular model of a gas: postulates and derivation from the kinetic gas equation; The Maxwell –Boltzmann distribution of speed of molecules- average, root mean square and most probable velocity and average kinetic energy, law of equipartition of energy, degrees of freedom and molecular basis of heat capacities. Collision frequency; collision diameter; mean free path and viscosity of gases. Real gases: Deviations from ideal gas behaviour, (Andrew's and Amagat's plots); compressibility factor, Z, and its variation with pressure for different gases. equations of states for real gases-van der Waal's equation; Virial equation; Boyle temperature; Numerical problems based on equations of statesfor real gases, isotherms of real gases – critical phenomena – isotherms of CO_2 - continuity of state–Van der waal's equation and the critical state; law of corresponding states-liquefaction of gases; numerical problems involving thecore concepts**.**
	Unit-II **Liquid and Solid State** Properties of Liquids- Surface tension, viscosity and their applications. Crystalline and amorphous – differences - geometry, isotropy and anisotropy,melting point; isomorphism, polymorphism. Crystals –size and shape; laws of crystallography; symmetry elements – plane,

	centre and axis; Miller indices, unit cells and space lattices; classification of crystal systems; Bravais lattices; X – ray diffraction – Bragg's equation Packing in atomic solids – simple cubic, body centered cubic, face centered and hexagonal close packing; Co-ordination number in typical structures - NaCl, CsCl, ZnS, TiO_2; comparison of structure and properties of diamond and graphite;.numerical problems involving core concepts Defects in solids - stoichiometric and nonstoichiometric defects. **Liquid crystals** – classification and applications.
	UNIT-III **Nuclear Chemistry** Natural radioactivity - □, □ and □ rays; half-life period; Fajan–Soddy group displacement law; Geiger–Nattal rule; isotopes, isobars, isotones, mirror nuclei, iso diaphers; nuclear isomerism; radioactive decay series; magic numbers; units – Curie, Rutherford, Roentgen; nuclear stability - neutron- proton ratio; binding energy; packing fraction; mass defect. Simple calculations involving mass defect and B.E., decay constant and $t_{1/2}$ and radioactive series. Isotopes – uses – tracers – determination of age of rocks by radiocarbon dating. (Problems to be worked out) Nuclear energy; nuclear fission and fusion – major nuclear reactors in India; radiation hazards, disposal of radioactive waste and safety measures. .
	UNIT-IV **Halogen derivatives Aliphatic halogen derivatives** Nomenclature and classes of alkyl halides – isomerism, physical properties, Chemical reactions. Nucleophilic substitution reactions – S_N1, S_N2 and S_Ni mechanisms with stereochemical aspects and effect of solvent. **Di, Tri & Tetra Halogen derivatives:** Nomenclature, classification, preparation, properties and applications. **Aromatic halogen compounds** Nomenclature, preparation, properties and uses Mechanism of nucleophilic aromatic substitution – benzyne intermediate. **Aryl alkyl halides** Nomenclature, benzyl chloride – preparation – preparation properties and uses **Alcohols:** Nomenclature, classification, preparation, properties, use; conversions – ascent and descent of series; test for hydroxyl groups. Oxidation of diols by periodic acid and lead tetraacetate.

	UNIT-V **Phenols** Nomenclature; classification, Preparation from diazonium salts, cumene, Dow's process, Raching process; properties – acidic character and effect of substitution on acidity. Reactions – Fries, claisen rearrangement, Electrophilic substitution reactions, Reimer - Teimen, Kolbe, Schmidt, Gatermann synthesis, Libermann, nitro reaction, phthalein reaction. Resorcinol, quinol, picric acid – preparation, properties and uses. **Aromatic alcohols** Nomenclature, benzyl alcohol – methods of preparation – hydrolysis, reduction of benzaldehyde, Cannizzaro reaction, Grignard synthesis, physical properties, reactions – reaction with sodium, phosphorus pentachloride, thionyl chloride, acetic anhydride, hydrogen iodide, oxidation – substitution on the benzene nucleus, uses. Thiols: Nomenclature, structure, preparation and properties.
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 examinationsUPSC/JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. B.R. Puri, L.R. Sharma, M.S. Pathania; *Principles of Physical Chemistry*,46th edition, Vishal Publishing, 2020. 2. B.R. Puri, L.R. Sharma and K.C. Kalia, *Principles of Inorganic Chemistry*, Milestone Publishers and Distributors, New Delhi, thirtieth edition, 2009. 3. 4. P.L. Soni and Mohan Katyal, *Textbook of Inorganic Chemistry*, SultanChand & amp; Sons, twentieth edition, 2006. 4. M. K. Jain, S. C. Sharma, *Modern Organic Chemistry*, Vishal Publishing,fourth reprint, 2003. 5. S.M. Mukherji, and S.P. Singh, *Reaction Mechanism in Organic Chemistry*,Macmillan India Ltd., third edition, 1994.
ReferenceBooks	1. T. W. Graham Solomons, *Organic Chemistry*, John Wiley & Sons,fifth edition, 1992. 2. A. Carey Francis, *Organic Chemistry*, Tata McGraw-Hill Education Pvt.,Ltd.,New Delhi, seventh edition, 2009. 3. I. L. Finar, *Organic Chemistry*, Wesley Longman Ltd, England, sixth edition, 1996.

	4. P. L. Soni, and H. M.Chawla - *Text Book of Organic Chemistry*, New Delhi,Sultan Chand & Sons, twenty ninth edition, 2007. 5. J.D. Lee, *Concise Inorganic Chemistry*, Blackwell Science, fifth edition,2005.
Website and e-learning source	**MOOC components** https://nptel.ac.in/courses/104104101 Solid state chemistry https://nptel.ac.in/courses/103106071 Nuclear industries and safety https://nptel.ac.in/courses/104106119s Introduction to organic chemistry

Course Learning Outcomes (for Mapping with POs and PSOs)On completion of the course the students should be able to

CO1: explain the kinetic properties of gases by using mathematical concepts.

CO2: describe the physical properties of liquid and solids; identify various types of crystalswith respect to its packing and apply the XRD method for crystal structure determinations.

CO3: investigate the radioactivity, nuclear energy and it's production, also the nuclear wastemanagement.

CO4: write the nomenclature, physical & chemical properties and basic mechanisms of haloorganic compounds and alcohols.

CO5: investigate the named organic reactions related to phenol; explain the preparation andproperties of aromatic alcohol including thiol.

	PO 1	**PO2**	**PO 3**	**PO4**	**PO5**	**PO 6**	**PO7**	**PO 8**	**PO 9**	**PO10**
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

CO-PO Mapping (Course Articulation Matrix)

Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0
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

Level of Correlation between PSO's and CO's

COURSE	**THIRD SEMESTER - ALLIED PAPER**
COURSE TITLE	**ALLIED PHYSICS – I**
COURSE CODE	**23113GEC34**
CREDITS	
COURSE OBJECTIVES	To impart basic principles of Physics that which would be helpful for students who have taken programmes other than Physics.

UNITS	**COURSE DETAILS**
UNIT-I	**PROPERTIES OF MATTER:** Stress – Strain – Hooke's law – bending of beams – depression of cantilever- Determination of Y by uniform and non- uniform bending method- Torsion in a wire- Determination of rigidity modulus by torsional pendulum – Newton's law of Gravitation – Determination of G by Boy's method – mass and density of earth – acceleration due to gravity – Determination of g by compound pendulum.
UNIT-II	**HEAT AND THERMODYNAMICS:** Zeroth law of thermodynamics – First law of thermodynamics – Reversible and irreversible process – Carnot's theorem – Second law of thermodynamics – Entropy – Change of entropy in reversible and irreversible processes – Third law of thermodynamics – Joule-Thomson effect – Porous plug experiment – liquefaction of gases: liquefaction of helium – Refrigerating mechanism –Air conditioning machines.
UNIT-III	**ATOMIC SPECTROSCOPY:** Pauli's exclusion principle – Optical spectra – Fine structure of sodium D line – Zeeman effect – Photo electric emission – laws – Lenard's experiment – Richardson and Compton experiments – Einstein's photoelectric equation – Experimental verification of Einstein's photoelectric equation by Millikan's experiment – X-Rays: Introduction – Production – Coolidge tube – Bragg's law – derivation – X-Ray spectra – Continues – Characteristic – Moseley law and its importance.
UNIT-IV	**ELECTRICITY:** Ohm's law – Kirchoff's law – Application to Wheatstone's Bridge – Carey Foster Bridge – Potentiometer – Measurement of current and resistance – Calibration of low and high range voltmeter – Conversion of galvanometer into ammeter and voltmeter – Fleming's left and right hand rule – Electromagnetic induction – Eddy current – Transformers: Theory, energy loss and applications
UNIT-V	**MAGNETISM:** Magnetic properties of materials: Magnetic induction B – Magnetisation M – Magnetising field H – Relation between – B, H and M – Magnetic susceptibility – Magnetic permeability – Properties of dia, para and ferro magnetic materials – Curie temperature – Energy loss due to hysteresis – importance of hysteresis curves – magnetic circuit.
TEXT BOOKS	1. Properties of Matter and Acoustics, R. Murugesan, 2nd Edition, S.Chand & Co. Ltd. Reprint (2017). 2. Modern Physics, R.Murugesan, Kiruthiga Sivaprasath, Twelth Revised Edition, S.Chand & Co. Ltd. Reprint (2006). 3. Heat and Thermodynamics, Brijlal N.subramaniyam, S.Chand & Co. LtdReprint(2006). 4. Electricity and magnetism , R. Murugesan ,Revised edition , S.Chand & Co Reprint (2014)
REFERENCEBOOKS	1. Heat Thermodynamics and Satistical Physics, Brijlal N.subramaniyam,P.S.Hemme, S.Chand & Co,Revised edition (2007). 2. Thermodynamics and Statistical Physics, Agrawal Prakash, Pragati Prakashan, 27th edition (2015)

WEBLINKS	1. https://youtu.be/M_5KyncYNyc 2. https://youtu.be/ljJLJgIvaHY 3. https://youtu.be/7mGqd9HQ_AU 4. https://youtu.be/h5jOAw57OXM

COURSE OUT COMES:
At the end of the course, the student will be able to:

COURSE OUTCOMES	**CO1**	understand and define the laws involved in gravitation and elasticity.
	CO2	develop the knowledge about heat and thermodynamics, sound and spectroscopy.
	CO3	understand the concept of properties of matter and to recognize their applications in various real problems.
	CO4	Articulate the knowledge about electric current resistance,capacitance in terms of potential electric field
	CO5	Understand the magnetic properties

MAPPING WITH PROGRAM OUT COMES:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** in the 3-point scale of STRONG(**S**), MEDIUM (**M**) and LOW(**L**).

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

23114SEC35L	Qualitative Inorganic Analysis	0	0	3	3

Title of the Course	**QUALITATIVE INORGANIC ANALYSIS**						
Paper No.	**Core VI**						
Category	**Core**	**Year**	II	**Credits**	2	**Course Code**	23114SEC35L
		Semester	III				
Instructional	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	

hours per week	1	-	3	4
Prerequisites	General chemistry			
Objectives of the course	To develop the skill on systematic analysis of simple inorganic salts and mixture of salts.			
Course Outline	**Semi - Micro Qualitative Analysis** 1. Analysis of simple acid radicals: Carbonate, sulphide, sulphate, thiosulphite, chloride, bromide, iodide, nitrate 2. Analysis of interfering acid radicals: Fluoride, oxalate, borate, phosphate, arsenate, arsenite. 3. Elimination of interfering acid radicals and Identifying the group of basic radicals 4. Analysis of basic radicals (group wise): Lead, copper, bismuth, cadmium, tin, antimony, iron, aluminium, arsenic, zinc,manganese, nickel, cobalt, calcium, strontium, barium, magnesium, ammonium 5. Analysis of a mixture - I to VIII containing two cations and two anions (of which one is interfering type)			
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.			
Recommended Text	**Reference Books:** V. Venkateswaran, R. Veeraswamy and A. R. Kulandivelu, Basic Principles of Practical Chemistry, Sultan Chand & Sons, New Delhi, second edition, 1997.			
Website and e-learning source	https://www.vlab.co.in/broad-area-chemical-sciences			
Course Learning Outcomes (for Mapping with POs and PSOs)				

On successful completion of the course the students should be able to **CO 1:** acquire knowledge on the systematic analysis of Mixture of salts.**CO 2:** identify the cations and anions in the unknown substance.

CO 3: identify the cations and anions in the soil and water and to test the quality of water.

CO4: assess the role of common ion effect and solubility product

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

CO-PO Mapping (Course Articulation Matrix)

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
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

COURSE	**THIRD SEMESTER - CORE**
COURSETITLE	**ALLIED PRACTICAL– I**
COURSE CODE	**23113SEC36L**
CREDITS	
COURSE OBJECTIVES	Apply various physics concepts to understand Properties of Matter and waves, set up experimentation to verify theories, quantify and analyse, able to do error analysis and correlate results

Minimum of Eight Experiments from the list:

1. Young's modulus by non-uniform bending using pin and microscope
2. Young's modulus by non-uniform bending using optic lever, scale and telescope
3. Rigidity modulus by static torsion method.
4. Rigidity modulus by torsional oscillations without mass
2. Surface tension and interfacial Surface tension – drop weight method
3. Comparison of viscosities of two liquids – burette method
4. Specific heat capacity of a liquid – half time correction
5. Verification of laws of transverse vibrations using sonometer

6. Calibration of low range voltmeter using potentiometer
7. Determination of thermo emf using potentiometer
8. Verification of truth tables of basic logic gates using ICs
9. Verification of De Morgan's theorems using logic gate ICs.
10. Use of NAND as universal building block.

Note : Use of digital balance permitted

Course Code	Course Title	L	T	P	C
23113SEC37	Energy Physics	2	0	0	2

Learning Objective:

To get the understanding of the conventional and non-conventional energy sources, their conservation and storage systems.

UNITS	COURSE DETAILS
UNIT-I	**INTRODUCTION TO ENERGY SOURCES:** energy consumption as a measure of prosperity – world energy future – energy sources and their availability – conventional energy sources – non-conventional and renewable energy sources – comparison – merits and demerits.
UNIT-II	**SOLAR ENERGY:** solar energy Introduction – solar constant – solar radiation at the Earth's surface – solar radiation geometry – Solar radiation measurements – solar radiation data –solar energy storage and storage systems – solar pond – solar cooker – solar water heater – solar greenhouse – types of greenhouses – solar cells.
UNIT-III	**WIND ENERGY:** introduction –nature of the wind – basic principle of wind energy conversion – wind energy data and energy estimation – basic components of Wind Energy Conversion Systems (WECS) – advantages and disadvantages of WECS – applications – tidal energy
UNIT-IV	**BIOMASS ENERGY:** introduction – classification – biomass conversion technologies – photosynthesis – fermentation - biogas generation –classification of biogas plants – anaerobic digestion for biogas – wood gasification – advantages & disadvantages.
UNIT-V	**ENERGY STORAGE:** Energy storage systems – Mechanical Energy storage – Compressed Air storage – Electrical storage – Thermal energy storage - importance of energy storage-batteries - lead acid battery -nickel-cadmium battery – fuel cells – types of fuel cells – advantages and disadvantages of fuel cells – applications of fuel cells - hydrogen storage.
TEXT BOOKS	1. G.D.Rai, Non-Conventional Sources of Energy, Khanna Publishers, 2009, 4thEdn. 2. S P Sukhstme, J K Nayak, Solar Energy, Principles of Thermal Collection and Storage, McGraw Hill, 2008, 3rdEdn.
REFERENCE BOOKS	1. John Twidell& Tony Weir, Renewable Energy Resources, Taylor & Francis, 2005, 2ndEdn. 2. S.A. Abbasi and NasemaAbbasi, Renewable Energy sources and their environmental impact, PHI Learning Pvt. Ltd, 2008.

23114SEC37	Entrepreneurial Skills in Chemistry	2	0	0	1

Objectives of the course	The course aims at providing training to • develop entrepreneur skills in students • to provide hands on experience to prepare and develop products • develop start ups
Course Outline	**UNIT -I** **Food Chemistry** Food adulteration-contamination of food items with clay stones, water andtoxicchemicals -Common adulterants.Food additives, Natural and synthetic anti-oxidants, glazing agents (hazardous effect),food colourants, Preservatives, leavening agents,Baking powder and baking soda, yeast,MSG,vinegar. **Dyes** Classification – Natural, synthetic dyes and their characteristics – basicmethods and principles of dyeing
	UNIT II **Hands on Experience (Students can choose any four)** Detection of adulterants in food items like coffee, tea, pepper, chillipowder, turmeric powder, butter, ghee, milk, honey etc., by simple techniques.Preparation of Jam, squash and Jelly, Gulkand, cottage cheese. Preparation of products like candles, soap, detergents, cleaning powder, shampoos, pain balm, tooth paste/powde rand disinfectants in small scale. Extraction of oils from spices and flowers.Testing of water samples using testing kit. Dyeing – cotton fabrics with natural and synthetic dyes Printing – tie and dye, batik.

Skills acquired from this course	**Entrepreneurial** skills.
Recommended Text	1. George S &Muralidharan V, (2007) Fibre to Finished Fabric – A Simple Approach, Publication Division, University of Madras, Chennai. 2. Appaswamy G P, A Handbook on Printing and Dyeing of Textiles.
Reference Books	Shyam Jha, Rapid detection of food adulterants and contaminants(Theory and Practice), Elsevier, e Book ISBN 9087128004289, 1st Edition,2015
Website and e-learning source	https://www.vlab.co.in/broad-area-chemical-sciences

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO 1: identify adulterated food items by doing simple chemical tests.

CO 2: prepare cleaning products and become entrepreneurs

CO 3: educate others about adulteration and motivate them to become entrepreneurs.

	PO 1	**PO2**	**PO3**	**PO4**	**PO 5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO 1	S	S	S	S	S	S	S	M	S	M
CO 2	M	S	S	S	M	S	S	M	M	M
CO 3	S	S	S	M	S	S	S	M	S	M

CO /PSO	**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

23114SEC38	Pesticide Chemistry	2	0	0	2

Objectives of the course	This course aims to providing the students • knowledge about the various types of pesticides and their toxicity. • to understand the accumulation of pesticides in in the form ofresidues and its analysis. • knowledge on choice of alternate and eco-friendly pesticides.
Course Outline	**Unit I** **Introduction**: History of pesticides. Chemistry of Pesticides: Brief introduction to classes of pesticides (Chemical class, targets), structures, chemical names, physical and chemical properties. **Toxicity of pesticides**: Acute and chronic toxicity in mammals, birds, aquatic species etc. Methods of analysis of pesticides. **Insecticides:** Classification and study of following insecticides with respect to structure, chemical name, physical properties, chemical properties, synthesis, degradation, metabolism, formulations, Mode of action, uses, toxicity. Organophosphates and Phosphothionates: Acephate, Chlorpyriphos, Monocrotophos, and parathion-methyl. Organochlorine – Endosulfan, heptachlor; Carbamate: Cartap hydrochloride, Methomyl, Propoxur.
	Unit II **Pesticides residues:** Introduction- application of agrochemicals, dissemination pathways of pesticides, causes of pesticide residues,remedies. Pesticides residues in atmosphere- entry into atmosphere, action of pesticides, effects on environments. Pesticides residues in water - entry into water systems, action and effect in aquatic environment. Pesticides residues in soil. entry into soil, absorption, retention and transport in soil, effects on microorganism, soil condition and fertility, decomposition and degradation by climatic factors and microorganism. **Pesticide Residues effect and analysis:** Effects of pesticides residue on human life, birds and animals- routes for exposure to pesticides, action of pesticides on living system. Analysis of pesticides residues- sample preparation, extraction of pesticides residues (soil, water and vegetables/fruits) simple methods and schemes of analysis, multi-residue analysis.

	Unit III **Biopesticides:** Pheromones, attractants, repellents – Introduction, types and application (8- Dodecen-1-ol, 10-cis-12-hexadecadienoic, Trimedlure, Cue-lure, methyl eugenol, N,N- Diethyl-m-toluamide, Dimethyl phthalate, Icaridin). Baits-Metaldehyde, Iron (II) phosphate, Indoxacarb, Zinc Phosphide, Bromadiolone.
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 competitiveexaminations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Handa SK. Principles of pesticide chemistry. Agrobios (India); 2012. 2. Matolcsy G, Nádasy M, Andriska V. Pesticide chemistry. Elsevier; 1989. 3. J. Miyamoto and P. C. Kearney Pesticide Chemistry Human Welfare and the Environment vol. IV Pesticide Residue and Formulation Chemistry, Pergamon press,1985. 4. R. Cremlyn: Pesticides, John Wiley.
Reference Books	1. Roy N. K., Chemistry of Pesticides. CBS Publisher & Distributors PLtd; 1st Ed. (2010). 2. Nollet L.M., Rathore H.S., Handbook of pesticides: methods ofpesticide residues analysis. CRC press; 2016. 3. Ellerbrock R.H., Pesticide Residues: Significance, Management and Analysis, 2005

Course Learning Outcomes (for Mapping with POs and PSOs)On completion of the course the students should be able to

CO 1: teach about the pesticides and their toxicity with respect to structure and category.
CO 2: explain the preparation and property of pesticides
CO 3: investigate the pesticide residues, prevention and care
CO 4: demonstrate the extraction and analytical methods of pesticide residues
CO 5: make awareness to the public on bio-pesticides

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO 5
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 PSOs	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CO /PO	PO1	PO2	PO3	PO4	PO 5
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

Level of Correlation between PO's and CO's

Course Code	Course Title	L	T	P	C
23114RMC039	Research Methodology	2	0	0	2

UNIT I: Introduction to Research Methodology

Meaning of research – Objectives of research – Types of research – Significance of research – Research approaches

UNIT II: Research Methods

Research methods versus methodology – Research and scientific method – Criteria of good research – Problems encountered by researchers in India.

UNIT III: Literature Survey

Articles – Thesis – Journals – Patents – Primary sources of journals and patents – Secondary sources – Listing of titles – Abstracts – Reviews – General treatises – Monographs.

UNIT IV: Database Survey

Database search – NIST – MSDS – PubMed – Scopus – Science citation index – Information about a specific search.

UNIT V: Laboratory Safety

General guidelines. Hygiene – Eye, foot, skin and hand protection – Safety rules -Equipment protection – Respiratory protective equipment – safety equipment – Leaking compressed gas cylinders – electrical safety. Fire – fire extinguishers.

References:

1. C. R. Kothari, Research Methodology, New Age International Publishers. New Delhi, 2004.
2. R.A Day and A.L. Underwood, Quantitative analysis, Prentice Hall, 2099.
3. D.G Peters, J.M. Hayes and G.M. Hefige, A brief introduction to Modern chemical analysis.
4. R. Gopalan, Thesis writing, Vijay Nicole Imprints Private Ltd., 2005.
5. R.Gopalan, P. S. Subramanian and K. Rengarajan, Elements of Analytical Chemistry, Sultan Chand and Sons, New Delhi, 2005.
6. E. Balagurusamy, Numerical methods, Tata McGraw-Hill
7. S.S. Sastry, Introductory Methods of Numerical analysis, PHI, N.Delhi

Course Code	Course Title	L	T	P	C
231ACLSOAN	Office Automation	0	0	0	1

Aim and Course Objectives:

To provide an in-depth training in use of office automation, internet and internet tools. The course also helps the candidates to get acquainted with IT.

Course Outcomes:

After completion of the course, students would be able to documents, spreadsheets, make small presentations and would be acquainted with internet.

UNIT I

Knowing the basics of Computers

UNIT II

Word Processing (MS word)

UNIT III

Spread Sheet (MS XL)

UNIT IV

Presentation (MS Power Point)

UNIT V

Communicating with Internet

Reference:

1. Fundamentals of computers - V.Rajaraman - Prentice- Hall of india
2. Microsoft Office 2007 Bible – John Walkenbach, HerbTyson, FaitheWempen, cary N.Prague, Michael R.groh, Peter G.Aitken, and Lisa a.Bucki -Wiley India pvt.ltd.
3. Introduction to Information Technology - Alexis Leon, Mathews Leon, and Leena Leon, Vijay Nicole Imprints Pvt. Ltd., 2013.
4. Computer Fundamentals - P. K. Sinha Publisher: BPB Publications
5. https://en.wikipedia.org
6. https://wiki.openoffice.org/wiki/Documentation
7. http://windows.microsoft.com/en-in/windows/windows-basics-all-topics

SECOND YEAR

SEMESTER – IV

Course Code	Course Title	L	T	P	C
THEORY					
23110AEC41/ 23111AEC41/ 23132AEC41/ 23135AEC41	Tamil-IV/ Advanced English-IV / Hindi-IV/ French – IV	3	0	0	3
23111AEC42	English-IV	3	0	0	3
23114AEC43	General Chemistry –IV	4	1	0	3
23116GEC44	Physics II	4	1	0	3
	PRACTICAL				
23114SEC45L	Physical Chemistry Practical I	0	0	3	3
23116GEC46L	Physics Lab-II	0	0	3	2
Skill Enhancement Course					
23114SEC47	Instrumental methods of chemical analysis	2	0	0	2
23114SEC48	Forensic science	2	0	0	2
Ability Enhancement Compulsory course (AECC1)					
23114BRC49	Participation in Bounded Research	2	0	0	2
231AECCEVS	Environmental Studies-II	2	0	0	2
AUDIT COURSE					
231LCSCLS	Leadership and Management Skills	-	-	-	1
	Total	**22**	**2**	**6**	**26**

Course Code	Course Title	L	T	P	C
23110AEC41	Tamil-IV				

சங்க இலக்கியம்

பாடநோக்கங்கள்

- இலக்கியங்கள் வாயிலரக சமுதாயக் கருத்தக்களை
- பழந்தமிழ் இலக்கிய வளத்தை உணர்த்துதல்.
- சங்க அக, புற பாடல் மரபுகளைப் பயிற்றுவித்தல்
- வாழ்வியல் அறங்கள் மற்றும் வரலாற்றுச் செய்திகளை . பயிற்றுவித்தல்
- புற இலக்கியங்கள் காட்டும் வாழ்வியல் அறங்களை எடுத்துக் கூறுதல்

பயன்கள்

- பழந்தமிழ் இலக்கிய மரபை அறிவர்.
- சங்க இலக்கியங்களில் உள்ள அழகியல் கூறுகளை உணர்வர்.
- வாழ்வியல் அறங்கள் மற்றும் வரலாற்றுச் செய்திகளை அறிவர்.
- சங்க அக, புற பாடல் மரபுகளை புரிந்துக்கொள்வர்.
- *புற இலக்கியங்கள் காட்டும் வாழ்வியல் அறங்களை உணர்வர்.

அலகு 1

1. குறுந்தொகை- பாடல் எண்: 28,38
2. நற்றிணை - பாடல் எண்: 1,27,28,167,168
3.ஐங்குறுநூறு- பாடல் எண்: இளவேனில் பத்து

அலகு 2

1.கலித்தொகை - பாடல் எண்: 3,7
2.அகநானூறு- பாடல் எண்:5,42,100
3. புறநானூறு- பாடல் எண்: 182,204,41,121

அலகு 3

சிறுபாணாற்றுப்படை முழுவதும்

அலகு 4

திருக்குறள் - செய்நன்றி அறிதல், கூடா நட்பு,நலம்புனைந்துரைத்தல்
நாலடியார் - பாடல் எண்: 1,172,215,253

அலகு 5

இலக்கிய வரலாறு
1.சங்க இலக்கியம்
2.எட்டுத்தொகை, பத்துப்பாட்டு
3.பதினெண் கீழ்க்கணக்கு நூல்கள்

பார்வை நூல்கள்

- குறுந்தொகை - கழக வெளியீடு, சென்னை
- நற்றிணை - கழக வெளியீடு, சென்னை
- ஐங்குறுநூறு கழக வெளியீடு,சென்னை
- கலித்தொகை கழக வெளியீடு,சென்னை
- அகநானூறு - கழக வெளியீடு,சென்னை
- புறநானூறு - கழக வெளியீடு,சென்னை
- திருக்குறள் - பரிமேலழகர் உரை,கழக வெளியீடு,சென்னை
- இணையதளம் -www.tamilvu.org, www.noolulagam.com

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CLO1	3	2	3	3	3	2	2	2	3	2	3	2
CLO2	3	3	2	2	2	3	2	3	3	2	2	2
CLO3	3	2	3	3	2	2	2	3	2	3	3	2
CLO4	3	3	3	2	2	2	3	2	3	2	3	3
CLO5	3	3	2	2	2	2	3	2	2	2	3	3

Course Code	**Course Title**	**L**	**T**	**P**	**C**
23111AEC42	English-IV	3	1	0	3

	Learning Objectives
LO1	To help learners imbibe the rules of language unconsciously and tune to deduce language structure and usage.
LO2	To enable them use receptive skills through reading and listening to acquire good exposure to language and literature.
LO3	To help them develop style in speech and writing and manipulate the tools of language for effective communication.
LO4	To provide exposure to plays, autobiographies and expose them to value based ideas.
LO5	To enhance their language skills especially in the areas of grammar and pronunciation.

Unit No.	**Unit Title & Text**
I	**Life Writing** 1.1 I am Malala-Malala Yousafzai - Chapter 1 1.2 My Inventions - Nikola Tesla - Chapter 2
II	**One Act Plays** 2.1The Zoo Story- Edward Albee 2.2 The Proposal- Anton Chekhov
III	**Interviews** 3.1 Nelson Mandela's Interview with Larry King. 3.2 Rakesh Sharma's Interview with Indira Gandhi from Space 3.3 Lionel Messi with Sid Lowe (Print)
IV	**Language Competency** 4.1 Refuting, Arguing & Debating 4.2 Making Suggestions & Responding to Suggestions, Asking for and Giving Advice or Help 4.3 Interviews (face to face, telephone and video conferencing)

V	**English for Workplace** 5.1 Job Applications: Covering letters, CV and Resume 5.2 Creating a digital profile - Linkedin 5.3 Filling Forms (Online & Manual): creation of account, railway reservation, ATM, Credit/debit card 5.4 Body Language -Practical Skills for Interviews

TextBooks(LatestEditions)	
1.	I Am Malala The Girl Who Stood Up for Education and Was Shot by the Taliban by Malala Yousafzai, Christina Lamb , Little Brown, 2013.
2	My Inventions by Nikola Tesla Ingram Short title, 2011 Edition
	ReferencesBooks **(Latest editions,and the style as given below must be strictly adhered to)**
1	Writing Your Life: A Guide to Writing Autobiographies, Mary Borg, Taylor & Francis, 2021
2	One-act Plays for Acting Students: An Anthology of Short Norman A. Bert · 1987 ·
3	The One-Act Play Companion: A Guide to plays, playwrights ... Colin Dolley, Rex Walford · 2015
4	How to Build a Professional Digital Profile Kindle Edition by Jeanne Kelly Bernish, Bernish Communications Associates, LLC; 1st edition (May 29, 2012)
5	Role Play-Theory and Practice.Krysia M Yardley-Matwiejczuk, SAGE publications ltd, 1997

Web Resources	
1	For Readers' Theatre: https://www.youtube.com/watch?v=JaLQJt8orSw&t=469s(the link to the performance; refer scripts by Aaron Sheperd)
2	http://BBC learn English.com
3	http://onestopenglish.com
4	http://hearn-english-today.com
5	http://talkenglish.com

Course Outcomes		
Course Outcomes	On completion of this course, students will;	
CO1	Learn to communicate effectively and appropriately in real life situation.	PO1
CO2	Use English effectively for study purpose across the curriculum	PO1,PO2
CO3	Develop interest in and appreciation of Literature	PO4,PO6

CO4	Develop and integrate the use of the four language skills	PO4,PO5,PO 6
CO5	Enhance their language skills especially in the areas of grammar and pronunciation.	PO3,PO8

COURSE OBJECTIVES	1. To provide an in-depth understanding of the basics of various phenomena in geometrical and wave optics; 2. To explain the behaviour of light in different mediums; To understand the differences in the important phenomena namely interference, diffraction and Polarization and apply the knowledge in day to day life; 3. To understand the design of optical systems and methods to minims aberrations; 4. To solve problems in optics by selecting the appropriate equations and performing numerical or analytical calculations.

Title of the Course	**GENERAL CHEMISTRY-IV**						
Paper No.	**Core VII**						
Category	**Core**	**Year**	II	**Credits**	4	**Course Code**	23114AEC43
		Semester	I V				
Instructional hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	4	-	-			4	
Prerequisites	General Chemistry VI						
Objectives ofthe course	This course aims to provide a comprehensive knowledge on • thermodynamic concepts on chemical processes and applied aspects. • thermo chemical calculations • transition elements with reference to periodic properties and group study of transition metals. • the organic chemistry of ethers, aldehydes and ketones • the organic chemistry of carboxylic acids						
Course Outline	**UNIT I** **Thermodynamics I** Terminology – Intensive, extensive variables, state, path functions; isolated, closed and open systems; isothermal, adiabatic, isobaric, isochoric, cyclic, reversible and irreversible processes; First law of thermodynamics – Concept and significance of heat (q), work (w), internal energy (E), enthalpy (H); calculations of q, w, E and H for reversible, irreversible						

	expansion of ideal and real gases under isothermal and adiabatic conditions; relation between heat capacities (Cp & Cv); Joule Thomson effect- inversion temperature. Thermochemistry - heats of reactions, standard states; types of heats of reactions and their applications; effect of temperature (Kirchhoff's equations) and pressure on enthalpy of reactions; Hess's law and its applications; determination of bond energy; Measurement of heat of reaction – determination of calorific value of food and fuels Zeroth law of thermodynamics-Absolute Temperature scale. .
	Unit II **Thermodynamics II** Second Law of thermodynamics - Limitations of first law, spontaneity and randomness; Carnot's cycle; Concept of entropy, entropy change for reversible and irreversible processes, entropy of mixing, calculation of entropy changes of an ideal gas and a van der Waals gas with changes in temperature, volume and pressure, entropy and disorder. Free energy and work functions - Need for free energy functions, Gibbs free energy, Helmholtz free energy - their variation with temperature, pressure and volume, criteria for spontaneity; Gibbs-Helmholtz equation – derivations and applications; Maxwell relationships, thermodynamic equations of state; Thermodynamics of mixing of ideal gases, Ellingham Diagram-application. Third law of thermodynamics - Nernst heat theorem; Applications of third law - evaluation of absolute entropies from heat capacity measurements, exceptions to third law.
	UNIT III **General Characteristics of d-block elements** **Transition Elements**- Electronic configuration - General periodic trend variable valency, oxidation states, stability of oxidation states, colour, magnetic properties, catalytic properties and tendency to form complexes. Comparative study of transition elements and non transition elements – comparison of II and III transition series with I transition series. Group study of Titanium, Vanadium, Chromium, Manganese, Iron, Cobalt, Nickel and Zinc groups
	UNIT IV **Ethers, Thio ethers and Epoxides** Nomenclature, isomerism, general methods of preparations, reactions involving cleavage of C-O linkages, alkyl group and ethereal oxygen. Zeisel's method of estimation of methoxy group.

	Reactions of epoxides with alcohols, ammonia derivatives and $LiAH_4$ Thioethers - nomenclature, structure, preparation, properties and uses. **Aldehydes and Ketones** Nomenclatue, structure and reactivity of aliphatic and aromatic aldehydes and ketones; general methods of preparation and physical properties. Nucleophilic addition reactions, base catalysed reactions with mechanism- Aldol, Cannizzaro's reaction, Perkin reaction, Benzoin condensation, Haloform reaction, Knoevenagel reaction. Oxidation of aldehydes. Baeyer - Villiger oxidation of ketones. Reduction: Clemmensen reduction, Wolf - Kishner reduction, Meerwein – Pondorf Verley reduction, reduction with $LiAlH_4$ and $NaBH_4$. Addition reactions of unsaturated carbonyl compounds: Michael addition.
	UNIT V **Carboxylic Acids**: Nomenclature, structure, preparation and reactions of aliphatic and aromatic monocarboxylic acids. Physical properties, acidic nature, effect of substituent on acidic strength. HVZ reaction, Claisen ester condensation, Bouveault Blanc reduction, decarboxylation, Hunsdieckerreaction.Formic acid-reducing property. Reactions of dicarboxylic acids, hydroxy acids and unsaturated acids. **Carboxylic acid Derivatives:** Preparations of aliphatic and aromatic acid chlorides, esters, amides and anhydrides. Nucleophilic substitution reaction at the acyl carbon of acyl halide, anhydride, ester, amide. Schottan- Baumann reaction. Claisen condensation, Dieckmann and Reformatsky reactions, Hofmann bromamide degradation and Curtius rearrangement. **Active methylene compounds:** Keto – enol tautomerism. Preparation and synthetic applications of diethyl malonate and ethyl acetoacetate **Halogen substituted acids** – nomenclature; preparation by direct halogenation, iodination from unsaturated acids, alkyl malonic acids **Hydroxy acids** – nomenclature; preparation from halo, amino, aldehydicand ketonic acids, ethylene glycol, aldol acetaldehyde; reactions – action of heat on α, β and γhydroxy acids.
Extended Professional Component (is a part of internal component only, Not to be included in the external	Questions related to the above topics, from various competitive examinations UPSC/JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)

examination question paper)	
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. B.R. Puri and L.R. Sharma, *Principles of Physical Chemistry*, Shoban Lal Nagin Chand and Co., thirty three edition, 1992. 2. K. L. Kapoor, *A Textbook of Physical chemistry*, (volume-2 and 3), Macmillan, India Ltd, third edition, 2009. 3. P.L. Soni and Mohan Katyal, *Textbook of Inorganic Chemistry*, Sultan Chand & Sons, twentieth edition, 2006. 4. M. K. Jain, S. C. Sharma, *Modern Organic Chemistry*, Vishal Publishing, fourth reprint, 2003. 5. S.M. Mukherji, and S.P. Singh, *Reaction Mechanism in Organic Chemistry*, Macmillan India Ltd., third edition, 1994.
ReferenceBooks	1. Maron, S. H. and Prutton C. P. *Principles of Physical Chemistry*,4th ed.; The Macmillan Company: Newyork,1972. 2. Lee, J. D. *Concise Inorganic Chemistry*, 4th ed.; ELBS William Heinemann: London,1991. 3. Gurudeep Raj, *Advanced Inorganic Chemistry*, 26th ed.; Goel Publishing House: Meerut, 2001. 4. Atkins, P.W. & Paula, J. *Physical Chemistry*, 10th ed.; Oxford University Press:New York, 2014. 5. Huheey, J. E. *Inorganic Chemistry: Principles of Structure and Reactivity*, 4th ed; Addison Wesley Publishing Company: India,1993.
Website and e-learning source	**MOOC components** https://nptel.ac.in/courses/112102255 Thermodynamics https://nptel.ac.in/courses/104101136 Advanced transition metal chemistry

Course Learning Outcomes (for Mapping with POs and PSOs)On

completion of the course the students should be able to

CO1: explain the terms and processes in thermodynamics; discuss the various laws of thermodynamics and thermo chemical calculations.

CO2: discuss the second law of thermodynamics and its application to heat engine; discuss third law and its application on heat capacity measurement.

CO3: investigate the chemistry of transition elements with respect to various periodic properties and group wise discussions.

CO4: discuss the fundamental organic chemistry of ethers, epoxides and carbonyl compounds including named organic reactions.

CO5: discuss the chemistry and named reactions related to carboxylic acids and their

derivatives; discuss chemistry of active methylene compounds, halogen substituted acidsand hydroxyl acids.

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

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

Course Code	Course Title	L	T	P	C
23113GEC44	Optics and Spectroscopy	4	1	0	3

COURSE OBJECTIVES	5. To provide an in-depth understanding of the basics of various phenomena in geometrical and wave optics; 6. To explain the behaviour of light in different mediums; To understand the differences in the important phenomena namely interference, diffraction and Polarization and apply the knowledge in day to day life; 7. To understand the design of optical systems and methods to minims aberrations; 8. To solve problems in optics by selecting the appropriate equations and performing numerical or analytical calculations.

UNITS	COURSE DETAILS
UNIT-I	**INTRODUCTION TO OPTICS:** postulates of geometrical optics *Lens*: thick and thin lenses – focal length, critical thickness, power and cardinal points of a thick lens – lens makers formula (no derivation) – aberrations: spherical aberration,chromatic aberrations, coma,and astigmatism– curvature of the field – distortion – chromatic aberrations methods.

	Prism: narrow angled prisms - dispersion, deviation, aberrations - applications rainbows and halos, constant deviation spectroscope. *Eyepieces*: advantage of an eyepiece over a simple lens – Huygen's and Ramsden's eyepieces, construction and working –merits and demerits of the eyepiece. *Resolving power*: Rayleigh's criterion for resolution – limit of resolution for the eye – resolving power of, (i) Prism (ii) grating (iii) telescope *Fiber Optics*: Basic ideas of optical fibre – Numerical aperture – Stepped and graded index fibres – Fibre optic communication (Block diagram only).
UNIT-II	**INTERFERENCE:** division of wave front, Fresnel's biprism – fringes with white light – division of amplitude: interference in thin films due to, (i) reflected light, (ii) transmitted light – colours of thin films applications – air wedge – Newton's rings. *Interferometers* : Michelson's interferometer – applications, (i) determination of the wavelength of a monochromatic source of light, (ii) determination of the wavelength and separation D_1 and D_2 lines of sodium light, (iii) determination of a thickness of a mica sheet.
UNIT-III	**DIFFRACTION:** Fresnel's assumptions – zone plate – action of zone plate for an incident spherical wave front – differences between a zone plate and a convex lens –Fresnel type of diffraction – diffraction pattern due to a straight edge – positions of maximum and minimum intensities – diffraction due to a narrow slit – Fraunhofer type of diffraction – Fraunhofer diffraction at a single slit – plane diffraction grating– experiment to determine wavelengths – width of principal maxima.
UNIT-IV	**POLARISATION:** optical activity – optically active crystals –polarizer and analyser–double refraction – optic axis, principal plane – Huygens's explanation of double refraction in uniaxial crystals – polaroids and applications – circularlyand elliptically polarized light –quarter wave plate – half wave plate – production and detection of circularly and elliptically polarized lights – Fresnel's explanation – specific rotation – Laurent half shade polarimeter – experiment to determine specific rotatory power.
UNIT-V	**SPECTROSCOPY:** infra-red spectroscopy near infra-red and far infra-red – properties –origin of IRspectra – IR spectrophotometer – applications interpretation of IR spectra – CH, CO, CN bending and stretching vibrational modes only – scattering of light – Raman effect –classical theory –quantum theory –mutual exclusion principle – Raman spectrometer- characteristics of Raman lines –applications – ultraviolet and visible spectroscopy –properties – spectrophotometer.
TEXT BOOKS	1. Subramaniam. N&Brijlal, 2014,Optics, 25th edition,S.Chand &Co. 2. S.L.Gupta,V.Kumar & R.C.Sharma,1997,Elements of Spectroscopy, 13th Edition, Pragati Prakashan, Meerut. 3. G.Aruldhass,2000,Molecular Structure and Spectroscopy,II edition.PHIPvt Ltd, New Delhi.
REFERENCEBOOKS	1. Agarwal B.S, 2011,Optics, KedernathRamnath Publishers, Meerut. 2. Sathyaprakash, 1990,Optics,VII edition, RatanPrakashanMandhir, New Delhi. 3. C.N.Banewell, 2006, Introduction to Molecular Spectroscopy,IV edition,TMH Publishing Co,New Delhi.

WEBLINKS	1. https://science.nasa.gov/ems/ 2. https://www.youtube.com/watch?v=tL3rNc1G0qQ&list=RDCMUCzwo7UlGkb-8Pr6svxWo-LA&start_radio=1&t=2472 1. https://science.nasa.gov/ems/

COURSE OUTCOMES:

At the end of the course, the student will be able to:

COURSE OUTCOMES	**CO1**	Outline basic knowledge of methods of rectifying different defects in lenses
	CO2	Discuss the principle of superposition of wave, use these ideas to understand the wave nature of light
	CO3	Extend the knowledge about nature of light through diffraction techniques
	CO4	Interpret basic formulation of polarization
	CO5	Relate the principles of optics to various fields of IR, Raman

MAPPING WITH PROGRAM OUT COMES:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** in the 3-point scale of STRONG (**S**), MEDIUM (**M**) and LOW (**L**).

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

<table>
<tr><td>Title of theCourse</td><td colspan="7">PHYSICAL CHEMISTRY PRACTICAL – I</td></tr>
<tr><td>Paper No.</td><td colspan="7">Core VIII</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td rowspan="2">23114SEC45L</td></tr>
<tr><td>Semester</td><td>IV</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>-</td><td>-</td><td colspan="3">3</td><td colspan="2">3</td></tr>
<tr><td>Prerequisites</td><td colspan="7">General Chemistry</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">The course aims at providing an understanding of
the laboratory experiments in order to understand the concepts of physical changes in chemistry
the rates of chemical reactions
colligative properties and adsorption isotherm</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT-I
Chemical kinetics
1. Determination of rate constant of acid catalysed hydrolysis of an ester</td></tr>
</table>

	(methyl acetate). 2. Determination of order of reaction between iodide and persulphate (initial rate method). 3. Polarimetry: Determination of rate constant of acid catalysedinversion of cane sugar **Thermochemistry** 4. Determination of heat of neutralisation of a strong acid by a strong base. 5. Determination of heat of hydration of copper sulphate.
	UNIT II **Electrochemistry – Conductance measurements** 6. Determination of cell constant 7. Determination of molar conductance of strong electrolyte 8. Determination of dissociation constant of acetic acid **Colorimetry** 9. Determination of concentration of copper sulphate solution
	UNIT III **Colligative property** 10. Determination of molecular weight of an organic compound by Rast method using naphthalene or diphenyl as solvent **Adsorption** 11. Construction of Freundlich isotherm for the adsorption of aceticacid on activated charcoal
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Reference Books	1. Sindhu, P.S.*Practicals in Physical Chemistry*, Macmillan India : New Delhi, 2005. 2. Khosla, B. D.Garg,V. C.; Gulati, A.; *Senior Practical Physical Chemistry*, R.Chand : New Delhi, 2011. 3. Gupta, Renu, *Practical Physical Chemistry*, 1st Ed.; New Age International: New Delhi, 2017.

Website and e-learning source	https://www.vlab.co.in/broad-area-chemical-sciences

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: describe the principles and methodology for the practical work

CO2: explain the procedure, data and methodology for the practical work.

CO3: apply the principles of electrochemistry, kinetics for carrying out the practical work.

CO4: demonstrate laboratory skills for safe handling of the equipment and chemicals

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

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

Level of Correlation between PSO's and CO's

Course Code	Course Title	L	T	P	C
23113SEC45L	Physics Practical - II	0	0	3	3
COURSE OBJECTIVES:	Demonstrate various optical phenomena principles, working, apply with various materials and interpret the results.				

OPTICS (any eight experiments)
.
1. Determination of refractive index of prism using spectrometer.
2. Determination of refractive index of liquid using hollow prism and spectrometer
3. Determination of dispersive power of a prism.
4. Determination of radius of curvature of lens by forming Newton's rings.
5. Determination of thickness of a wire using air wedge.
6. Determination of Cauchy's Constants.
7. Determination of resolving power of grating
8. Determination of resolving power of telescope
9. Comparison of intensities using Lummer Brodhum Photometer.
10. Determination of range of motion using Searlesgoniometer.
11. Verification of Newton's formula for a lens separated by a distance.
12. Determination of refractive index of a given liquid by forming liquid lens
13. Determination of refractive index using Laser.
14. Determination of wavelengths, particle size using Laser/Monochromatic source.
15. Determination of resolving power of Diffraction grating using Laser
16. Determination ofwire using Laser.

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

1. To understand the use of volumetric pipette, burette and analytical balance.
2. To explain the principles of volumetric analysis,

23114SEC47	Instrumental methods of chemical analysis	2	0	0	2

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

	Classification, principle, Factors affecting - Solvent Extraction – Liquid - Liquid Extraction, Chromatography: Column, TLC, Paper, Gas, HPLC and Electrophoresis, Principle, Classification, Choice of Adsorbents,Solvents, Preparation of Column, Elution Mechanism of separation: adsorption, partition & ion exchange. Development of chromatograms and Rf value.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Vogel, Arthur I: A Test book of Quantitative Inorganic Analysis (Rev. by G.H. Jeffery and others) 5th Ed., The English Language Book Society of Longman. 2. R. Gopalan, P. S. Subramanian and K. Rengarajan, Elements of Analytical Chemistry, Sultan Chand, New Delhi, 2007 3. Skoog, Holler and Crouch, Principles of Instrumental Analysis, Cengage Learning, 6th Indian Reprint (2017). 4. R. Speyer, Thermal Analysis of Materials, CRC Press, 1993. 5. R.A. Day and A.L. Underwood, Quantitative Analysis, 6thedn., Prentice Hall of India Private Ltd., New Delhi, 1993
Reference Books	1. D. A. Skoog, D. M. West and F. J. Holler, Analytical Chemistry: An Introduction, 5thedn., Saunders college publishing, Philadelphia, 1998. 2. Dash U N, Analytical Chemistry; Theory and Practice, Sultan Chand and sons Educational Publishers, New Delhi, 2011. 3. Christian, Gary D; Analytical Chemistry, 6th Ed., John Wiley & Sons, New York, 2004. 4. Mikes, O. &Chalmes, R.A. Laboratory Handbook of Chromatographic & Allied Methods, Elles Harwood Ltd. London 5. G.H. Jeffery, J. Bassett, J. Mendham and R.C. Denney, Vogel's Textbook of Quantitative Chemical Analysis, sixth edition Pearson Education, 2000
Website and e-learning sources	1. http://www.epa.gov/rpdweb00/docs/marlap/402-b-04-001b-14-final.pdf 2. http://eric.ed.gov/?id=EJ386287 3. http://www.sjsu.edu/faculty/watkins/diamag.htm 4. http://www.britannica.com/EBchecked/topic/108875/separation-

	and-purification 5. http://www.chemistry.co.nz/stoichiometry.htm

Course Learning Outcomes (for Mapping with POs and PSOs)On completion of the course the students should be able to

CO1: apply error analysis in the calibration and use of analytical instruments, explain theory, instrumentation and application of flame photometry and Atomic Absorption spectrometry

CO2: explain theory, instrumentation and application of UV visible and Infraredspectroscopy.

CO3: able to discuss instrumentation, theory and applications of thermal and electrochemical techniques

CO4: explain the use of chromatographic techniques in the separation and identification of mixtures

CO5: explain preparation of solutions, stoichiometric calculations

	PO 1	**PO2**	**PO3**	**PO4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**
CO 1	S	S	S	S	S	S	S	M	S	M
CO 2	M	S	S	S	M	S	S	M	M	M
CO 3	S	S	S	M	S	S	S	M	S	M
CO 4	S	S	S	S	S	S	S	M	M	M
CO 5	S	M	S	S	S	S	S	M	M	S

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

Level of Correlation between PSO's and CO's

23114SEC48	Forensic science	2	0	0	2

Objectives of the course	This course aims at giving an overall view of • crime detection through analytical instruments • forgery and its detection • medical aspects involved
Course Outline	**UNIT I Poisons** Poisons - types and classification - diagnosis of poisons in the living andthe dead -clinical symptoms - postmortem appearances. Heavy metal contamination (Hg, Pb, Cd) of seafoods - use of neutron activation analysisin detecting arsenic in human hair. Treatment in cases of poisoning – use of antidotes for common poisons.
	Unit-II **Crime Detection** Accidental explosion during manufacture of matches and fireworks (as in Sivakasi). Human bombs - possible explosives (gelatin sticks and RDX) - metal detector devices andother security measures for VVIP-composition of bullets and detecting powder burns.
	UNIT-III **Forgery and Counterfeiting** Documents - different types of forged signatures - simulated and traced forgeries -inherent signs of forgery methods - writing deliberately modified - uses of ultraviolet rays -comparison of type written letters – checking silver line water mark in currency notes – alloy analysis using AAS todetect counterfeit coins – detection of gold purity in 22 carat ornaments – detecting gold plated jewels -authenticity of diamond.
	UNIT-IV **Tracks and Traces** Tracks and traces - small tracks and police dogs - foot prints - costing of

	foot prints -residue prints, walking pattern or tyre marks – miscellaneous traces and tracks – glass fracture - tool marks - paints - fibres - Analysis of biological substances - blood, semen, saliva, urine and hair - Cranial analysis (head and teeth) DNA Finger printing for tissue identification in dismembered bodies - detecting steroid consumption in athletes and racehorses.
	UNIT-V **Medical Aspects** Aids - causes and prevention - misuse of scheduled drugs - burns and their treatment by plastic surgery. Metabolite analysis using mass spectrum - Gas chromatography-Arson - natural fires and arson - burning characteristics and chemistry of combustible materials -nature of combustion. Ballistics - classification - internal and terminal ballistics - small arms -laboratory examination of barrel washing and detection of powder residue by chemical tests.
Recommended Text	1. SA Iqbal, M Liviu, Textbook of forensic chemistry, Discoverypublishing house private limited, 2011. 2. Kelly M. Elkins, Introduction to Forensic Chemistry, CRC Press,Taylor & Francis Group, 2019. 3. Javed I. Khan, Thomas J. Kennedy, Donnell R. Christian, Jr., Basicprinciples of Forensic chemistry, Humana Press, first edition, 2012. 4. Bapuly AK, (2006) Forensic Science – Its application in crimeinvestigation, Paras Medical Publisher, Hyderabad. 5. Sharma B.R., (2006) Scientific Criminal Investigation, Universal Law Publishing Co. Pvt. Ltd, New Delhi.
ReferenceBooks	1. Richard Saferst in and Criminalistics-An Introduction to Forensic Science (College Version), Sopfestein, Printice hall, eighth edition,2003 2. Suzanne Bell, Forensic Chemistry, Pearson, second international edition, 2014. 3. Jay Siegel, Forensic chemistry: Fundamentals and applications, Wiley-Blackwell, first edition, 2015. 4. Max M. Houck & Jay A. Segal, (2006) Fundamentals of ForensicScience, Elsevier Academic press. 5. Henry C. Lee, Timothy Palmbach, Marilyn T. Miller, (2006) HenryLee's Crime Scene Book Elsevier Academic press.
Website and e-learning source	1. http://www.library.ucsb.edu/ist/03-spring/internet.html 2. http://www.wonder howto.com/topic/forensic-science/

Course Learning Outcomes (for Mapping with POs and PSOs)On

completion of the course the students should be able to

CO 1: learn about the Poisons - types and classification of poisons in the living and the deadorganisms and also get information about Postmortem.

CO 2: get awareness on Human bombs, possible explosives (gelatin sticks and RDX) and metal defector devices and other security measures for VVIP - composition of bulletsand detecting powder burns

CO 3: detect the forgery documents, different types of forged signatures

CO4: have an idea about how to tracks and trace using police dogs, foot prints identificationand gain the knowledge in analyzing biological substances - blood, semen, saliva, urine and hair - DNA Finger printing for tissue identification in dismembered bodies

CO 5 [illegible]

	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

CO-PO Mapping (Course Articulation Matrix)

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO 5
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

Level of Correlation between PSO's and CO's

231AECCEVS	Environmental Studies-II	2	0	0	2

ENVIRONMENTAL SCIENCE

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY

Definition, scope, and importance of Risk and hazards; Chemical hazards, Physical hazards, Biological hazards in the environment – the concept of anecosystem – structure, and function of an ecosystem – producers, consumers,and decomposers-Oxygen cycle and Nitrogen cycle – energy flow in the ecosystem – ecological succession processes

UNIT II ENVIRONMENTAL POLLUTION

Definition - causes, effects, and control measures of (a) Air pollution (Atmospheric chemistry - Chemical composition of the atmosphere; Chemical and photochemical reactions in the atmosphere - formation of smog, PAN, acid rain, oxygen, and ozone chemistry; Mitigation procedures- Control ofparticulate and gaseous emission,

UNIT III NATURAL RESOURCES

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people –Water resources: Use and overutilization of surface and groundwater, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT

From unsustainable to sustainable development – urban problems related to energy – water conservation, rainwater harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – the role of non-governmental organization environmental ethics:

UNIT V HUMAN POPULATION AND THE ENVIRONMENT

Population growth, variation among nations – population explosion –family welfare program – environment and human health – human rights –value education – HIV / AIDS – women and child welfare.

TEXT BOOKS:

1. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education (2004).
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, (2006).

REFERENCES:

1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media.
2. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia',Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT LTD,New Delhi, 2007.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press (2005)

AUDIT COURSE

Course Code	Course Title	L	T	P	C
231LCSCLS	Leadership and Management Skills	0	0	0	1

Aim:

The aim of the course cultivating and nurturing the innate leadership skills of the youth so that they may trans form these challenges into opportunities and become torch bearers of the future by developing creative solutions.

Course Objective:

The Module is designed to**:**

Help students to develop essential skills to influence and motivate others

- Inculcate emotional and social intelligence, and integrative thinking for effective leadership
- Create and maintain an effective and motivated team to work for the society
- Nurture a creative and entrepreneurial mindset
- Make students understand the personal values and apply ethical principles in professional and social contexts.

Course Outcomes:

Upon completion of the course, students will be able to:

- Examine various leadership models and understand/assess their skills, strengths and abilities that affect their own leadership style and can create their leadership vision
- Learn and demonstrate a set of practical skills such as time management, self-management, handling conflicts, team leadership, etc.
- Understand the basics of entrepreneurship and develop business plans
- Apply the design thinking approach to leadership
- Appreciate the importance of ethics and moral values for making of a balanced personality.

Unit I: Leadership Skills: Understanding Leadership and its Importance - What is leadership? - Why Leader ship required? - Whom do you consider as an ideal leader? - Traits and Models of Leadership - Are leaders born or made? - Key characteristics of an effective leader - Leadership styles - Perspectives of different leaders - Basic Leadership Skills – Motivation – Teamwork Negotiation – Networking.

Unit I: Managerial Skills: Basic Managerial Skills - Planning for effective management - How to organize teams? - Recruiting and retaining talent - Delegation of tasks - Learn to coordinate – Conflict management - Self-Management Skills - Understanding self- concept – Developing self – awareness - Self-examination - Self-regulation

Unit III: Entrepreneurial Skills: Basics of Entrepreneurship - Meaning of entrepreneurship - Classification and types of entrepreneurships - Traits and competencies of entrepreneur - Creating Business Plan - Problem identification and idea generation - Idea validation – Pitch making

Unit IV: Innovative Leadership and Design Thinking: Innovative Leadership - Concept of emotional and social intelligence - Synthesis of human and artificial intelligence - Why does culture matter for today's global leaders – Design Thinking - What is design thinking? - Key elements of design thinking: Discovery – Interpretation - Ideation - Experimentation - Evolution. How to transform challenges in to opportunities? - How to develop human-centric solutions for creating social good?

Unit V: Ethics and Integrity - Learning through Biographies - What makes an individual great? - Understanding the persona of a leader for deriving holistic inspiration - Drawing insights for leadership - How leaders sail through difficult situations? - Ethics and Conduct - Importance of ethics - Ethical decision making - Personal and professional moral codes of conduct - Creating a harmonious life

Book

- Ashokan, M. S. (2015). Karmayogi: A Biography of E. Sreedharan. Penguin, UK.
- Brown, T. (2012). Change by Design. Harper Business
- Elkington, J., & Hartigan, P. (2008). The Power of Unreasonable People: How Social Entrepreneurs Create Markets that Change the World. Harvard Business Press.
- Goleman D. (1995). Emotional Intelligence. Bloomsbury Publishing India Private Limited
- Kalam A. A. (2003). Ignited Minds: Unleashing the Power within India. Penguin Books India
- Kelly T., Kelly D. (2014). Creative Confidence: Unleashing the Creative Potential WithinUsAll. William Collins

E-Resources

- HowtoBuildYourCreativeConfidence,TedTalkbyDavidKelly
- India’s Hidden Hot Beds of Invention Ted Talk by Anil Gupta - https://www.ted.com/ talks/anil_gupta_india_s_hidden_hotbeds_of_invention
- Knowledge@Wharton Interviews Former Indian President APJ Abdul Kalam - . "A Leader Should Know How to Manage Failure" https://www.youtube.com/ watch?v=laGZaS4sdeU
- Martin, R. (2007). How Successful Leaders Think. Harvard Business Review, 85(6):60.

THIRD YEAR

SEMESTER – V

Course Code	Course Title	L	T	P	C
THEORY					
23114AEC51	Organic Chemistry - I	5	1	0	4
23114AEC52	Inorganic Chemistry - I	5	1	0	4
231145AEC53	Physical Chemistry - I	5	1	0	4
23114DSC54A 23114DSC54B 23114DSC54C	Discipline Specific Elective –I A) Green Chemistry (OR) B) Industrial Chemistry (OR) C) Disaster Management	4	1	0	3
PRACTICAL					
23114SEC55L	Industrial Chemistry Practical	0	0	5	3
23114SEC56L	Physical Chemistry Practical II	0	0	5	3
Skill Enhancement Course					
231IIVFV5	Internship/Industrial Visit/Field Visit	-			**2**
AUDIT COURSE					
231ACLSPSL	Professional Skills	-	-	-	1
231AECCVED	Value Education	2	0	0	2
	Total	**22**	**3**	**5**	**26**

23114AEC51	Organic Chemistry - I	5	1	0	4

Title of theCourse	**ORGANIC CHEMISTRY - I**						
Paper No.	**Core IX**						
Category	**Core**	**Year**	II I	**Credits**	4	**Course Code**	23114AEC51
		Semester	V				
Instructional hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	4	1	-			5	
Prerequisites	General Chemistry I,II, III and IV						

Objectives of the course	This course aims to provide an understanding of • stereoisomerism in chirals and geometric isomerism in olefins, conformations of ethane and butane • preparation and properties of aromatic and aliphatic nitrocompounds and amines • preparation of different dyes, food colour and additives • preparation and properties of five membered heterocycles likepyrrole, furan and thiophene • preparation and properties of six membered heterocycles like pyridine, quinoline and isoquinoline.
Course Outline	**UNIT I** **Stereochemistry** Fischer Projection, Newmann and Sawhorse Projection formulae and their interconversions; Geometrical isomerism:cis–trans, syn-anti isomerism, E/Z notations. **Optical Isomerism:** Optical activity, specific rotation, asymmetry, enantiomers, distereoisomers, meso structures - molecules with one and two chiral centres, racemisation- methods of racemisation; resolution- methods of resolution. C.I.P rules. R and S notations for one and two chirality (stereogenic) centres. Molecules with no asymmetric carbon atoms – allenes and biphenyls. Conformational analysis of ethane and butane.
	UNIT II **Chemistry of Nitrogen Compounds – I** **Nitroalkanes** Nomenclature, isomerism, preparation from alkyl halides, halo acids, alkanes; physical properties; reactions – reduction, halogenations, Grignard reagent, Pseudo acid character. Nitro - aci nitro tautomerism. **Aromatic nitro compounds** Nomenclature, preparation – nitration, from diazonium salts, physicalproperties; reactions - reduction of nitrobenzene in different medium, Electrophilic substitution reactions, TNT.

	Amines: Aliphatic amines Nomenclature, isomerism, preparation – Hofmanns' degradationreaction, Gabriel's phthalimide synthesis, Curtius Schmidt rearrangement. Physical properties, reactions – alkylation, acylation, carbylaminereaction, Mannich reaction, oxidation, basicity of amines.
	UNIT III **Chemistry of Nitrogen Compounds – II** **Aromatic amines** – Nomenclature, preparation – from nitro compounds, Hofmann's method; Schmidt reaction, properties - basic nature, ortho effect; reactions – alkylation, acylation, carbylamine reaction, reaction with nitrous acid, aldehydes, oxidation, Electrophilic substitution reactions, diazotization and coupling reactions; sulphanilic acid - zwitter ion formation. Distinction between primary, secondary and tertiary amines - aliphatic and aromatic Diazonium compounds Diazomethane, Benzene diazonium chloride - preparations andsynthetic applications. **Dyes** Theory of colour and constitution; classification based onstructure and application; preparation –Martius yellow, aniline yellow, methyl orange, alizarin, indigo, malachite green. Industry oriented content Dyes Industry, Food colour and additives
	UNIT IV **Heterocyclic compounds** Nomenclature and classification. General characteristics - aromatic character and reactivity. Five-membered heterocyclic compounds Pyrrole – preparation - from succinimide, Paal Knorr synthesis; reactions – reduction, basic character, acidic character, electrophilic substitution reactions, ring opening. Furan – preparation from mucic acid and pentosan; reactions – hydrogenation, reaction with oxygen, Diels Alder reactions, formation of thiophene and pyrrole; Electrophilic substitution reaction. Thiophene synthesis - from acetylene; reactions –reduction; oxidation;

	electrophilic substitution reactions.
	UNIT V **Six-membered heterocyclic compounds** Pyridine – synthesis - from acetylene, Physical properties; reactions - basic character, oxidation, reduction, electrophilic substitution reactions; nucleophilic substitution- uses Condensed ring systems Quinoline – preparation - Skraup synthesis and Friedlander's synthesis; reactions – basic nature, reduction, oxidation; electrophilic substitutions; nucleophilic substitutions – Chichibabin reaction Isoquinoline – preparation by the Bischler – Napieralski reaction, reduction, oxidation; electrophilic substitution.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1.M.K. Jain, S.C.Sharma, Modern Organic Chemistry, VishalPublishing, fourth reprint, 2009. 2.S.M. Mukherji, and S.P. Singh, Reaction Mechanism in Organic Chemistry, Macmillan India Ltd., third edition, 2009. 3. ArunBahl and B.S. Bahl, Advanced organic chemistry, New Delhi, S.Chand& CompanyPvt. Ltd., Multicolour edition, 2012. 4.P. L.Soni and H. M. Chawla, Text Book of Organic Chemistry,Sultan Chand & Sons, New Delhi, twenty ninth edition, 2007. 5.C.N.Pillai, Text Book of Organic Chemistry, Universities Press(India) Private Ltd., 2009.
Reference Books	1.R. T. Morrison and R. N. Boyd, Organic Chemistry, PearsonEducation, Asia, sixth edition, 2012. 2. T.W.Graham Solomons, Organic Chemistry, John Wiley & Sons, eleventh edition, 2012.

	3. A. Carey Francis, Organic Chemistry, Tata McGraw-Hill Education Pvt. Ltd., New Delhi, seventh edition,2009. 4. I. L. Finar, Organic Chemistry, Vol. (1& 2), England, Wesley Longman Ltd, sixth edition, 2006. 5. J. A. Joule, and G. F. Smith, Heterocyclic Chemistry, Wiley, Fifth Edition, 2010.
Website and e-learning sources	1.www.epgpathshala.nic.in 2. www.nptel.ac.in 3. http:/swayam.gov.in 4. Virtual Textbook of Organic Chemistry

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: assign RS notations to chirals and EZ notations to olefins and explain conformations of ethane and butane.

CO2: explain preparation and properties of aromatic and aliphatic nitro compounds andamines

CO3: explain colour and constitution of dyes and food additives

CO4: discuss preparation and properties of five membered heterocycles like pyrrole, furan and thiophene

CO5: discuss preparation and properties of six membered heterocycles like pyridine,quinoline and isoquinoline

	PO 1	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

CO /PSO	**PSO1**	**PSO2**	**PSO3**	**PSO 4**	**PSO 5**
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

Level of Correlation between PSO's and CO's

23114AEC52	Inorganic Chemistry - I	5	1	0	4

Title of the Course	**INORGANIC CHEMISTRY -I**						
Paper No.	**Core X**						
Category	**Core**	**Year**	III	**Credits**	4	**Course Code**	23114AEC52
		Semester	V				
Instructional hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	4	-	-			4	
Prerequisites	General Chemistry I , II, III and IV						
Objectives of the course	The course aims to provide knowledge on • nomenclature, isomerism and theory of coordination compounds, and chelate complexes • crystal field theory, magnetic properties, stability of complexesand Jahn Teller effect • preparation and properties of metal carbonyls • Lanthanoids and actinoids • preparation and properties of inorganic polymers						
Course Outline	**UNIT I** **Co-ordination Chemistry - I** IUPAC Nomenclature of coordination compounds, Isomerism in coordination compounds. Werner's coordination theory – effective atomic number –interpretation of geometry and magnetic properties by Pauling's theory – geometry of co-ordination compounds with co-ordination number 4 &6. Chelates – types of ligands forming chelates – stability of chelates, applications of chelates in qualitative and quantitative analysis–application of DMG and oxine in gravimetric analysis –estimation ofhardness of water using EDTA, metal ion indicators. Role of metal chelates in living systems – haemoglobin and chlorophyll						

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

	UNIT III **Organometallic compounds** **Metal Carbonyls** Mono and polynuclear carbonyls, General methods of preparation of carbonyls – general properties of binary carbonyls – bonding in carbonyls – structure and bonding in carbonyls of Ni, Fe, Cr, Co, Mn, Ru and Os. EAN rule as applied to metal carbonyls. Ferrocene-Methods of preparation, physical and chemical properties
	UNIT IV **Inner transition elements (Lanthanoids and Actinoids)** General characteristics of f-block elements - Comparative account of lanthanoids and actinoids - Occurrence, Oxidation states, Magnetic properties, Colour and spectra - Lanthanoids and Actinoids, Separation by ion-Exchange and Solvent extraction methods - Lanthanoids contraction- Chemistry of thorium and Uranium-Occurrence, Ores, Extraction, properties and uses - Preparation, Properties and uses of ceric ammonium sulphate, thorium dioxide and uranyl acetate.
	UNIT V **Inorganic polymers** General properties – classification of inorganic polymers based on element in the backbone (Si, S, B and P) - preparation and properties of silicones (polydimethylsiloxane and polymethylhydrosiloxane) phosphorous based polymer (polyphosphazines and polyphophonitrilic chloride), sulphur based polymer (polysulfide and polymeric sulphur nitride), boron based polymers (borazine polymers) – industrial applications of inorganic polymers.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Puri B R, Sharma L R, Kalia K C (2011), Principles of Inorganic Chemistry, 31thEdition, Milestone Publishers & Distributors, Delhi. 2. Satya Prakash, Tuli G. D., Basu S. K., Madan R. D. (2009),

	Advanced Inorganic Chemistry, 18th Edition, S. Chand & Co., New Delhi 3. Lee J D, (1991), Concise Inorganic Chemistry, 4th Edition, ELBS William Heinemann, London. 4. W V Malik, G D Tuli, R D Madan, (2000), Selected Topics in Inorganic Chemistry, S. Chand and Company Ltd. 5. A. K. De, Text book of Inorganic Chemistry, Wiley East Ltd,seventh edition, 1992.
Reference Books	1. Madan R D, Sathya Prakash, (2003), Modern Inorganic Chemistry, 2nd ed ., S.Chand and Company, New Delhi. 2. Gopalan R, (2009) Inorganic Chemistry for Undergraduates, Ist Edition, University Press (India) Private Limited,Hyderabad 3. Sivasankar B, (2013) Inorganic Chemistry.Ist Edition, Pearson, Chennai 4. Alan G. Sharp (1992), Inorganic Chemistry, 3rd Edition, Addition-Wesley, England 5. Peter Atkins, Tina Overton, Jonathan Rourke and Mark Weller, Inorganic Chemistry, Oxford University Press, sixth edition, 2014.
Website and e-learning source	1.www.epgpathshala.nic.in 2. www.nptel.ac.in 3. http:/swayam.gov.in

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: explain isomerism, Werner's Theory and stability of chelate complexes

CO2: discuss crystal field theory, magnetic properties and spectral properties of complexes.

CO3: explain preparation and properties of metal carbonyls

CO4: give a comparative account of the characteristics of lanthanoids and actinoids

CO5:explain properties and uses of inorganic polymers of silicon, sulphur, boron and phosphorous

	PO 1	PO2	PO 3	PO4	PO 5	PO6	PO7	PO8	PO9	PO1 0
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

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

Level of Correlation between PSO's and CO's

231145AEC53	Physical Chemistry - I	5	1	0	4

Title of the Course	**PHYSICAL CHEMISTRY -I**						
Paper No.	**Core XI**						
Category	**Core**	**Year**	III	**Credits**	4	**Course Code**	23114AEC53
		Semester	V				
Instructional hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	4	1	-			5	
Prerequisites	General Chemistry I,II,III and IV						
Objectives of the course	The course aims at providing an overall view of • Gibbs free energy, Helmholtz free energy, Ellingham's diagramand partial molar properties • chemical kinetics and different types of chemical reactions • adsorption, homogeneous and heterogeneous catalysis • colloids and macromolecules • photochemistry, fluorescence and phosphorescence						

Course Outline	**UNIT I** **Thermodynamics - III** Free energy and work functions - Need for free energy functions, Gibbs free energy, Helmholtz free energy - their variation with temperature, pressure and volume, criteria for spontaneity; Gibbs-Helmholtz equation – derivations and applications; Maxwell relationships, thermodynamic equations of state; Thermodynamics of mixing of ideal gases, Ellingham Diagram-application. Partial molar properties – chemical potential, Gibbs Duhem equation, variation of chemical potential with temperature and pressure, chemical potential of a system of ideal gases, Gibbs- Duhem-Margules equation.

	Macromolecules: Molecular weight of Macromolecules-Number average molecular weight- average molecular weight, Determination of Molecular weight of molecules
	UNIT V **Photochemistry** Laws of photo chemistry – Lambert – Beer, Grotthus – Draper and Stark – Einstein. Quantum efficiency. Photochemical reactions – ratelaw – Kinetics of H_2-Cl_2, H_2-Br_2 and H_2-I_2 reactions, comparison between thermal and photochemical reactions. Fluorescence – applications including fluorimetry – sensitised fluorescence, phosphorescence – applications - chemiluminescence and photosensitisation – examples Chemistry of Vision – 11 cis retinal – vitamin A as a precursor - colour perception of vision
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. B.R. Puri and L.R. Sharma, Principles of Physical Chemistry, Shoban Lal Nagin Chand and Co., forty eighth edition, 2021. 2. Peter Atkins, and Julio de Paula, James Keeler, Physical Chemistry, Oxford University press, International eleventh edition, 2018. 3. ArunBahl, B.S. Bahl, G. D. Tuli Essentials of physicalchemistry, 28^{th} edition 2019, S, Chand & Co. 4. S. K. Dogra and S. Dogra, Physical Chemistry through Problems: New Age International, fourth edition, 1996. 5. J. Rajaram and J.C. Kuriacose, Thermodynamics, ShobanLalNagin Chand and CO., 1986.
Reference Books	1. J. Rajaram and J.C. Kuriacose, Chemical Thermodynamics, Pearson, 1^{st} edition, 2013. 2. Keith J. Laidler, Chemical kinetics, third edition, Pearson, 2003. 3. P. W. Atkins, and Julio de Paula, Physical Chemistry, Oxford University press, seventh edition, 2002. 4. K. L. Kapoor, A Textbook of Physical Chemistry, Macmillan

	India Ltd, third edition, 2009. 5. B.R. Puri, L.R. Sharma and M.S. Pathania, Principles of Physical Chemistry, Shobanlal Nagin Chand and Co. Jalendhar,forty first, edition, 2001
Website and e-learning source	1. https://nptel.ac.in 2. https://swayam.gov.in 3. www.epgpathshala.nic.in

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: explain Gibbs and Helmholtz free energy functions, partial molar quantities and Ellinghams

CO2: apply the concepts of chemical kinetics to predict the rate of the reaction and order of the reaction, demonstrate the effect of temperature on reaction rate, and the significance of free energy and entropy of activation.

CO3: compare chemical and physical adsorption, Freundlich and Langmuir adsorption isotherms, and differentiate between homogenous and heterogeneous catalysis.

CO4: demonstrate the types and characteristics of colloids, preparation of sols andemulsions, and determine the molecular weights of macromolecules.

CO5: utilize the concepts of photochemistry in fluorescence, phosphorescence, chemiluminescence and color perception of vision.

	PO 1	**PO2**	**PO 3**	**PO4**	**PO 5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO1 0**
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

CO /PSO	**PSO1**	**PSO2**	**PSO3**	**PSO 4**	**PSO 5**
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

Level of Correlation between PSO's and CO's

23114DSC54A	Discipline Specific Elective –I A) Green Chemistry (OR)	4	1	0	3

Title of the Course	Green Chemistry						
Paper No.	**EC V**						
Category	**Elective**	**Year**	II I	**Credits**	4	**Course Code**	23114DSC54A
		Semester	V				
Instructional hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	4	1	-			5	
Prerequisites	Green Chemistry						
Objectives of the	The course aims at providing knowledge on						

course	• relationship between biochemistry and medicine, composition ofblood • structure and properties of amino acids, peptides, enzyme,vitamins and proteins • biological functions of proteins, enzymes, vitamins and hormones • biochemistry of nucleic acids and lipids • metabolism of lipids
Course Outline	**UNIT I** **Logic of Living Organisms** Relationship of Biochemistry and Medicine Blood - Composition of Blood, Blood Coagulation – Mechanism.Hemophilia and Sickle Cell Anaemia Maintenance of pH of Blood – Bicarbonate Buffer, Acidosis, Alkalosis.
	UNIT II **Peptides and Proteins** **Amino acids** – nomenclature, classification – essential and Non-essential; Synthesis - Gabriel Phthalimide, Strecker; properties – zwitter ion and isoelectric point, electrophoresis and reactions. **Peptides** – peptide bond – nomenclature – synthesis of simple peptides – solution and solid phase. Determination of structure of peptides, N-terminal analysis – Sanger's & Edmann method; C terminal analysis - Enzymic method. **Proteins** – classification based on composition, functions and structure; properties and reactions – colloidal nature, coagulation, hydrolysis, oxidation, denaturation, renaturation; colour tests for proteins; structure of proteins – primary, secondary, tertiary and quaternary. Metabolism of Amino acids – general aspects of metabolism (a brief outline); urea cycle.
	UNIT III **Enzymes and Vitamins** Nomenclature and classification, characteristics, factors influencing enzyme activity – mechanism of enzyme action – Lock and key hypothesis, Koshland's induced fit model. Proenzymes, antienzymes, coenzymes and isoenzymes; allosteric enzyme regulation. Vitamins as coenzymes – functions of TPP, lipoic acid, NAD, NADP, FMN, FAD, pyridoxal phosphate, CoA, folic acid, biotin, cyanocobalamin.
	UNIT IV **Amino acids** Components of nucleic acids - nitrogenous bases and pentose sugars, structure of nucleosides and nucleotides, DNA- structure & functions;

	RNA –types– structure - functions; biosynthesis of proteins **Hormones** Adrenalin and thyroxine — chemistry, structure and functions (Nostructure elucidation).
	UNIT V **Lipids** Occurrence, biological significance of fats, classification of lipids. **Simple lipids** – Oils and fats, chemical composition, properties, reactions – hydrolysis, hydrogenation, trans-esterification, saponification, rancidity; analysis of oils and fats – saponification number, iodine number, acid value, R.M. value. Distinction between animal and vegetable fats. **Compound lipids** – Lipoproteins - VLDL, LDL, HDL, chylomicrons – biological significance. Cholesterol – occurrence, structure, test, physiological activity. Metabolism of lipids: β-oxidation of fatty acids.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Bahl, B. S.; Bhal, A. *Advanced Organic Chemistry*, 3rd ed.; S. Chand: New Delhi, 2003. 2. Jain, M.K.; Sharma, S.C. *Modern Organic Chemistry*, Vishal Publications: New Delhi, 2017. 3. Shanmugam, A. *Fundamentals of Biochemistry for Medical Students*,6th ed.; Published by the author, 1999. 4. Veerakumari, L. *Biochemistry*, 1st ed.; MJP Publications: Chennai,2004. 5. Jain, J. L.; *Fundamentals of Biochemistry*, 2nd ed.; S.Chand: New Delhi, 1983.
Reference Books	1. Conn, E. E.; Stumpf, P. K. *Outline of Biochemistry,* 5th ed.; WileyEastern: New Delhi, 2002. 2. West, E. S.; Todd, W. R.; Mason, H. S.; Van Bruggen, J. T. *Text Bookof Biochemistry*, 4th ed.; Macmillan: New York, 1970. 3. Lehninger, A. L. *Principles of Biochemistry*, 2nd ed.; CBS Publisher:Delhi, 1993. 4. Rastogi, S. C. *Biochemistry*, 2nd ed.; Tata McGraw-Hill: New Delhi,

	2003. 5. Chatterjea, M. N.; Shinde, R. *Textbook of Medical Biochemistry*, 5th ed.; Jaypee Brothers: New Delhi, 2002.
Website and e-learning source	1) http://library.med.utah.edu/NetBiochem/nucacids.html 2)http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/E/EnzymeKinetics.html 3) https://swayam.gov.in/courses/4384-biochemistry Biochemistry 4) https://onlinecourses.nptel.ac.in/noc19_cy07/preview Experimental Biochemistry
Course Learning Outcomes (for Mapping with POs and PSOs)On completion of the course the students should be able to **CO1:** explain molecular logic of living organisms, composition of blood and bloodcoagulation **CO2:** explain synthesis and properties of amino acids, determination of structure of peptidesand proteins **CO3:** explain factors influencing enzyme activity and vitamins as coenzymes **CO4:** explain RNA and DNA structure and functions **CO5:** explain biological significance of simple and compound lipids	

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

Level of Correlation between PSO's and CO's

CO /PO	PO1	PO2	PO3	PO4	PO5
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

Level of Correlation between PO's and CO's

23114DSC54B	Industrial Chemistry	4	1	0	3

Title of theCourse	**INDUSTRIAL CHEMISTRY**						
Paper No.	**EC VI**						
Category	**Elective**	**Year**	III	**Credits**	3	**Course Code**	23114DSC54B
		Semester	V				
Instructional hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	4	-	-			4	
Prerequisites	General Chemistry I,II, III and IV						
Objectives of the course	This course is designed to provide knowledge on • classifications and characteristics of fuels • preparation of cosmetics • manufacture of sugar, paper, cement and leather and foodprocessing • applications of abrasives, lubricants and other industrial products • intellectual property rights						
Course Outline	**UNIT I** **Survey of Indian Industries and mineral resources in India** **Fuels:** Classification, characteristics of fuels. Solid fuels: coal - classification; analysis of coal- proximate analysis and ultimate analysis; calorific value-determination, carbonisation of coal. Liquid fuels: Petroleum - characteristics; Gasoline aviation petrol- knocking in internal combustion engines, antiknock agents; unleaded petrol-octane number, cetane number. Gaseous fuel: advantages over solid and liquid fuels; water gas, producer gas, carburetted water gas - preparations - uses. Natural gas: LPG-composition, advantages, application; gobar gas- production, composition, advantages, application. Propellants – rocket fuels (basic idea)						
	UNIT II **Cosmetics** Skin care: powders, ingredients; creams and lotion-cleansing, moisturising, all purpose shaving cream, sunscreen; make up preparations. Dental care: tooth pastes – ingredients. Hair care: shampoos-types, ingredients; conditioners-types, ingredients. Perfumes: natural-plant origin-parts of the plant used, chief constituents;						

	animal origin-amber gries, civetone and musk; synthetic-classification-esters-amylsalicylate alcohols-citronellol; terpeneols-gereniol and nerol; ketones-muskone, coumarin; aldehydes-vanilin. **Soaps and Detergents** Soaps-properties, manufacture of soap-batch process; types-transparent soap, toilet soap, powder soap and liquid soap – ingredients. Detergents-definition, properties-cleansing action; soapless detergents-anionic, cationic and non-ionic (general idea only); uses of detergents as surfactants. Biodegradability of soaps and detergents.
	UNIT III **Sugar Industry** Manufacture from sugar cane; recovery of sugar from molasses; testing and estimation of sugar. **Food Preservation and processing** Food spoilage – causes; Food preservation - methods – high temperature, low temperature, drying, radiation; Food additives – preservatives, flavours, colours, anti-oxidants, sweetening agents; hazards of using food additives; Food standards – Agmark and Codex alimentarius.
	UNIT IV **Abrasives** Definition, characteristics, types-natural and synthetic; natural abrasives – diamond, corundum, emery, garnet, quartz – composition, uses; synthetic abrasives – carborundum, aluminium carbide, boron carbide, boronnitride, synthetic graphite – composition and uses. **Leather Industry** Structure and composition of skin, hide; Manufacture of leather – pre-tanning process – curing, liming, beating, pickling; methods of tanning-vegetable, chrome – one bath, two bath process; finishing. **Paper Industry** Manufacture of pulp - mechanical, chemical processes; sulphate pulp, rag pulp; manufacture of paper- beating, refining, filling, sizing, colouring, calendaring; cardboard.
	UNIT V **Lubricants** Definition, classification-liquid, semi-solid, solid and synthetic; properties-viscosity index, flash point, cloud point, pour point, aniline point and drop point; greases-properties, types; cutting fluids,

	selection of lubricants. **Cement Industry** Cement – types, raw materials; manufacture-wet process, constituent of cement, setting of cement; properties of cement-quality, setting time, soundness, strength; mortar, concrete, RCC; curing and decay of concrete. **Intellectual Property Rights** Introduction to Intellectual Property Rights – Patents - Factors for patentability - Novelty, Non obviousness, Industrial applications - Patent offices in India: Trademark - Types of trademarks- Certification marks, logos, brand names, signatures, symbols and service marks
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Sharma, B.K. *Industrial Chemistry*, 9th ed.; Goel Publishing House: Meerut, 1998. 2. Wilkinson, J.B.E. Moore, R.J. *Harry's Cosmeticology*, 7th ed.; Chemical Publishers : New York, 1982. 3. Alex V. Ramani, *Food Chemistry*, MJP publishers: Chennai, 2009. 4. Jayashree Ghosh, *Applied Chemsitry*, S. Chand : New Delhi, 2006. 5. Srilakshmi, B. *Food Science*, 4th ed.; New Age International Publication, 2005.
Reference Books	1. Jain, P.C.; Jain, M. *Engineering Chemistry*, 16th ed.; Dhanapet Rai: Delhi, 1992 2. George Howard, *Principles and Practice of Perfumes and Cosmetics*, Stanley Therones, Cheltenham: UK, 1987. 3. Thankamma Jacob, *Foods, Drugs and Cosmetics - A Consumer Guide*, Macmillan : London, 1997. 4. ShankuntalaManay, N.; Shadaksharaswamy, M. *Food Facts and Principles*, 3rd ed.; New Age Publication, 2008. 5. Neeraj Pandey, KhushdeepDharni, *Intellectual Property Rights*, PHI Learning, 2014.

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

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: summarize the properties of fuels which include petroleum, water gas, natural gas and propellents

CO2: evaluate cosmetic products, soaps, detergents.

CO3: explain manufacture of sugar, food spoilages and food additives

CO4: explain properties of abrasives, manufacture of leather and paper

CO5: explain properties and manufacture of lubricants and cement, and intellectual property rights

	PO1	**PO 2**	**PO3**	**P O 4**	**PO5**	**PO 6**	**PO7**	**PO 8**	**PO 9**	**PO10**
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

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

Level of Correlation between PSO's and CO's

Course Code	Course Title	L	T	P	C
23114DSC54C	Disaster Management	4	1	0	3

DISASTER MANAGEMENT

Course Code	Course Title	L	T	P	C
23114DSC54C	Disaster Management	4	0	0	3

Course Objectives:

- To provide students an understanding the need for studying the disaster management
- Develop an understanding about the various types of disasters.
- To expose students to the risk and vulnerability analysis
- To create awareness about disaster prevention and risk reduction
- To establish relationship between disasters and developments.
- To understand Rehabilitation, Reconstruction and Recovery in the event of Disaster
- To gain knowledge on Climate Change Adaptation and IPCC Scenario and Scenarios in the context of India.

Course Outcomes:

CO1: Understand the need and significance of studying disaster management

CO2: Understand the different types of disasters and causes for disasters.

CO3: Gain knowledge on the impacts Disasters on environment and society

CO4: Study and assess vulnerability of a geographical area.

CO5: Students will be equipped with various methods of risk reduction measures and risk mitigation.

CO6: Understand the role of Information Technology in Disaster Management

CO7: Understand Geographical Information System applications in Disaster Management

Content of Course

Unit I: Introduction to Disasters

Chapter No.1: Disaster: Concept, Meaning, and Definition
Chapter No.2: History of Major Disaster Events in India
ChapterNo.3: Types of Disasters - Natural Disasters: Famine, Drought, Flood, Cyclone, Tsunami, Earthquake

Unit II: Disaster Mitigation and Disaster Management

Chapter No.4: Man-made Disasters: Riots, Blasts, Industrial, Militancy
Chapter No.5: Profile, Forms and Reduction of Vulnerability
Chapter No. 6: Disaster Mitigation: Concept and Principles

Unit III: Impact of Disaster

Chapter No.7: Disaster Management: Concept and Principles

Chapter No.8: Pre-disaster-Prevention and Preparedness

Chapter No.9: Physical, Economic, Social, Psycho-socio Aspects, Environmental Impacts

Unit IV: Disaster Process and Intervention

Chapter No.10: During Disaster – Rescue and Relief

Chapter No.11: Post-disaster – Rehabilitation and Reconstruction
Chapter No.12: Victims of Disaster-Children, Elderly, and Women
Chapter No.13: Displacement-Causes, Effects and Impact

Unit V: Disaster Intervention

Chapter No.14: Major Issues and Dynamics in the Administration of Rescue, Relief, Reconstruction and Rehabilitation
Chapter No.15: Components of Rescue, Relief, Reconstruction; Rehabilitation
Chapter No.16: Disaster Policy in India; Disaster Management Authority-NDMA, SDMA, DDMA; Disaster Management Act, 2005
References:

1. Anil Sinha (2001), Disaster Management-Lessons Drawn and Strategies for Future. New Delhi, Jain Publications.
2. Backer, C.W. and Chapman, W. (ed.). (1969), Man and Society in Disasters, New Delhi,
3. Clarke, J.I., Peter Curson, et.al. (ed.) (1991), Population and Disaster, Oxford, Basil Blackwell Ltd.
4. Cuny, Frederick (1984), Disasters and Development, Oxford, Oxford University Press. Disaster Management Act 2005
5. Garb, S. and Eng.E (1969), Disasters Hand Book, New York, Springer.
6. Gupta, M.C, L.C. Gupta, B. K. Tamini and Vinod K. Sharma (2000), Manual on Natural Disaster Management in India, New Delhi, National Institute of Disaster Management. Hoff, A (1978), People in Crisis-Understanding and Helping, California, Addison Wesley.
7. Maskrey Andrew (1989), Disaster Mitigation: A Community Based Approach, Oxford, Oxfarm.
8. Narayan, Sachindra (ed.) (2000), Anthropology of Disaster Management, New Delhi, Gyan Publishing House.
9. Nidhi G Dhawan (2014), Disaster Management and Preparedness, New Delhi, Jain Publications.

10. Parasuraman, S. and Unnikrishnan, P.V. (2000), India Disasters Report: Towards Policy Initiative, New Delhi, Oxford University Press.

COURSE CODE	COURSE TITLE	L	T	P	C
23114SEC55L	Industrial Chemistry Practical	0	0	3	2

1. Estimation of glucose in food samples.
2. Determination of dissolved oxygen in water.
3. Determination of Chemical Oxygen Demand (COD)
4. Determination of Biological Oxygen Demand (BOD)
5. Estimation of phosphoric acid in superphosphate fertilizer.
6. Determination of alkali content in antacid tablet using Hcl.
7. Estimation of Calcium in Calcium ammonium nitrate fertilizer.
8. Testing of turmeric powder, milk and mustard oil for adulterants.
9. Determination of total permanent and temporary hardness of water using EDTA.
10. Measurement of chloride, sulphate and salinity of water samples by simple titration method. (AgNO3 and potassium chromate)

Suggested Readings

1. E. Stocchi: Industrial Chemistry, Vol-I, Ellis Horwood Ltd. UK.
2. P. C. Jain, M. Jain: Engineering Chemistry, Dhanpat Rai & Sons, Delhi.
3. B. K. Sharma: Engineering Chemistry, Goel Publishing House, Meerut
4. A. K. De, Environmental Chemistry: New Age International Pvt, Ltd, New Delhi.
5. S. M. Khopkar, Environmental Pollution Analysis: Wiley Eastern Ltd, New Delhi.
6. S. C. Bhatia: Chemical Process Industries, Vol. I & II, CBS Publishers, New Delhi.
7. J. A. Kent: Riegel's Handbook of Industrial Chemistry, CBS Publishers, New Delhi.
8. S. S. Dara: A Textbook of Engineering Chemistry, S. Chand & Company Ltd. New Delhi.
9. O. P. Vermani, A. K. Narula: Industrial Chemistry, Galgotia Publications Pvt. Ltd., New Delhi.
10. R. Gopalan, D. Venkappayya, S. Nagarajan: Engineering Chemistry, Vikas Publications, New Delhi.
11. W. D. Kingery, H. K. Bowen, D. R. Uhlmann: Introduction to Ceramics, Wiley Publishers, New Delhi.
12. R.M. Felder, R.W. Rousseau: Elementary Principles of Chemical Processes, Wiley Publishers, New Delhi.

COURSE CODE	COURSE TITLE	L	T	P	C
23114SEC56L	Physical Chemistry Practical II	0	0	3	2

Conductometeric Experiments

1. Cell constant
2. Equivalent conductance
3. Verification of on- Sager equation
4. Acid- base titrations
5. Precipitation titrations

Potentiometric Experiments:

1. FAS vs $KMnO_4$
2. KI Vs KMN_{O4}
3. FAS VS $K_2Cr_2O_7$
4. KI Vs $K_2Cr_20_7$
5. Determination of solubility of silver salts.

AUDIT COURSE

PROFESSIONAL SKILLS

Course Code	Course Title	L	T	P	C
231ACLSPSL	Professional Skills	-	-	-	1

Course Objectives:

The Objectives of the course are to help students/candidates:

- Acquire career skills and fully pursue to partake in a successful career path
- Prepare a good resume, prepare for interviews and groupdiscussions
- Explore desired career opportunities in the employment market in consideration ofan individual SWOT.

Course Outcomes:

At the end of this course the students will be able to:

- Prepare their resume in an appropriate template without grammatical and other errors and using proper syntax
- Participate in a simulated interview

- Actively participate in group discussions towards gainful employment
- Capture a self - interview simulation video regarding the job role concerned
- Enlist the common errors generally made by candidates in an interview
- Perform appropriately and effectively in group discussions
- Explore sources (online/offline) of career opportunities
- Identify career opportunities in consideration of their own potential and aspirations
- Use the necessary components required to prepare for a career in an identified occupation (as a case study).

Unit I: Resume Skills: Preparation and Presentation, Introduction of resume and its importance, Difference between a CV, Resume and Biodata, Essential components of a good resume, Resume skills: common errors, Common errors people generally make in preparing their resume, prepare a good resume of her/his considering all essential components

Unit II: Interview Skills: Preparation and Presentation, Meaning and types of interviews (F2F, telephonic, video, etc.). Dress Code, Background Research, Do's and Don'ts, Situation, Task, Approach and Response (STAR Approach) for facing an interview. Interview procedure (opening, listening skills, closure, etc.). Important questions generally asked in job interview (open and closed ended questions).

Unit III: Interview Skills: Simulation Observation of exemplary interviews Comment critically on simulated interviews, Interview Skills: Common Errors: Discuss the common errors generally candidates make in interview Demonstrate an ideal interview

Unit IV: Group Discussion Skills: Meaning and methods of Group Discussion, Procedure of Group Discussion, Group Discussion-Simulation, Group Discussion - Common Errors.

Unit V: Exploring Career Opportunities: Knowing yourself - personal characteristics, Knowledge about the world of work, requirements of jobs including self-employment. Sources of career information, preparing for a career based on their potentials and availability of opportunities.

VALUE EDUCATION

Course Code	Course Title	L	T	P	C
231AECCVED	Value Education	2	0	0	2

Course Objectives

- Provide insights into the central dogma of molecular biology and explain the mechanism of DNA replication.

- Elaborate the mechanism of transcription and reverse transcription.
- Highlight the characteristics of genetic code and describe the process of protein synthesis.
- Introduce the concept of regulation of gene expression in prokaryotes
- Familiarize the different types of mutations and explain the mechanism of DNA repair.

Course Content:

UNIT I: Central Dogma of molecular Biology, DNA as the unit of inheritance. Experimental evidences by Griffith's transforming principle, Avery, McLeod and McCarthy's experiment, and Hershey and Chase Experiment. Replication in prokaryotes: Modes of replication, Meselson and Stahl's experimental proof for semiconservative replication. Mechanism of Replication – Initiation, events at Ori C, Elongation – replication fork, semi discontinuous replication, Okazaki fragments, and termination. Bidirectional replication, Inhibitors of replication. Models of replication-theta, rolling circle and D loop model.

UNIT II: Transcription - Mechanism of transcription: DNA dependent RNA polymerase(s), recognition, binding and initiation sites, TATA/ Pribnow box, elongation and termination. Post-transcriptional modifications; inhibitors of transcription. RNA splicing and processing of mRNA, tRNA and rRNA. Reverse transcription.

UNIT III: Genetic Code and its characteristics, Wobble hypothesis. Translation: Adaptor role of tRNA, Activation of amino acids, Initiation, elongation and termination of protein synthesis, post-translational modifications and inhibitors of protein synthesis

UNIT IV: Regulation of Gene Expression In Prokaryotes - Principles of gene regulation, negative and positive regulation, concept of operons, regulatory proteins, activators, repressors, regulation of lac operon and trp operon.

UNIT V: Mutation: Types-Nutritional, Lethal, Conditional mutants. Missense mutation and other point mutations. Spontaneous mutations; chemical and radiation – induced mutations. DNA repair: Direct repair, Photo reactivation, Excision repair, Mismatch repair, Recombination repair and SOS repair.

Course Outcomes

- Illustrate the Central Dogma of molecular biology, explain the multiplication of DNA in the cell and describe the types and modes of replication.
- Elaborate the mechanism of transcribing DNA into RNA, discuss the formation of different types of RNA.
- Decipher the genetic code and summarize the process of translation.
- Comprehend the principles of gene expression and explain the concept of operon in prokaryotes.
- Distinguish the types of mutations and explain the various mechanisms of DNA repair.

Text Books (Latest Editions)

1. Veer Bala Rastogi, 2008, Fundamentals of Molecular Biology, 1st edition, Anebooks India.
2. David Friefelder,1987, Molecular Biology, 2nd edition, Narosa Publishing House.
3. Dr. P.S. Verma and Dr. V.K. Agarwal, 2013, Cell biology, Genetics, Molecular Biology, Evolution and Ecology,1st edition, S. Chand & Company Pvt. Ltd.

References Books

1. Karp, G., 2010, Cell and Molecular Biology: Concepts and Experiments, 6th edition, John Wiley & Sons. Inc.
2. DeRobertis, E.D.P. and De Robertis, E.M.F., 2010, Cell and Molecular Biology, 8th edition, Lippincott Williams and Wilkins, Philadelphia.
3. James. D. Watson, 2013, Molecular Biology of the Gene 7th edition, Benjamin Cumming.

THIRD YEAR
SEMESTER – VI

Course Code	**Course Title**	**L**	**T**	**P**	**C**
THEORY					
23114AEC61	Organic Chemistry II	5	0	0	4
23114AEC62	Inorganic Chemistry II	5	0	0	4
23114DSC63A	Discipline Specific Elective Courses-II	5	0	0	4
23114PRW64	Project - Viva	0	0	13	4
23114SEC65	Professional Competency Skill- General awareness for competitive examination	2	0	0	2
231EXACT	Extension activity	-	-	-	1
AUDIT COURSE					
231ACSIKWS	Indian Knowledge System	-	-	-	2
	Total	**30**	**0**	**0**	**21**
Total Credits -Programme					**137**
Total Credits - Audit Courses					**09**
Total Credits					**146**

23114AEC61	Organic Chemistry II	5	0	0	4

Title of theCourse	**ORGANIC CHEMISTRY - II**						
Paper No.	**Core XIII**						
Category	**Core**	**Year**	III	**Credits**	3	**Course Code**	23114AEC61
		Semester	V I				
Instructional hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	1	4	-			5	
Prerequisites	Organic Chemistry – I						
Objectives of the course	This course aims at providing knowledge on • classification, isolation and discussing the properties ofalkaloids and terpenes • preparation and properties of saccharides • biomolecules • different molecular rearrangement • preparation and properties of organometallic compounds						
Course Outline	**UNIT I** **Alkaloids** Classification, isolation, general properties- Hofmann Exhaustive Methylation; Structure elucidation – Coniine, piperine, nicotine. **Terpenes:** Classification, Isoprene rule, isolation and structuralelucidation of Citral, alpha terpineol, Menthol, Geraniol and Camphor.						

	UNIT II **Carbohydrates** Definition and Classification of Carbohydrates with examples.Relative configuration of sugars. Determination of configuration (Fischer's Proof). Definition of enantiomers, diastereomers, epimers and anomers with suitable examples. **Monosaccharides**– configuration – D and L hexoses – aldohexoses and ketohexoses. Glucose, Fructose – Occurrence, preparation, properties, reactions, structural elucidation, uses. Interconversions of sugar series – ascending, descending, aldose toketose and ketose to aldose. **Disaccharides** – sucrose, lactose, maltose - preparation, properties anduses (no structural elucidation). **Polysaccharides** – Source, constituents and biological importance of homopolysaccharides- starch and cellulose, heteropolysaccharides – hyaluronic acid, heparin.

	UNIT III **Molecular rearrangements:** Molecular Rearrangement: Type of rearrangements, Mechanism for Benzidine, Favorskii, Clasien, Fries, Hofmann, Curtius, Schmidt and Beckmann, Pinacol-pinacolone rearrangement
	UNIT IV **Special reagents in organic synthesis** AIBN, 9BBN, BINAP/BINOL, BOC, DABCO, DCC, DIBAL, DMAP,NBS/NCS, NMP, PCC, TBHP, TEMPO **Organometallic compounds in Organic Synthesis** Preparation, Properties and applications: Grignard Reagents, Organo Lithium Compounds, Ziegler – Natta,Wilkinson, Metal Carbonyl, Zeiss's Salt
	UNIT V **Green Chemistry:** Principles, chemistry behind each principle and applications in chemical synthesis. Green reaction media – green solvents, green reagents and catalysts; tools used like microwave andultra-sound in chemical synthesis.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1 M.K.Jain, S. C.Sharma, Modern Organic Chemistry, VishalPublishing, 4th reprint,2009. 2 S.M. Mukherji, and S.P. Singh, Reaction Mechanism in Organic Chemistry, Macmillan IndiaLtd., 3rd edition,2009 3 Arun Bahl and B.S. Bahl, Advanced organic chemistry, New Delhi, S.Chand & Company Pvt. Ltd., Multicolour edition,2012. 4 P. L.Soni and H. M. Chawla, Text Book of Organic Chemistry, Sultan Chand & Sons, New Delhi, 29th edition, 2007.

	5. C Bandyopadhya; An Insight into Green Chemistry; Published on2020
Reference Books	1. R. T. Morrison and R. N. Boyd, Organic Chemistry, PearsonEducation, Asia,6th edition, 2012. 2. T.W.Graham Solomons, Organic Chemistry, John Wiley &Sons,11th edition, 2012. 3. A. Carey Francis, Organic Chemistry, Tata McGraw-Hill Education Pvt. Ltd., New Delhi,7th edition,2009. 4. I. L. Finar, Organic Chemistry, Vol. (1& 2), England, WesleyLongman Ltd, 6th edition, 2006. 5. J. A. Joule, and G. F. Smith, Heterocyclic Chemistry, Wiley, 5th Edition, 2010.
Website and e-learning source	1.www.epgpathshala.nic.in 2.www.nptel.ac.in 3.http:/swayam.gov.in 4.Virtual Textbook of Organic Chemistry 5.https://vlab.amrita.edu/

Course Learning Outcomes (for Mapping with POs and PSOs)On completion of the course the students should be able to

CO1: explain isolation and properties of alkaloids and terpenes
CO2: explain preparation and reactions of mono and disachharides
CO3: classify biomolecules and natural products based on their structure, properties,reactions and uses.
CO4: explain molecular rearrangements like benzidine, Hoffmann etc.,
CO5: preparation and properties of organolithium compounds

	PO 1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0
CO 1	S	S	S	S	S	S	S	M	S	M
CO 2	M	S	S	S	M	S	S	M	M	M
CO	S	S	S	M	S	S	S	M	S	M

3										
CO 4	S	S	S	S	S	S	S	M	M	M
CO 5	S	M	S	S	S	S	S	M	M	S

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

Level of Correlation between PSO's and CO's

23114AEC62	Inorganic Chemistry II	5	0	0	4

<table>
<tr><td>Title of theCourse</td><td colspan="7">INORGANIC CHEMISTRY –II</td></tr>
<tr><td>Paper No.</td><td colspan="7">Core XIV</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">23114AEC62</td></tr>
<tr><td>Semester</td><td>VI</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>4</td><td></td><td colspan="2">-</td><td colspan="2">4</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Inorganic Chemistry – I</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">The course aims to provide knowledge on
tracer elements and their role in the biological system.
iron transport and storage
metallo enzymes, oxygen transport.
silicates and their applications
industrial applications of refractories, alloys, paints and pigments</td></tr>
<tr><td rowspan="2">Course Outline</td><td colspan="7">UNIT I
Bioinorganic Chemistry
Essential and trace elements: Role of Na^{+}, K^{+}, Mg^{2+}, Ca^{2+}, Fe^{3+}, Cu^{2+} and Zn^{2+} in biological systems. Effect of excess intake (Toxicity) of Metal ions – trace elements - As, Cd, Pb, Hg.</td></tr>
<tr><td colspan="7">UNIT II
Metal ion transport and storage

Iron – storage, transport - Transferrin and Ferretin; Iron-porphyrins – myoglobin, haemoglobin – oxygen transport - Bohr effect; Sodium/potassium pump, calcium pump; transport and storage - copper and zinc.</td></tr>
</table>

	UNIT III **Metallo enzymes** Isomerase and synthetases, structure of cyanocobalamin (Vitamin B12), nature of Co-C bond; Metalloenzymes - functions of carboxy peptidase A, zinc metalloenzyme – mechanism and uses, Zn-Cu enzyme - structure and function, carbonic anhydrase, Vitamin B-12 as transferase and isomerase - Iron-sulphur proteins - 2Fe-2S – rubredoxin, 4Fe-2S – ferridoxin, Iron sulphur cluster enzymes. Invivo and Invitro nitrogen fixation – biological functions of nitrogenase and molybdo enzymes.
	UNIT IV **Silicates** Introduction – general properties of silicates, structure – types of silicates – ortho silicates(zircon), pyrosilicates (thortveitite), chain silicates(pyroxenes), ring silicates(beryl), sheet silicates(talc, mica, asbestos), silicates having three dimensional structure (feldspars, zeolites, ultramarines)
	UNIT V **Industrial Applications of Inorganic Compounds** Refractories, pyrochemical, explosives. Alloys, Paints and pigments - requirements of a good paint; classification, constituents of paints – pigments, vehicles, thinners, driers, extenders, anti-knocking agents, anti-skinning agents, plasticizers, binders-application; varnishes- oils, spirit; enamels. Nanocomposite Hydrogels: synthesis, characterization and uses. Industrial visits and internship mandatory.
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 competitiveexaminations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Puri B R, Sharma L R, Kalia K C (2011), Principles of InorganicChemistry, 31th ed., Milestone Publishers & Distributors, Delhi.

	2. Satya Prakash, Tuli G. D., Basu S. K., Madan R. D. (2009), Advancd Inorganic Chemistry, 18th Edition, S. Chand & Co., New Delhi 3. Lee J D, (1991), Concise Inorganic Chemistry, 4th ed., ELBS William Heinemann, London. 4. W V Malik, G D Tuli, R D Madan, (2000), Selected Topics inInorganic Chemistry, Schand and Company Ltd. 5. A. K. De, Text book of Inorganic Chemistry, Wiley East Ltd, seventhedition, 1992
Reference Books	1. Madan R D, Sathya Prakash, (2003), Modern Inorganic Chemistry,2nded., S.Chand and Company, New Delhi. 2. Gopalan R, (2009) Inorganic Chemistry for Undergraduates, IstEdition, University Press (India) Private Limited, Hyderabad 3. Sivasankar B, (2013) Inorganic Chemistry. Ist Edition, Pearson,Chennai 4. Alan G. Sharp (1992), Inorganic Chemistry, 3rd Edition, Addition-Wesley, England 5. Peter Atkins, Tina Overton, Jonathan Rourke and Mark Weller, Inorganic Chemistry, Oxford University Press, sixth edition, 2014.
Website and e-learning source	1. www.epgpathshala.nic.in 2. www.nptel.ac.in 3. http:/swayam.gov.in

Course Learning Outcomes (for Mapping with POs and PSOs)On completion of the course the students should be able to

CO1: ability to explain the importance of tracer elements on biological system.

CO2: explain the metal ion transport, Bohr effect, Na, K, Ca pump.

CO3: explain the function of Vitamin B12, Zn-Cu enzyme, ferredoxin, cluster enzymes.

CO4: classification and structure of silicates.

CO5: explain the manufacture of refractories, explosives, paints and pigments

	PO1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO9	PO1 0
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

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

Level of Correlation between PSO's and CO's

AUDIT COURSE
INDIAN KNOWLEDGE SYSTEM

Course Code	Course Title	L	T	P	C
231ACSIKWS	Indian Knowledge System	-	-	-	2

Course Objectives:

The course design seeks to address the following issues:

- To introduce to the students the overall organization of IKS
- To develop an appreciation among the students the role and importance of Veda, Vedāṅgas, Upa Vedas and Purāṇas
- To show case the multi-dimensional nature of IKS and their importance in the contemporary society
- To motivate the students to take up a detailed study of some of these topics and explore their application potential

Course Outcomes:

CO1: Explain the historicity of Indian Knowledge System and the broad classification of Indian philosophical systems

CO2: Explain the potential of Sanskrit in natural language processing

CO3: Explain the features of Indian numeral system and its role in science & technology advancement

CO4: Illustrate the basic elements of the Indian calendar and the components of Indian Panchanga

CO5: Outline the science, engineering & technology heritage of ancient and medieval India

Syllabus

Unit I: Introduction to Indian Knowledge System (IKS), Definition, Concept and Scope of IKS (4).

Definition, Concept and Scope of IKS. IKS based approaches on Knowledge Paradigms. IKS in ancient India and in modern India

Unit II: IKS and Indian Scholars, Indian Literature (8)

Philosophy and Literature (Maharishi Vyas, Manu, Kanad, Pingala, Parasar, Banabhatta, Nagarjuna and Panini). Mathematics and Astronomy (Aryabhatta, Mahaviracharya, Bodhayan, Bhashkaracharya, Varahamihira and Brahmgupta). Medicineand Yoga (Charak, Susruta, Maharishi Patanjali and Dhanwantri). Sahitya (Vedas, Upvedas, Upavedas (Ayurveda,

Dhanurveda, Gandharvaveda). Puran and Upnishad and shaddarshan (Vedanta, Nyaya. Vaisheshik, Sankhya, Mimamsa, Yoga, Adhyatma and Meditation). Shastra (Nyaya, vyakarana, Krishi, Shilp, Vastu, Natya and Sangeet).

Unit III: Indian Traditional/tribal/ethnic communities, their livelihood and local wisdom (6).

Geophysical aspects, Resources and Vulnerability. Resource availability, utilization pattern and limitations. Socio-Cultural linkages with Traditional Knowledge System. Tangible and intangible cultural heritage.

Unit IV: Unique Traditional Practices and Applied Traditional Knowledge (8)

Myths, Rituals, Spirituals, Taboos and Belief System, Folk Stories, Songs, Proverbs, Dance, Play, Acts and Traditional Narratives. Agriculture, animal husbandry, Forest, Sacred Groves, Water Mills, Sacred Water Bodies, Land, water and Soil Conservation and management Practices. Indigenous Bio-resource Conservation, Utilization Practices and Food Preservation Methods, Handicrafts, Wood Processing and Carving, - Fiber Extraction and Costumes. Vaidya (traditional health care system), Tantra-Mantra, Amchi Medicine System. Knowledge of dyeing, chemistry of dyes, pigments and chemicals

Unit V: Protection, preservation, conservation and Management of Indian Knowledge System (4)

Documentation and Preservation of IKS. Approaches for conservation and Management of nature and bio-resources. Approaches and strategies to protection and conservation of IKS.

PONNAIYAH RAMAJAYAM INSTITUTE OF SCIENCE & TECHNOLOGY (PRIST)

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U/s 3 of UGC Act, 1956

SCHOOL OF ARTS OF SCIENCE

DEPARTMENT OF CHEMISTRY

M.Sc CHEMISTRY CURRICULUM

REGULATION 2023

SCHOOL OF ARTS AND SCIENCE

DEPARTMENT OF CHEMISTRY

M.Sc CHEMISTRY – REGULATION 2023

COURSE STRUCTURE

M.Sc. Graduate Attributes

- Domain knowledge
- Investigative
- Critical thinking
- Resourceful and Responsible
- Effective Communication
- Ethical and Moral values

M.Sc. Programme Educational Objective – PEO

- PEO1-To demonstrate broad knowledge of descriptive Chemistry.
- PEO2-To impart the basic analytical and technical skills to work effectively in the various fields of chemistry.
- PE03- To motivate critical thinking and analysis skills to solve complex chemical problems, e.g., analysis of data, synthetic logic, spectroscopy, structure and modeling, team-based problem solving, etc.
- PEO4-To demonstrate an ability to conduct experiments in the above sub-disciplines with mastery of appropriate techniques and proficiency using core chemical instrumentation and modeling methods.
- PEO5-To demonstrate the ability to perform accurate quantitative measurements with an understanding of the theory and use of contemporary chemical

instrumentation, interpret experimental results, perform calculations on these results and draw reasonable, accurate conclusions.

- PEO6-To develop skills in quantitative modeling of static and dynamic chemical systems.
- PEO7-To develop laboratory competence in relating chemical structure to spectroscopic phenomena.
- PEO8-To demonstrate the ability to synthesize, separate and characterize compounds using published reactions, protocols, standard laboratory equipment, and modern instrumentation.

M.Sc Pragramme Outcome –PO

- PO1-Think critically and analyze chemical problems.
- PO2-Present scientific and technical information resulting from laboratory experimentation in

  both written and oral formats.
- PO3-Work effectively and safely in a laboratory environment.
- PO4-Use technologies/instrumentation to gather and analyze data.
- PO5-Work in teams as well as independently.
- PO6-Apply modern methods of analysis to chemical systems in a laboratory setting.

M.Sc Course -C

- C1- Organic Reaction Mechanism-I
- C2- Structure and Bonding in Inorganic Compounds
- C3- Chemistry in everyday life
- C4- Organic reaction mechanism-II

- C5- Physical Chemistry-I
- C6- Industrial Chemistry
- C7- Organic synthesis and Photochemistry
- C8- Coordination Chemistry-I
- C9- Coordination Chemistry-II
- C10- Physical Chemistry-II
- C11-Project Work

M.Sc Curriculum Mapping

Programme Educational Objectives Vs Programme Outcome

Programme Outcome-PO **Programme Educational Outcome - PEO**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
PE01	✓					
PE02						
PE03		✓				
PE04			✓			
PE05						
PE06					✓	
PE07				✓		
PE08						✓

M.Sc Curriculum Mapping

Programme Outcome *vs* Courses Outcome

Programme Outcome-PO **Courses Outcome-CO**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1			*	*		*
CO2		*		*	*	*
CO3	*	*			*	
CO4			*	*		*
CO5			*	*		*
CO6		*		*	*	*
CO7	*	*			*	
CO8		*	*		*	
CO9	*	*			*	*
CO10		*	*	*		*
CO11		*		*	*	

PONNAIYAH RAMAJAYAM INSTITUTE OF SCIENCE & TECHNOLOGY (PRIST)

Declared as DEEMED-TO-BE-UNIVERSITY
U/s 3 of UGC Act, 1956

M.SC.,

CHEMSITRY

SYLLABUS

FROM THE ACADMIC YEAR

2023-2024

PONNAIYAH RAMAJAYAM INSTITUTE OF SCIENCE & TECHNOLOGY (PRIST)

Declared as DEEMED-TO-BE-UNIVERSITY
U/s 3 of UGC Act, 1956

SCHOOL OF ARTS AND SCIENCE

M. Sc CHEMISTRY-SYLLABUS – REGULATION 2023

COURSE STRUCTURE

Course Code	Course Title	L	T	P	C
	SEMESTER I				
23214AEC11	Organic Reaction Mechanism-I	5	1		4
23214AEC12	Structure and Bonding in Inorganic Compounds	5	1		4
23214SEC13L	Organic Chemistry lab	0	1	4	5
23214DSC14-	**Discipline specific Elective Courses-I**	4	1	0	4
23214DSC15-	**Discipline specific Elective Courses-II**	4	1	0	3
23214RMC16	Research methodology	2	1	0	2
	Total	20	6	4	**21**
SEMESTER II					
23214AEC21	Organic reaction mechanism-II	4	1	0	4
23214AEC22	Physical Chemistry-II	4	1	0	4

23214SEC23L	Inorganic Chemistry lab	0	0	5	5
23214DSC24-	**Discipline specific Elective Courses-III**	4	1	0	4
23214DSC25-	**Discipline specific Elective Courses-IV**	4	1	0	4
23214AECC26	Participation in bounded research (AECC 2) SoftSkill-2	2	0	0	2
23214GECC27	Industrial Chemistry /	2	0	0	3
23215SEC28	Internship-	-	-	-	2
	Total	**22**	**3**	**4**	**26**
SEMESTER III					
23214AEC31	Organic synthesis and Photochemistry	5	1	0	4
23214AEC32	Coordination Chemistry-I	5	1	0	4
23214SEC33L	Physical Chemistry Practical	0	0	5	5
23214SEC34L	Analytical Instrumentation technique lab	0	0	5	5
23214DSC35	**Discipline specific Elective Courses-V**	3	0	0	2
23214GEC36B	Analytical chemistry	3	0	0	2
23215SEC37	Industrial Visit – fertilizer composition analysis	2	0	0	2
	Total	18	2	10	**24**
SEMESTER IV					
23214AEC41	Coordination Chemistry-II	4	0	0	3
23214AEC42	Physical Chemistry-II	4	0	0	3
23214SEC43L	Analytical Instrumentation lab	0	0	5	4
23214DSC44-	**Discipline specific Elective Courses-VI**	3	0	0	3

23214PRW45	Project with viva voce	0	0	0	3
23214SEC46	Industrial Visit – Pharmaceutical drug analysis	0	0	0	4
	Total	11	0	5	**20**
	Total Credits for the Programme				**91**

Discipline specific Electives

Semester	**Discipline specific Elective Courses-I**
I	**23214DSC14 A** Pharmaceutical Chemistry/ **23214DSC14 B** Nanomaterials and Nanotechnology
	Discipline specific Elective Courses-II
	23214DSC15 A Electrochemistry/ **23214DSC15 B** Molecular Spectroscopy
II	**Discipline specific Elective Courses-III**
	23214DSC24 A Medicinal chemistry **23214DSC24 B Green chemistry**
	223214DSC25 A Bio inorganic chemistry **23214DSC25 B Material science** **3215SECC28- Internship**
III	**23214DSC35-A** Pharmacognosy and Phytochemistry **23214DSC35-B** Biomolecules and Heterocyclic Compounds
	Discipline specific Elective Courses-IV
IV	**23214DSC44-A** Chemistry of Natural products **23214DSC44-**B – Polymer Chemistry

CREDIT DISTRIBUTION

SEMESTER	SEC	GEC	DSE	RESEARCH	OTHERS	TOTAL
I	19		04	01		**24**
II	19		04	05		**28**
III	19	03		02		**24**
IV			04	9	02	**15**
TOTAL	**57**	**03**	**12**	**17**		**91**

SCHOOL OF ARTS AND SCIENCE

M. Sc CHEMISTRY-SYLLABUS – REGULATION 2023

COURSE STRUCTURE

Course Code	Course Title	L	T	P	C
23214AEC11	**Organic Reaction Mechanism-I**	**5**	**1**	**0**	**4**
Course Outline	**UNIT-I:Methods of Determination of Reaction Mechanism:** 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. Kinetic methods - relation of rate and mechanism.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 Substitution: Aromaticity: Aromaticity in benzenoid, non-benzenoid, heterocyclic compounds and annulenes. Aromatic electrophilic substitution: Orientation and reactivity of di- and polysubstituted phenol, nitrobenzene and halobenzene. Reactions involving nitrogen electrophiles: nitration, nitrosation and diazonium coupling; Sulphur electrophiles: sulphonation; Halogen electrophiles: chlorination and bromination; Carbon electrophiles: Friedel-Crafts alkylation, acylation and arylation reactions.Aliphatic electrophilic substitution Mechanisms: SE2 and SEi, SE1- Mechanism and evidences.				
	UNIT-III:Aromatic and Aliphatic Nucleophilic Substitution:Aromatic nucleophilic substitution: Mechanisms - S_NAr, S_N1 and Benzyne mechanisms - Evidences - Reactivity, Effect of structure, leaving group and attackingnucleophile. 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: 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 theconfiguration. 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 re phase Cahn-Ingold-Prelog rules, absolute and relative configurations. Configurations of allenes, spiranes, biphenyls, cyclooctene, helicene, binaphthyls, ansa and cyclophanic compounds, exo-cyclic alkylidene-cycloalkanes. Topicityand prostereoisomerism, chiral shift reagents and chiral solvating reagents.Criteria for optical purity: Resolution of racemic modifications, asymmetric transformations, asymmetric synthesis, destruction. Stereoselective and stereospecific synthesis.	
	UNIT-V:Stereochemistry-II: 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, poly cyclic 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.	
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. March and M. Smith, Advanced Organic Chemistry, 5th 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, 8th edition, New Age International Publishers, 2015. 4. P. Y. Bruice, Organic Chemistry, 7th edn, Prentice Hall, 2013. 5. J.Clayden, N. Greeves, S. Warren, Organic Compounds, 2nd edition, Oxford University Press, 2014.	
Reference Books	1. F.A. Carey and R.J. Sundberg, Advanced Organic Chemistry Part-A and B, 5th edition, Kluwer Academic / Plenum Publishers, 2007. 2. D. G. Morris, Stereochemistry, RSC Tutorial Chemistry Text 1, 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, 6th edition, Pearson Education Asia, 2004.	
Website and e-learning source	1.https://sites.google.com/site/chemistryebookscollection02/home/organic-chemistry/organic 2. https://www.organic-chemistry.org/	

Course Code	Course Title	L	T	P	C

23214AEC11	**STRUCTURE AND BONDING IN INORGANIC COMPOUNDS**	**5**	**1**	**0**	**4**
Course Outline	**UNIT-I:Structure of main group compounds and clusters:** VB theory – Effect of lone pair and electronegativity of atoms (Bent's rule) on the geometry of the molecules; Structure of silicates - applications of Paulings rule of electrovalence - 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; main group clusters –zintlions and mono rule.				
	UNIT-II: Solid state chemistry – I: Ionic crystals: Packing of ions in simple, hexagonal and cubic close packing, voids in crystal lattice, Radius ratio, Crystal systems and Bravis lattices, Symmetry operations in crystals, glide planes and screw axis; point group and space group;Solid state energetics: Lattice energy – Born-Lande equation - Kapustinski equation, Madelung constant.				
	UNIT-III:Solid state chemistry – II: Structural features of the crystal systems: Rock salt, zinc blende & wurtzite, fluorite and anti-fluorite, rutile and anatase, cadmium iodide and nickel arsenide; Spinels -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: 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:Band theory and defects in solids Band theory – features and its application of conductors, insulators and semiconductors, Intrinsic and extrinsic semiconductors; Defects in crystals – point defects (Schottky, Frenkel, metal excess and metal deficient) and their effect on the electrical and optical property, laser and phosphors; Linear defects and its effects due to dislocations.	
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. 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, 4th Edition, CRC Press, 2012. 4. K. F. Purcell and J. C. Kotz, Inorganic Chemistry; W.B. Saunders company: Philadelphia, 1977. 5. J. E. Huheey, E. A. Keiter and R. L. Keiter, Inorganic Chemistry; 4th ed.; Harper and Row: NewYork, 1983.	
Reference Books	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, 2nd edition, Wiley Publication, 2013. 3. C N R Rao and J Gopalakrishnan, New Directions in Solid State Chemistry, 2nd 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.	

Website and e-learning source	https://ocw.mit.edu/courses/3-091-introduction-to-solid-state-chemistry-fall-2018/video_galleries/lecture-videos/	

Course Code	Course Title	L	T	P	C
23214CC13L	Organic Chemistry Practical	**5**	**1**	**0**	**4**
Course Outline	**UNIT-I:Separation and analysis:** A. Two component mixtures. B. Three component mixtures.				
	UNIT-II:**Estimations:** 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 Ascorbic acid (iodimetry) f) Estimation of Aromatic nitro groups (reduction) g) Estimation of Glycine (acidimetry) h) Estimation of Formalin (iodimetry) i) Estimation of Acetyl group in ester (alkalimetry) j) Estimation of Hydroxyl group (acetylation) Estimation of Amino group (acetylation)				
	UNIT-III:Two stage preparations: a) *p*-Bromoacetanilide from aniline b) *p*-Nitroaniline from acetanilide c) 1,3,5-Tribromobenzene from aniline d) Acetyl salicyclic acid from methyl salicylate e) Benzilic acid from benzoin f) *m*-Nitroaniline from nitrobenzene **g) *m*-Nitrobenzoic acid from methyl benzoate**				

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. 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, 4th Edition, CRC Press, 2012.	
Reference Books	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, 2nd edition, Wiley Publication, 2013. 3. C N R Rao and J Gopalakrishnan, New Directions in Solid State Chemistry, 2nd Edition, Cambridge University Press, 199.	
Website and e-learning source	https://ocw.mit.edu/courses/3-091-introduction-to-solid-state-chemistry-fall-2018/video_galleries/lecture-videos/	

Course Code	Course Title	L	T	P	C
23214DSC14A	**Elective I(Generic /Discipline Specific)(One from Group A) Pharmaceutical Chemistry / Nanomaterials and Nanotechnology**	**0**	**0**	**4**	**4**
	PHARMACEUTICAL CHEMISTRY				

Course Outline	**UNIT-I: Physical properties in Pharmaceuticals:** 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.Rheology of pharmaceutical systems: Introduction, Definition, Applications, concept of viscosity, Newton's law offlow, Kinematic, Relative, Specific, Reduced & Intrinsic viscosity. Newtonian system, non-Newtonian system- Plastic flow, Pseudoplastic flow, Dilatent flow. Viscosity measurements- selection of viscometer for Newtonian and non-Newtonian system.	
	UNIT-II:Isotopic Dilution analysis: principle andapplications, 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: Introduction to drug dosage Forms & Drug Delivery system – Definition of Commonterms. Drug Regulation and control,pharmacopoeias formularies, sources of drug, drug nomenclature, 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 – Definition of Common terms. Drug Regulation and control,pharmacopoeias formularies, sources of drug, drug nomenclature, routes of administration of drugs products, need for a dosage form, classification of dosage forms.	
	UNIT-IV:Development of new drugs: Introduction,procedure followed in drug design, theresearch for lead compounds, molecular modification of lead compounds. Structure-Activity Relationship (SAR): Factorseffecting bioactivity, resonance, inductive effect,isoterism, bioisosterism, spatial considerations,biological properties of simple functional groups,theories of drug activity, occupancy theory, ratetheory, induced-fit theory,4.3Quantitative structure activity relationship(QSAR): Development of QSAR, drug receptor interactions, the additivity of group contributions, physico-chemical parameters, lipophilicity parameters, electronic parameter, ionizationconstants, steric parameters, chelation parameters, redox potential, indicator-variables.	

	UNIT-V:Computers in Pharmaceutical Chemistry: Need of computers for chemistry. Computers for Analytical Chemists-Introduction to computers: Organization of computers, CPU, Computer memory, I/Odevices, 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 andintegrations.	
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. 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, Sultanchand & Sons.	
Reference Books	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.	

Website and e-learning source	https://www.ncbi.nlm.nih.gov/books/NBK482447/ https://training.seer.cancer.gov/treatment/chemotherapy/types.html	

Course Code	Course Title	L	T	P	C
23214DSC14B	**NANO MATERIALS AND NANO TECHNOLOGY**	**0**	**0**	**4**	**4**
Course Outline	**UNIT-I:**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: Bonding and structure of the nanomaterials, Predicting the Type of Bonding in a Substance crystal structure.Metallic nanoparticles, Surfaces of Materials, Nanoparticle Size and Properties.Synthesis- Physical and chemical methods - inert gas condensation, arc discharge, laser ablation, sol-gel, solvothermal and hydrothermal-CVD-types, metallo organic, plasma enhanced, and low-pressure CVD. Microwave assisted and electrochemical synthesis.				
	UNIT-III: Mechanical properties of materials, theories relevant to mechanical properties.Techniques to study mechanical properties of nanomaterials, adhesion and friction, thermal properties of nanomaterialsNanoparticles: gold and silver, metal oxides: silica, iron oxide andalumina - synthesisandproperties.				
	UNIT-IV: 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: Nano thin films, nanocomposites. Application of nanoparticles in different fields. Core-shellnanoparticles-types,synthesis,andproperties.Nanocomposites-metal-,ceramic-andpolymer-matrixcomposites-applications. Characterization–SEM, TEM and AFM-principle,instrumentationand 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.	
Recommended Text	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.	
Reference 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.	
Website and e-learning source	1. http://xrayweb.chem.ou.edu/notes/symmetry.html. 2. http://www.uptti.ac.in/classroom-content/data/unit%20cell.pdf.	

Course Code	Course Title	L	T	P	C
23214DSC15A	**Elective II (Generic / Discipline Specific) (One from Group B) Electrochemistry/Molecular Spectroscopy**	**5**	**1**	**0**	**3**
	Electrochemistry				
Course Outline	**UNIT-I:Ionics**: Arrhenius theory -limitations, van't Hoff factor and its relation to colligative properties. Deviation from ideal behavior. Ionic activity, mean ionic activity and mean ionic activity coefficient-concept of ionic strength, Debye Huckel theory of strong electrolytes,activity coefficient of strong electrolytes Determination of activity coefficient ion solvent and ion-ion interactions. Born equation.Debye-Huckel Bjerrum model. Derivation of Debye-Huckel limiting law at appreciable concentration of electrolytes modifications and applications.Electrolytic conduction-Debye-Huckel Onsager treatment of strong electrolyte-qualitative and quantitative verification and limitations. Evidence for ionic atmosphere. Ion association and triple ion formations.				
	UNIT-II:Electrode-electrolyte interface: Interfacial phenomena -Evidences for electrical double layer, polarizable and non-polarizable interfaces, Electrocapillary phenomena - Lippmann equation electro capillary curves. Electro-kinetic phenomena electro-osmosis, electrophoresis, streaming and sedimentation potentials, colloidal and poly electrolytes. Structure of double layer: Helmholtz -Perrin, Guoy- Chapman and Stern models of electrical double layer. Zeta potential and potential at zero charge. Applications and limitations.				
	UNIT-III:Electrodics of Elementary Electrode Reactions: 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: Rates of simple elementary reactions. Butler-Volmer equation-significance of exchange current density, net current density and symmetry factor. Low and high field approximations. symmetry factor and transfer coefficient Tafel equations and Tafel plots.				

	UNIT-IV:Electrodics of Multistep Multi Electron System: Rates of multi-step electrode reactions, Butler - Volmer equation for a multi-step reaction. Rate determining step, electrode polarization and depolarization. Transfer coefficients, its significance and determination,Stoichiometric number. Electro-chemical reaction mechanisms-rate expressions, order, and surface coverage. Reduction of I^{3-}, Fe^{2+}, and dissolution of Fe to Fe^{2+}. Overvoltage - Chemical and electro chemical, Phase, activation and concentration over potentials. Evolution of oxygen and hydrogen at different pH. Pourbiax and Evan's diagrams.	
	UNIT-V:Concentration Polarization, Batteries and Fuel cells: Modes of Transport of electro active species - Diffusion, migration and hydrodynamic modes. Role of supporting electrolytes. 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. Mechanism of charge storage: conversion and alloying. Capacitors- mechanism of energy storage, charging at constant current and constant voltage.Energy production systems: 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.	

Recommended Text	1. D. R. Crow, Principles and applications of electrochemistry, 4thedition, 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, 2nd edition, Wiley, 2004.	
Reference Books	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, 2nd 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.	
Website and e-learning source	1. https://www.pdfdrive.com/modern-electrochemistry-e34333229.	

Course Code	Course Title	L	T	P	C
23214DSC15B	**Molecular Spectroscopy**	**5**	**1**	**0**	**3**

Course Outline	**UNIT-I:Rotational and Raman Spectroscopy:** 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: 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: 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, Xray photoelectron spectroscopy (XPS).Lasers: Laser action, population inversion, properties of laser radiation, examples of simple laser systems.	
	UNIT-IV:NMR and ESR spectroscopy: Chemical shift, Factors influencing chemical shifts: electronegativity and electrostatic effects; Mechanism of shielding and deshielding. Spin systems: First order and second order coupling of AB systems, Simplification of complex spectra. Spin-spin interactions: Homonuclear coupling interactions - AX, AX2, AB types. Vicinal, germinal and long-range coupling-spin decoupling. Nuclear Overhauser effect (NOE), Factors influencing coupling constants and Relative intensities. 13CNMRand structural correlations, Satellites. Brief introduction to 2D NMR – COSY, NOESY. Introduction to 31P, 19F NMR.ESR spectroscopy Characteristic features of ESR spectra, line shapes and line widths; ESR spectrometer. The g value and the hyperfine coupling parameter (A), origin of hyperfine interaction. Interpretation of ESR spectra and structure elucidation of organic radicals using ESR spectroscopy; Spin orbit coupling and significance of g-tensors, zero/non-zero field splitting, Kramer's degeneracy, application to transition metal complexes (having one to five unpaired electrons) including biological molecules and inorganic free radicals. ESR spectra of magnetically dilute samples.	

	UNIT-V:Mass Spectrometry, EPR and Mossbauer Spectroscopy: Ionization techniques- Electron ionization (EI), chemical ionization (CI), desorption ionization (FAB/MALDI), electrospray ionization (ESI), isotope abundance, molecular ion, fragmentation processes of organic molecules, deduction of structure through mass spectral fragmentation, high resolution. 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.	
Recommended Text	1. C. N. Banwell and E. M. McCash, *Fundamentals of Molecular Spectroscopy*, 4th Ed., Tata McGraw Hill, New Delhi, 2000. 2. R. M. Silverstein and F. X. Webster, *Spectroscopic Identification of Organic Compounds*, 6th Ed., John Wiley & Sons, New York, 2003. 3. W. Kemp, *Applications of Spectroscopy*, English Language Book Society, 1987. 4. D. H. Williams and I. Fleming, *Spectroscopic Methods in Organic Chemistry,* 4th Ed., Tata McGraw-Hill Publishing Company, New Delhi, 1988. 5. R. S. Drago, *Physical Methods in Chemistry*; Saunders: Philadelphia, 1992.	

Reference Books	1. P.W. Atkins and J. de Paula, *Physical Chemistry*, 7th Ed., Oxford University Press, Oxford, 2002. 2. I. N. Levine, *Molecular Spectroscopy*, John Wiley & Sons, New York, 1974. 3. A. Rahman, *Nuclear Magnetic Resonance-Basic Principles*, Springer-Verlag, New York,1986. 4. K. Nakamoto, *Infrared and Raman Spectra of Inorganic and coordination Compounds*, PartB: 5th ed., John Wiley& Sons Inc., New York, 1997. 5. J. A. Weil, J. R. Bolton and J. E. Wertz, *Electron Paramagnetic Resonance*; Wiley Interscience, 1994.	
Website and e-learning source	1. https://onlinecourses.nptel.ac.in/noc20_cy08/preview 2. https://www.digimat.in/nptel/courses/video/104106122/L14.html	

Course Code	Course Title	L	T	P	C
23214AEC21	**Organic Reaction Mechanism-II**	4	1	0	4
Course Outline	**UNIT-I: Elimination and Free Radical Reactions:** 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 and free radical, 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: 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-Oxalyl chloride (Swern oxidation) and Corey-Kim oxidation, dimethyl sulphoxide- dicyclohexyl carbodiimide (DMSO-DCCD). Mechanism of reduction reactions: Wolff-Kishner, Clemmenson, Rosenmund, reduction with Trialkyl and triphenyltin hydrides, McFadyen-Steven's reduction, Homogeneous hydrogenation, Hydroboration with cyclic systems, MPV and Bouveault-Blanc reduction.				

	UNIT-III:Rearrangements: 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.	
	UNIT-IV: Addition to Carbon Multiple Bonds: 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, Prinsreaction. 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 ofesters.	
	UNIT-V:Reagents and Modern Synthetic Reactions: Lithium diisopropylamine (LDA), Azobisisobutyronitrile (AIBN), Sodium cyanoborohydride ($NaBH_3CN$), *meta*-Chloroperbenzoic acid (m-CPBA), Dimethyl aminiopyridine (DMAP), n-Bu_3SnD, Triethylamine (TEA), Diazobicyclo[5.4.0]undec-7-ene (DBU), Diisopropylazodicarboxylate (DIAD), Diethylazodicarboxylate (DEAD), *N*-bromosuccinimide (NBS), Trifluoroacetic acid (TFA), Tetramethyl piperiridin-1-oxyl (TEMPO), Phenyltrimethylammonium tribromide (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.	
Recommended Text	1. J. March and M. Smith, *Advanced Organic Chemistry*, 5th ed., 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*, 8thedn, New Age International Publishers,2015. 4. P. Y.Bruice, *Organic Chemistry*, 7thedn.,Prentice Hall, 2013. 5. R. T. Morrison, R. N. Boyd, S. K. Bhattacharjee*Organic Chemistry*, 7th edn., Pearson Education,2010.	
Reference Books	1. S. H. Pine, *Organic Chemistry*, 5thedn, McGraw Hill International Editionn,1987. 2. L. F. Fieser and M. Fieser, *Organic Chemistry*, Asia Publishing House, Bombay,2000. 3. E.S. Gould, *Mechanism and Structure in Organic Chemistry,* Holt, Rinehart and Winston Inc.,1959. 4. T. L. Gilchrist, *Heterocyclic Chemistry*, Longman Press, 1989. 5. J. A. Joule and K. Mills, *Heterocyclic Chemistry*, 4thed., John-Wiley,2010.	
Website and e-learning source	1.https://sites.google.com/site/chemistryebookscollection02/home/organic-chemistry/organic 2. https://www.organic-chemistry.org/	

Course Code	Course Title	L	T	P	C
23214AEC22	**Physical Chemistry-I**	4	1	0	4

Course Outline	**UNIT-I:Classical Thermodynamics:** Partial molar properties-Chemical potential, Gibb's-Duhem equation-binary and ternary systems. Determination of partial molar quantities. Thermodynamics of real gases - Fugacity-determination of fugacity bygraphical 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 andfreezing point methods.	
	UNIT-II:Statistical thermodynamics: Introduction of statistical thermodynamicsconcepts of thermodynamic and mathematicalprobabilities-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 functions-calculation of equilibrium constants. Statistical approach to Thermodynamic properties: pressure, internal energy, entropy, enthalpy, Gibb's function, Helmholtz function residual entropy, equilibrium constants and equipartition principle.Heat capacity of mono and di atomic gases-ortho and para hydrogen. Heat capacity of solids-Einstein and Debye models.	
	UNIT-III:Irreversible Thermodynamics: Theories of conservation of mass and energyentropy 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: Theories of reactions-effect of temperature on reaction rates, collision theory of reaction rates, Unimolecular reactions -Lindeman and Christiansen hypothesis- molecular beams,collision cross sections, effectiveness of collisions,Potential energy surfaces. Transition state theory-evaluation of thermodynamicparameters of activation-applications of ARRT to reactions between atoms and molecules, time andtrue 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: Kinetics of complex reactions, reversiblereactions, 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 Herzfeldmechanism.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.Kinetics of polymerization-free radical, cationic,anionic polymerization - Polycondensation.	
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. 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.BenjaminPublishers, 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.	
Reference Books	1. D.A. Mcqurrie 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.	
Website and e-learning source	1. https://nptel.ac.in/courses/104/103/104103112/ 2. https://bit.ly/3tL3GdN	

Course Code	Course Title	L	T	P	C

23214GEC23L	**Inorganic Chemistry Practical**	**5**	**1**	**0**	**4**
Course Outline	**UNIT-I: Analysis of mixture of cations:** 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: Preparation of inorganic complexes: a. Preparation of tristhioureacopper(I)sulphate b. Preparation of potassium trioxalate chromate(III) c. Preparation of tetramminecopper(II) sulphate d. Preparation of Reineck's salt e. Preparation of hexathioureacopper(I) chloridedihydrate f. Preparation of *cis*-Potassium tri oxalate diaquachromate(III) g. Preparation of sodium trioxalatoferrate(III) h. Preparation of hexathiourealead(II) nitrate				

	UNIT-III: Complexometric Titration: 1. Estimation of zinc, nickel, magnesium, and calcium. 2. Estimation of mixture of metal ions-pH control, masking and demasking agents. 3. Determination of calcium and lead in a mixture (pH control). 4. Determination of manganese in the presence of iron. 5. 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.	
Recommended Text	1. A. JeyaRajendran, Microanalytical Techniques in Chemistry: Inorganic Qualitative Analysis, United global publishers, 2021. 2. V. V. Ramanujam, *Inorganic Semimicro Qualitative Analysis*; 3rded.,The National Publishing Company, Chennai, 1974. 3. *Vogel's Text book of Inorganic Qualitative Analysis,* 4thed., ELBS, London.	
Reference Books	Pass, and H. Sutcliffe, *Practical Inorganic Chemistry*; Chapman Hall, G. Palmer, Experimental *Inorganic Chemistry*; Cambridge sity Press, 1954.	

Course Code	Course Title
23214SEC24L	Elective III (Generic /Discipline Specific) (One from Group C) Medicinal Chemistry/Green Chemistry
e	**UNIT-I:Introduction to receptors:** 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: Introduction, Targets of antibiotics action, classification of antibiotics, enzyme-based mechanism of action, SAR of penicllins and tetracyclins, clinical application of penicillins, cephalosporin.Current trends in antibiotic therapy.
	UNIT-III:Antihypertensive agents and diuretics: Classification of cardiovascular agents, introduction to hypertension, etiology, types, classification of antihypertensive agents, classification and mechanism of action of diuretics, Furosemide, Hydrochlorothiazide, Amiloride.
	UNIT-IV:Antihypertensive agents and diuretics: Classification of cardiovascular agents, introduction to hypertension, etiology, types, classification of antihypertensive agents, classification and mechanism of action of diuretics, Furosemide, Hydrochlorothiazide, Amiloride.
	UNIT-V: Analgesics, Antipyretics and Anti-inflammatory Drugs: Introduction, Mechanism of inflammation, classification and mechanism of action and paracetamol, Ibuprofen, Diclofenac, naproxen, indomethacin, phenylbutazone and meperidine. 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.
ssional Component (is a component only, Not to he external examination	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)
from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
l Text	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. JayashreeGhosh,AtextbookofPharmaceuticalChemistry,S.ChandandCo.Ltd,1999,1999 edn. 4. O.LeRoy,Natural andsyntheticorganicmedicinal compounds,Ealemi,1976. 5.S.AshutoshKar,MedicinalChemistry, WileyEasternLimited, NewDelhi,1993,New edn.
ks	1. Foye's Princles 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. WilsonandGisvold'sTextbookofOrganicMedicinalandPharmaceuticalChemistry,John M.BealeJrandJohnM. Block, Wolters Kluwer, 2011,12thedn. 4. P.Parimoo,ATextbookofMedicalChemistry,NewDelhi:CBSPublishers.1995. 5. S.Ramakrishnan, K.G.PrasannanandR.Rajan,TextbookofMedicalBiochemistry,Hyderabad: OrientLongman.3rd edition,2001.
rce	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

Course Code	Course Title	L	T	P	C
	GREEN CHEMISTRY	0	0	4	4
Course Outline	**UNIT-I:** Introduction- Need for Green Chemistry. Goals of Green Chemistry. Limitations/ of Green Chemistry. Chemical accidents, terminologies, Internationall green chemistry organizations and Twelve principles of Green Chemistry with examples.				
	UNIT-II: 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: 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: Phase transfer catalysis in green synthesis-oxidation using hydrogen peroxide, crown ethers-esterification, saponification, anhydride formation, Elimination reaction, Displacement reaction. Applications in organic synthesis.				
	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.				
Recommended Text	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, 7th 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.	
Reference Books	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.	
Website and e-learning source	2. https://www.organic-chemistry.org/ 3. https://www.studyorgo.com/summary.php	

Course Code	Course Title	L	T	P	C
23214DSE25_	Elective IV(Computer/IT related)(One from Group D)Bio Inorganic Chemistry/Material Science	4	1	0	3
	BIO-INORGANIC CHEMISTRY				

Course Outline	**UNIT-I:Essential trace elements:** Selective transport and storage of metal ions: Ferritin, Transferrin and sidorphores; Sodium and potassium transport, Calcium signalling proteins.Metalloenzymes: Zinc enzymes– carboxypeptidase and carbonic anhydrase. Ironenzymes–catalase, peroxidase. Copperenzymes – superoxide dismutase, Plastocyanin, Ceruloplasmin, Tyrosinase. Coenzymes - Vitamin-B12 coenzymes.	
	UNIT-II:Transport Proteins: Oxygen carriers-Hemoglobin and myoglobin - Structure and oxygenationBohr Effect. Binding of CO, NO, CN– to Myoglobin and Hemoglobin.Biological redox system: 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-Introduction, types of nitrogen fixing microorganisms. Nitrogenase enzyme - Metal clusters in nitrogenase- redox property - Dinitrogen complexestransition 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: 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.	
	UNIT-V:Enzymes -Introduction and properties - nomenclature and classification. 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.	
Recommended Text	1. Williams,D.R. –Introdution to Bioinorganic chemistry. 2. F.M. Fiabre and D.R. Williams– The Principles of Bioinorganic Chemistry,RoyolSoceity of Chemistry, Monograph for Teachers-31 3. K.F. Purcell and Kotz., Inorganic chemistry, WB Saunders Co., USA. 4. G.N. Mugherjea and Arabinda Das, Elements of Bioinorganic Chemistry - 1993. 5. R. Gopalan, V. Ramalingam, *Concise Coordination Chemistry*, S. Chand, **2001**.	
Reference Books	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.	
Website and e-learning source	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	

Course Code	Course Title	L	T	P	C
23214DSE25_	Elective IV(Computer/IT related)(One from Group D)Bio Inorganic Chemistry/Material Science	4	1	0	3
	Material Science				
Course Outline	**UNIT-I:Crystallography:**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 crystalapplications. Electron charge density maps, neutron diffraction-method and applications.				
	UNIT-II:Crystal growth methods: Nucleation–equilibrium stability and metastable state. Single crystal –Low and high temperature, solution growth– Gel and sol-gel. Crystal growthmethods-nucleation–equilibrium stabilityandmetastablestate.Singlecrystal–Lowandhightemperature, solution growth– Gel and sol-gel. Melt growth - Bridgeman-Stockbarger,Czochralskimethods.Fluxtechnique,physicalandchemical vapourtransport.Lorentz and polarization factor - primary and secondary extinctions.				
	UNIT-III:Properties of crystals: 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: 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 gian 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, Non-linear optics-Second Harmonic Generators, mixing of Laser wavelengths by quartz, ruby and $LiNbO_3$.				

	UNIT-V:Materials for Renewable Energy Conversion: 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, CO2 and N2. Manganese based photo systems for water-splitting. Complexes of Rh, Ru, Pd and Pt - photochemical generation of hydrogen from alcohol.	
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. 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.	

Reference Books	1.Suggested Readings 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.	
Website and e-learning source	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	

Course Code	**Course Title**	**L**	**T**	**P**	**C**
23214AEC31	**Organic Synthesis and Photochemistry**	5	1	0	4
Course Outline	UNIT-I:Planning an Organic Synthesis andControl elements: Preliminary Planning – knowns and unknowns of the synthetic systemstudied, analysis of the complex and interrelated carbon framework into simple rationalprecursors, retrosynthetic analysis, alternate synthetic routes, key intermediates that wouldbe formed, available starting materials and resulting yield of alternativemethods. Linear Vs convergent synthesis. synthesis based on umpolung concepts ofSeeback, regiospecific control elements. Use of protective groups, activating groups and bridgingelements. Examples on retrosynthetic approach, calculation of yield, advantages of connvergent synthesis, synthesis of stereochemistry-controlled products.				

	UNIT-II:Organic Synthetic Methodology: 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: Woodward 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. Ionic sigmatropic rearrangements. Group transfer reactions. Regioselectivity, stereoselectivity and periselectivity in pericyclic reactions.	
	UNIT-IV:Organic Photochemistry-I: 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-I: Photochemistry of α,β-unsaturated ketones; cis-trans isomerisation. Photon energy transfer reactions, Photo cycloadditions, Photochemistry of aromatic compounds; photochemical rearrangements; photo-stationery state; di-π-methane rearrangement; Reaction of conjugated cyclohexadienone to 3,4-diphenyl phenols; 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.	
Recommended Text	1. F. A. Carey and Sundberg, Advanced Organic Chemistry, 5thed, Tata McGraw-Hill, New York, 2003. 2. J. March and M. Smith, Advanced Organic Chemistry, 5th 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 3rd edn, McGraw Hill International Edition, 2011.	
Reference Books	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 4thedn, 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.	
Website and e-learning source	**1. https://rushim.ru/books/praktikum/Monson.pdf**	

Course Code	Course Title	L	T	P	C
23214AEC32	Coordination Chemistry – I	4	1	0	4
Course Outline	UNIT-I:**Modern theories of coordination compounds:** 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 antispinels - 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: Term states for d ions - characteristics of d-d transitions - charge transfer spectra - selection rules for electronic spectra - Orgel correlation diagrams - Sugano-Tanabe energy level diagrams - nephelauxetic series - Racha parameter and calculation of inter-electronic repulsion parameter.				
	UNIT-III:Stability and Magnetic property of the complexes: 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, Spectrophotometric method, Ion exchange method, Polorographic method and Continuous variation method (Job's 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: 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: 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.	
Recommended Text	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, 6thed.; Wiley Inter-science: New York, 1988.	

Reference Books	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, B. Douglas, D. McDaniel, J. Alexander, John Wiley, 1994, 3rd edn. 5. Inorganic Chemistry, D. F. Shriver, P. W. Atkins, W. H. Freeman and Co, London, 2010.	
Website and e-learning source	https://ocw.mit.edu/courses/5-04-principles-of-inorganic-chemistry-ii-fall-2008/pages/syllabus/	

Course Code	Course Title	L	T	P	C
23214SEC33L	**Physical Chemistry Practical**	4	1	0	4
Course Outline	**UNIT-I:Conductivity Experiments** 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).				

	UNIT-II:Kinetics 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.	
	UNIT-III: Phase diagram Construction of phase diagram for a simple binary system 1. Naphthalene-phenanthrene 2. Benzophenone- diphenyl amine **Adsorption** Adsorption of oxalic acid on charcoal & determination of surface area (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.	

Recommended Text	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 and Applications of Molecular and Quantum Mechanics, 2nd Ed., Springer, New York, 2011.	
Reference Books	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, 3rd Ed., Wiley-Blackwell.	
Website and e-learning source	https://web.iitd.ac.in/~nkurur/2015-16/Isem/cmp511/lab_handout_new.pdf	

Course Code	**Course Title**	**L**	**T**	**P**	**C**

23214SEC34L	Analytical Instrumentation technique Practicals	0	0	4	4
Course Outline	**UNIT-I:** 1. Determination of the equivalent conductance of a weak acid at different concentrations and verifying Ostwald dilution law. Calculation of the dissociation constant of the acid. 2. Determination of the equivalent conductance of a strong electrolyte at different concentrations and examining the validity of the Onsager's theory as limiting law at high dilutions. 3. Conductometric titration of a mixture of HCl and CH_3COOH Vs NaOH. 4. Conductometric titration of NH_4Cl Vs NaOH. 5. Conductometric titration of CH_3COONa Vs HCl. 6. Potentiometric titration of a mixture of HCl and CH_3COOH Vs NaOH 7. Determination of pK_a of weak acid by EMF method. 8. Potentiometric titration of FAS Vs $K_2Cr_2O_7$ 9. Potentiometric titration of KI Vs $KMnO_4$. 10. Potentiometric titration of a mixture of Chloride and Iodide Vs $AgNO_3$. 11. Determination of the pH of buffer solution by EMF method using Quinhydrone and Calomel electrode. Study of the inversion of cane sugar in the presence of acid by Polarimetric method.				

	UNIT-II: 1. Estimation of Fe, Cu and Ni by colorimetric method. 2. Estimation of Na and K by flame photometric method. 3. Determination of spectrophotometrically the mole ratio of the ferrithiocyanate complex and equilibrium constant for the complex formation. 4. Determination of the amount (mol/L) of ferricyanide present in the given solution using cyclic voltammetry. 5. Determination of the diffusion coefficient of ferricyanide using cyclic voltammetry. 6. Determination of the standard redox potential of ferri-ferrocyanide redox couple using cyclic voltammetry. 7. Estimation of the amount of sulphate present in the given solution using Nephelometric turbidimeter. 8. Estimation of the amount of nitrate present in the given solution using spectrophotometric method. 9. Heavy metal analysis in textiles and textile dyes by AAS 10. Determination of caffeine in soft drinks by HPLC 11. Analysis of water quality through COD, DO, BOD measurements. 12. Assay of Riboflavin and Iron in tablet formulations by spectrophotometry 13. Estimation of chromium in steel sample by spectrophotometry 14. Determination of Stern-Volmer constant of Iodine quenching by fluorimetry 15. Determination of ascorbic acid in real samples using Differential Pulse Voltammetry and comparing with specifications 16. Separation of (a) mixture of Azo dyes by TLC (b) mixture of metal ions by Paper chromatography 17. Estimation of chlorophyll in leaves and phosphate in waste water by colorimetry. 18. Estimation of Fe(II) by 1,10 phenonthroline using spectrophotometry	

	UNIT-III: Interpretation and identification of the given spectra of various organic compounds arrived at from the following instruments 1.UV-Visible 2.IR 3.Raman 4.NMR 5.ESR 6.Mass etc.,	
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.* 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, *Vogel's Textbook of Quantitative Chemical Analysis*; 6th ed., ELBS, 1989. 3. J. D. Woollins, *Inorganic Experiments*; VCH: Weinheim, 1995. 4. B. Viswanathan and P.S.Raghavan, Practical Physical Chemistry, Viva Books, New Delhi,2009. 5.Sundaram, Krishnan, Raghavan, Practical Chemistry (Part II), S. Viswanathan Co. Pvt., 1996.	

Reference Books	1. N. S. Gnanapragasam and G. Ramamurthy, Organic Chemistry – Labmanual, S. Viswanathan Co. Pvt. Ltd, 2009. 2. J. N. Gurtu and R. Kapoor, Advanced Experimental Chemistry, S. Chand and Co., 2011. 3. J. B. Yadav, Advanced Practical Physical Chemistry, Goel Publishing House, 2001. 4. G.W. Garland, J.W. Nibler, D.P. Shoemaker, Experiments in Physical Chemistry, 8th edition, McGraw Hill, 2009. 5. J. N. Gurthu and R. Kapoor, Advanced Experimental Chemistry, S. Chand and Co., 1987.	
Website and e-learning source	1. https://bit.ly/3QESF7t 2. https://bit.ly/3QANOnX	

Course Code	**Course Title**	**L**	**T**	**P**	**C**
23214DSC35A	Elective V(Generic /Discipline Specific) (One from Group E) Pharmacognosy and Phytochemistry	4	1	0	3
Course Outline	**UNIT-I:Pharmacognosy and Standardization of Herbal drugs:** Introduction, definition, development classification and Source of Drugs: Biological, mineral, marine,and plant tissue cultures. Study of pharmacognosticof 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: 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: 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 uses. Pentacyclic triterpenoids: amyrines; taraxasterol: Structure and pharmacological applications.	
	UNIT-IV:Drugs containing alkaloids: 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-structure, chemical properties and uses.	
	UNIT-V:Plant Glycosides and Marine drugs: Glycosides: Basic ring system, classification, isolation, properties, qualitative analysis. Pharmacological activity of Senna glycosides, Cardiacglycosides-Digoxin, digitoxin, Steroidal saponins glycosides-Diosgenin, hecogenin. Plant pigments: Occurrence and general methods of structure determination, isolation and synthesis of quercetin and cyanidin chloride.Marine drugs -Selected Drug Molecules: Cardiovascular active substances, Cytotoxic compounds, antimicrobial compounds, antibiotic compounds, Anti-inflammatory agents. Marine toxins.	
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. 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.	
Reference Books	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.	

Course Code	Course Title	L	T	P	C
23214AEC41	Coordination Chemistry – II	4	1	0	4

Course Outline	**UNIT-I: Chemistry of organometallic compounds:** 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: MO diagram of CO; Structure and bonding − bonding modes, MO approach of M-CO bonding, π-acceptor nature of carbonyl group, synergistic effect (stabilization of lower oxidation states of metals); Carbonyl clusters: Low nuclearity and high nuclearity carbonyl clusters – Structures based on polyhedral skeleton electron pair theory or Wade's rule.	
	UNIT-II: Reactions and catalysis of organometallic compounds: 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, Monsonto process.	
	UNIT-III: Inorganic spectroscopy -I: 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, 15N, 19F, 31P-NMR spectroscopy in structural identification of inorganic complexes, fluxional molecules, quadrupolar nuclei- effect in NMR spectroscopy.	

	UNIT-IV: Inorganic spectroscopy-II: 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 $[(NH_3)_5Co\text{-}O_2\text{-}Co(NH_3)_5]^{5+}$. 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: 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.	

Recommended Text	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, 6thed.; Wiley Inter-science: New York, 1988.	
Reference Books	1. Crabtree, Robert H. The Organometallic Chemistry of the Transition Metals. 3rd ed. New York, NY: John Wiley, 2000. 2. P Gütlich, E Bill, A X Trautwein, Mossbauer Spectroscopy and Transition Metal Chemistry: Fundamentals and Applications, 1st edition, Springer-Verlag Berlin Heidelberg, 2011. 3. Concepts and Models of Inorganic Chemistry, B. Douglas, D. McDaniel, J. Alexander, John Wiley, 1994, 3rd edn. 4. K. F. Purcell, J. C. Kotz, Inorganic Chemistry; Saunders: Philadelphia, 1976. 5. R. S. Drago, PhysicaI Methods in Chemistry; Saunders: Philadelphia, 1977.	
Website and e-learning source	https://archive.nptel.ac.in/courses/104/101/104101100/	

Course Code	Course Title	L	T	P	C
23214AEC42	Physical Chemistry –II	4	1	0	4

Course Outline	**UNIT-I:** Wave particle duality, Uncertainty principle, Particle wave and Schrodinger wave equation, wave function, properties of wave function. Properties of wave function, Normalized, Orthogonal, orthonormal, Eigen values, Eigen functions, Hermitian properties of operators.Introduction to quantum mechanics-black body radiation, photoelectric effect, hydrogen spectrum.Need for quantum mechanics, Postulates of Quantum Mechanics, Schrodinger wave equation, Time independent and time dependent	
	UNIT-II: Quantum models: Particle in a box-1D, two dimensional and three-dimensional, degeneracy, application to linear conjugated molecular system, free particles, ring systems.Harmonic Oscillator-wave equation and solution, anharmonicity, force constant and its significance.Rigid Rotor-wave equation and solution, calculation of rotational constants and bond length of diatomic molecules.	
	UNIT-III: Applications to Hydrogen and Poly electron atoms: Hydrogen atom and hydrogen like ions, Hamiltonian-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 particle in 1D box. Perturbation method - first order applications.Hatrefock self-consistent field method, Hohenberg-Kohn theorem and Kohn-Sham equation, Helium atom-electron spin, paulis exclusion principle and Slater determination.	
	UNIT-IV: Group theory: Groups, sub groups, symmetry elements, operations, classification-axial and non-axial. Dihedral point groups- C_n,C_{nh}, D_n, D_{nh}, D_{nd}, Tdand Oh.Matrix representation and classes of symmetry operations, reducible irreducible and direct product representation. The Great orthogonality theorem – irreduciblerepresentation and reduction formula, construction of character table for C_{2v}, C_{2h}, C_{3v} and D_{2h} point groups.	

	UNIT-V: Applications of quantum and group theory: 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, cyclopropenyl, cyclo 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.	
Recommended Text	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, 2nd edition. 3. A. Vincent, Molecular Symmetry and Group Theory. A Programmed Introduction to Chemical Applications, John and Willy & Sons Ltd., 2013, 2nd Edition. 4. T. Engel & Philip Reid, Quantum Chemistry and Spectroscopy, Pearson, New Delhi, 2018, 4th 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, 2nd edition.	

Reference Books	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.	

Course Code	Course Title	L	T	P	C
23214DSC44A	Elective VI(Generic /Discipline Specific)(One from Group F) Chemistry of Natural Products/Polymer Chemistry	4	1	0	3
	CHEMISTRY OF NATURAL PRODUCTS				
Course Outline	**UNIT-I: Alkaloids:** Introduction, occurrence, classification, isolation and functions ofalkaloids. Classification, general methods of structurallelucidation. Chemical methods of structure determination of Coniine, Piperine, Nicotine, Papaverine. Atropine, Quinine, Belladine, Cocaine, Heptaphylline, Papaverine and Morphine.				
	UNIT-II:Terpenoids: Introduction, occurrence, Isoprene rule,classification. General methods of determiningstructure.. Structure determination of Camphor, Abietic acid, Cadinene, Squalene, Zingiberine.**Carotenoids:** Introduction, geometricalisomerism, Structure, functions and synthesis of β-carotene andvitamin-A.				
	UNIT-III: Anthocyaninesandflavones: Anthocyanines: Introduction toanthocyanines.Structure and general methods of synthesis ofanthocyanines. Cyanidine chloride: structure anddetermination.Flavones: Biological importance of flavones. Structure and determination of flavone andflavonoids. Quercetin: Structure determination andimportance.				

	UNIT-IV: PurinesandSteroids: Purines: Introduction, occurrence and isolation of purines. Classification and spectral properties of steroids. biological importance, Structure and synthesis of Uric acid and Caffeine. Steroids: 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.	
	UNIT-V:NaturalDyes: Occurrence, classification, isolation, purification, properties, colour andconstitution. Structural determination and synthesis of indigoitin andalizarin.	
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. 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, 5thedition,PearsonEducation Asia, 1975.	
Reference Books	1. I. L. Finar, Organic Chemistry Vol-1, 6thedition, Pearson Education Asia,2004. 2. Pelletier, Chemistry of Alkaloids, Van Nostrand Reinhold Co,2000. 3. Shoppe, Chemistry of the steroids, Butterworthes,1994. 4. I. A. Khan, and A. Khanum. Role of Biotechnology in medicinal & aromatic plants, Vol 1 and Vol 10, Ukkaz Publications, Hyderabad,2004.	

Website and e-learning source	https://sites.google.com/site/chemistryebookscollection02/home/organic-chemistry/organic	

Course Code	Course Title	L	T	P	C
23214DSC44B	Polymer Chemistry	4	1	0	3
Course Outline	**UNIT-I: Characterization, Molecular weight and its Determination:** Primary and secondary bond forces in polymers; cohesiveenergy, molecular structure, chemical tests, thermal methods, Tg, molecular distribution, stability.Determination of Molecular mass of polymers: Number Average molecular mass (M_n)and Weight average molecular mass (M_w) ofpolymers. Molecular weight determination of high polymers by physical and methods.				
	UNIT-II:Mechanism and kinetics ofPolymerization: Chain growth polymerization: Cationic, anionic, free radical polymerization, Stereo regular polymers: Ziegler Nattapolymerization. Reaction kinetics. Step growthpolymerization, Degree of polymerization.				
	UNIT-III: Techniques of Polymerization andPolymerDegradation: Bulk, Solution, Emulsion, Suspension, solid, interfacial and gas phasepolymerization. Types of Polymer Degradation, Thermal degradation, mechanicaldegradation, photodegradation, Photostabilizers, Solid and gas phase polymerization.				
	UNIT-IV: **Industrial Polymers:** Preparation of fibre forming polymers, elastomericmaterial. Thermoplastics:Polyethylene,Polypropylene,polystyrene,Polyacrylonitrile,PolyVinyl Chloride, Poly tetrafluoro ethylene, nylon andpolyester. Thermosetting Plastics: Phenol formaldehyde and expoxideresin. Elastomers: Natural rubber and synthetic rubber - Buna - N, Buna-S and neoprene. Conducting Polymers: Elementary ideas; examples: poly sulphur nitriles, polyphenylene, poly pyrrole and polyacetylene.Polymethylmethacrylate, polyimides,polyamides,polyurethanes, polyureas, polyethylene and polypropyleneglycols.				
	UNIT-V:PolymerProcessing: Compounding:Polymer Additives: Fillers, Plasticizers, antioxidants, thermal stabilizers, fire retardantsand colourants. Processing Techniques:Calendaring, die casting, compression moulding, injection moulding, blow moulding andreinforcing. 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.	
Recommended Text	**1.** V.R. Gowariker, *Polymer Science*, Wiley Eastern,1995. 2. G.S. Misra, *Introductory Polymer Chemistry*, New Age International (Pvt) Limited,1996. 3. M.S. Bhatnagar, A Text Book of Polymers, vol-I & II, S.Chand & Company, New Delhi, 2004.	
Reference Books	1. F. N. Billmeyer, *Textbook of Polymer Science*, Wiley Interscience,1971. 2. A. Kumar and S. K. Gupta, *Fundamentals and Polymer Science and Engineering*, Tata McGraw-Hill,1978.	