ANNEXURE - 10

PG & RESEARCH DEPARTMENT OF CHEMISTRY

VISION:

> To achieve academic excellence in the chemistry discipline and create chemically literate society through teaching and research.

MISSION:

> The chemistry department is committed to prepare the man resource with sound knowledge of theory and practical in the chemistry.

Programme Educational Objectives (PEO)

PEO1	Natural navigators and nimble witted in diagnosing problems, in enlisting steps to rectify them and in providing the most effective solutions in the best possible way
PEO2	Moralistic while demonstrating their academic caliber, in recognizing and acknowledging value systems, in making decisions, accepting responsibilities and while concerned about society and public issues and needs
PEO3	Self-reliant in learning and in real life job situations through which they support their peers and become stable and reliable students, workers and citizens
PEO4	Steadfast in shielding and nurturing environment and stimulate its sustainable growth for a bright future
PEO5	Versatile and vibrant communicators in person and through other media. Vigilant/vital in prolonging the long winding richness and tradition of their mother tongue
PEO6	Neoteric global citizens of our nation, who would take the nation's pride around the world by adapting and adopting the scientific and technological developments
PEO7	Civilized and confident graduates, who believe in lifelong learning with the socio- cultural changes in the generations to come

Programme Objectives (PO)

B.Sc Chemistry programme is to prepare/equip the students

PO1	To develop skills in problem solving promote good will critical thinking and
	analytical reasoning as applied to chemistry related problems.
PO2	To get a firm foundation in the fundamentals and applications of chemical and
	scientific theories including ethical and environmental chemistry
PO3	To find out the solution of the ethical exhibit of problems critical thinking
	economical and environmental dimensions of problems and issues facing chemistry
PO4	To pursue post graduate program in higher educational institutions and also get
	suitable employment opportunities in industries and academic institutions.
PO5	Graduates will recognize to all sects of life in the society and service for human

PROGRAM SPECIFIC OUTCOME (PSO)

PSO1	Graduate will have a firm foundation in the fundamentals and application of current chemical and scientific theories including biological chemistry.
PSO2	Graduate are able to design a synthetic route for new compounds and transform innovative ideas into reality.
PSO3	Graduate are able to grab enormous existing job opportunities at all levels of chemical, medical, food processing and educational institutions.
PSO4	Graduate possess skill in problem solving, critical thinking and analytical reasoning as applied to scientific problems.
PSO5	Graduates can perform good social responsibility with greater in ethics and conducive use of nature resources.

PO - PEO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO 5
PEO 1	3	2	3	2	3
PEO 2	2	3	3	2	2
PEO 3	3	2	3	3	2
PEO 4	2	3	2	3	3
PEO 5	2	3	2	3	3
PEO 6	3	2	3	3	3
PEO 7	3	3	2	3	3

3-Strong;

2-Medium;

1-Low

B.SC CHEMISTRY: CHOICE BASED CREDIT SYSTEM WITH OBE PATTERN FOR THOSE WHO HAVE JOINED FROM THE ACADEMIC YEAR 2021 – 2022 ONWARDS

_				1	1	1				
Part	Course	Subject	Code	Hrs.	6 th Hr.	Cr.	Adl. Cr.	Exam (Hrs)	Ma Int.	a rks Ext.
		SEM	ESTER – I							
Ι	Lang. – I	Tamil – I	210103101	6		3		3	25	75
II	Lang. – II	General English – I	211003101	6		3		3	25	75
	Core	Inorganic Chemistry – I	212203101	4		4		3	25	75
	Core	Organic Chemistry – I	212203102	3		3		3	25	75
	Core Lab	Oualitative Analysis Lab – I	-	3		_		_	_	_
111				*6/4		5/4		3	25	75
	Al.Maths/	Allied Mathematics Paper – I	212003121/	*6/4	1 = 6	hr for	math	nematio	es pai	oer /
	Z00	/ Animal Diversity	212303121	4 ^{hr} f	or z	oolog	y pap	er (I to	IVS	ems)
	Al.ZooLab	Animal Diversity, Genetics, Cell Biology and Bio chemistry Lab	-	2		-		-	-	-
IV	SBE - I	SBE – I *	214403122/ 218203122	2		2		3	25	75
V	Extension	NSS / NCC / PED/Rover and								
v	activities	Rangers/Library Science and Information	-		3			-	-	-
A	dditional	Communicative English–I	-		2			-	-	_
(Courses	Computer Literacy	-		1			-	-	-
Ι	Lang. – I	Tamil – I	210103201	6		3		3	25	75
II	Lang. – II	General English – II	211003201	6		3		3	25	75
	Core	Physical Chemistry – I	212203201	3		3		3	25	75
	Core	Inorganic Chemistry – II	212203202	3		3		3	25	75
тт	Core Lab	Oualitative Analysis Lab	212203203	3		3		3	40	60
		Allied Mathematics Paper – II				_				
	Al.Maths/ Zoo	/ Genetics, Cell Biology and Bio Chemistry	212003221/ 212303221	*6/4		5/4		3	25	75
	Allied	Animal Diversity, Genetics, Cell	212303222	2		2		3	40	60
	Zoo Lab	Biology and Bio chemistry Lab	014402000/	4		4		0	10	00
IV	SBE	SBE – II*	214403222/ 218203222	2		2		3	25	75
	EVS	Environmental Studies	214103201	1		1		2	_	100
V	Extension activities	NSS / NCC / PED/Rover and Rangers/Library Science and Information	-		3			-	-	-
		Communicative English-I	218003201		2		1	3	25	75
A	dditional	Computer Literacy	_		1		-	-	20	
	Courses	SLC Agricultural Chamistry	218003222		1		2	2		100
		SLC - Agricultural Chemistry	210003222				3	3		100
т	Long I	Torreil III	210103301	6		2		2	05	75
1 11	Lang. – I	Concerct Franksh III	210103301	6		3 2		3	25	75
- 11	Lang. – II	General English – III	211000001	0		3		3	25	75
	Core Lab	Velementeis Anglessis Leb	212203301	2		2		3	25	75
	Core Lab	Allied Methematics Denor III	-	2				_	_	-
III	Zoo	/Microbiology & Immunology	212003321/ 212303321	*6/4		5/4		3	25	75
	Al. Zoo Lab	Chordata, Microbiology, Immunology and Commercial Zoology	-	2		-		-	-	-
	Al. Phy	Mechanics Properties of Matters and Sound	212103322	4		4		3	25	75
	Al.Phy.Lab	Allied Physics Practical-I	-	2				-	-	_
IV	NME - I	Nutrition Chemistry	214603322	2		2		3	25	75
V	Extension activities	NSS / NCC / PED/Rover and Rangers/Library Science and Information	-		3			-	_	-
		Communicative English–II	-		2			-	_	-
A	dditional	Computer Literacy	-		1			-	_	-
Courses		SLC - Biological Chemistry	218003322				3	3	_	100

		SEMI	ESTER - IV							
Ι	Lang. – I	Tamil – IV	210103401	6		3		3	25	75
II	Lang. – II	General English – IV	211003401	6		3		3	25	75
	Core	Physical Chemistry – II	212203401	2		2		3	25	75
	Core Lab	Volumetric Analysis Lab	212203402	2		2		3	40	60
	Al.Maths / Zoo	Allied Mathematics Paper – IV / Physiology & Biotechnology	212003421/ 212303421	*6/4		5/4		3	25	75
111	Al.Zoo lab	Animal Diversity, Microbiology, Immunology Physiology and Biotechnology	212303422	2		2		3	40	60
	Al.Phy	Thermal Physics	212103425	4		4		3	25	75
	Al.PhyLab	Allied Physics Practical–I	212103426	2		2		3	40	60
IV	NME - II	Food and Health	214603422	2		2		3	25	75
V	Extension activities	NSS / NCC / PED/Rover and Rangers/Library Science and Information	-		3	1		3	25 *40	75 *60
		Communicative English–II	218003401		2		1	3	25	75
A	dditional Courses	Computer Literacy	-		1				-	-
	courses	SLC - C – Programming	218003422				4	3	-	100
		SEM	ESTER - V							-
	Core	Organic Chemistry – III	212203501	4		4		3	25	75
	Core	Inorganic Chemistry – III	212203502	4		4		3	25	75
	Core	Physical Chemistry – III	212203503	4		4		3	25	75
III	Core	Analytical Chemistry and Applications of Computers in Chemistry	212203504	3		3		3	25	75
	Core Lab	Organic Analysis and Estimation	-	3		_		_	-	_
		Gravimetric Analysis Lab	-	-		—		_	-	-
	Al.Phy	Electricity and Electronics	212103521	4		4		3	25	75
	Al.PhyLab	Allied Physics Practical – II	-	2				-	-	_
IV	SBE	SBE III*	214403522/ 218203522	2		2		3	25	75
	WS	Women Studies	214503501	1	~	1		2	-	100
		Communicative English–III	-		2			_	-	_
A	dditional Courses	Computer Literacy Skill Development – Career Guidance	-		1 3			_	-	-
		SLC - Chemistry in daily life	218003522				4	3	_	100
		SEME	ESTER – VI						1	
	Core	Inorganic Chemistry - IV	212203601	3		3		3	25	75
	Core	Organic Chemistry – IV	212203602	4		4		3	25	75
	Core	Physical Chemistry – IV	212203603	4		4		3	25	75
		Organic Analysis and Estimation Lab	212203604	3		3		6	40	60
III	Core Lab	Gravimetric Analysis Lab	212203605	3		2		6	40	60
		Physical Chemistry Experiments	212203606	3		3		6	40	60
	Al.Phy	Optics and Modern Physics	212103621	4		4		3	25	75
	Al.PhyLab	Allied Physics Practical-II	212103622	2		2		3	40	60
	Elective	Project *Report; @Viva	212203607	5		5		_	40 [24:16]	60 [36:24]
IV	VBE	Value Based Education	214303601	2		2		2		100
		Communicative English–III	218003601		2		1	3	25	75
Addi	tional	Computer Literacy	218003602		1		1	3	_	100
Cour	3C3	Skill Development – Career Guidance	218003603		3		2	3	-	100
		τοται		190	26	140	20		1	1

*Skill Based Elective I, II and III : Each SBE paper has two choices, select any one.

- I.1. Forensic Chemistry-214403122
- II.1. Chemistry of Consumer Products-214403222
- I.2 Nano Science -218203122
- II. 2. Drug and Cosmetics-218203222
- III.1. Food Processing and Preservation 214403522 III.2. Industrial Chemicals and Environment - 218203522

	ALLIED – CHEMISTRY FOR PHYSICS												
Sem	Title of the Paper	SUB CODE	Hrs.	Cr.	Exam (Hrs)	Marks							
						Int	Ext						
III	Inorganic, Organic & Physical Chemistry – I	212203321	4	4	3	25	75						
IV	Inorganic, Organic & Physical Chemistry – II	212203421	4	4	3	25	75						
IV	Volumetric Analysis Lab	212203423	2	2	3	40	60						
v	Inorganic and Physical Chemistry	212203521	4	4	3	25	75						
VI	Organic and Physical Chemistry	212203621	4	4	3	25	75						
VI	Organic Analysis Lab	212203622	2	3	3	40	60						

ALLIED – CHEMISTRY FOR ZOOLOGY

Sem	Title of the Paper	SUB CODE	Hrs.	Cr.	Exam (Hrs)	Marks	
		502 0022				Int	Ext
I	General Chemistry – I	212203121	4	4	3	25	75
II	General Chemistry – II	212203221	4	4	3	25	75
II	Volumetric Analysis Lab – I	212203222	2	2	3	40	60
III	General Chemistry – III	212203322	4	4	3	25	75
IV	General Chemistry – IV	212203422	4	4	3	25	75
IV	Organic Analysis Lab	212203424	2	2	3	40	60

ALLIED - CHEMISTRY FOR BIOCHEMISTRY

Sem	Title of the Paper	SUB CODE	Hrs.	Cr.	Exam (Hrs)	Marks	
						Int	Ext
I	General Chemistry – I	212203121	4	4	3	25	75
II	General Chemistry – II	212203221	4	4	3	25	75
II	Volumetric Analysis Lab – I	212203222	2	2	3	40	60

ALLIED - CHEMISTRY FOR BIOTECHNOLOGY AND MICROBIOLOGY

Sem	Title of the Paper	SUB CODE	Hrs.	Cr.	Exam (Hrs)	Marks Allotted	
						Int.	Ext.
Ι	General Chemistry – I	212203121	4	4	3	25	75
Ι	Volumetric Analysis Lab – I	212203122	2	2	3	40	60
II	General Chemistry – II	212203221	4	4	3	25	75
III	General Chemistry – III	212203322	4	4	3	25	75
IV	Organic Analysis Lab	212203423	2	2	3	40	60
IV	General Chemistry – IV	212203422	4	4	3	25	75

Core Subject

ORGANIC CHEMISTRY - III SEMESTER V

Code:212203501 4 Hrs/Week Credits 4

Preamble:

 ${\ensuremath{\it \varkappa}}$ To have a knowledge of stereochemistry and carbohydrates.

🖉 Understanding the concept of reagent inorganic synthesis.

🗷 To learn the chemistry of Polynuclear hydrocarbons and aromatic acids.

COURSE OUTCOMES (COs)

On Successful completion of the course, the student will be able to

No.	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO1	Understanding the basic concept of stereochemistry such as chirality, nomenclature and asymmetric synthesis.	Up to K3
CO2	Apply the chemistry of carbohydrates and classification. Detailed study of mono, di & polysaccharides	Up to K3
CO3	Gain the knowledge on the chemistry of oxidizing agents, reducing agents and Tautomerism	Up to K3
CO4	Understanding the chemistry of polynuclear hydrocarbons and their derivatives	Up to K3
CO5	To gain knowledge of preparation and properties of aromatic acids	Up to K3

K1- Knowledge K2 – Understand K3-Apply

UNIT – I:

Stereoisomerism:

a) Geometrical Isomerism:

Definition – geometrical isomerism of maleic and fumaric acids – aldoximes and ketoximes – determination of configurations of geometrical isomers – E - Z notation.

- b) Optical Isomerism:
 - Optical activity specific rotation definition of optical isomerism – symmetry elements.
 - ii. Optical isomerism of compounds containing asymmetric carbon atom - racemisation - resolution of racemic mixtures -Walden inversion - asymmetric synthesis - chirality - CIP rule
 - R-S notations.
 - iii. Optical activity of compounds without asymmetric carbon atoms; allenes and biphenyls.

UNIT – II:

Carbohydrates:

 a) Introduction and classification: Monosaccharides – preparation, properties and structure of glucose and fructose – configuration – Interconversion of glucose and fructose – descending and ascending of sugar series – epimerization and mutarotation.

[12 Hrs]

[12 Hrs]

- b) Disaccharides: Preparation , properties and configuration of sucrose and maltose (structural elucidation not necessary)
- c) Polysaccharides: A general study of starch and cellulose applications of cellulose derivatives (celluloid, Nitro cellulose, collodion, viscose)

UNIT – III:

[12 Hrs]

Reagents in Organic Synthesis and Tautomerism:

- a) Oxidising Agents: Oxidation reactions involving SeO₂, OsO₄, Leadtetraacetate, N –bromo succinimide, m-CPBA.
- b) Reducting agents: NaBH₄, Lithium aluminium hydride, MeerweinPondorfVerley reduction, clemmenson reduction, Reduction by H₂PdC, H₂Ni.
- c) Tautomerism Definition conditions difference between resonance and tautomerism – prototropy, keto – enol, Lactam – Lactimtautomerism, Quinone monoxime – p – Nitrophenoltautomerism.

UNIT – IV:

[12 Hrs]

[12 Hrs]

Polynuclear Hydrocarbons and Their Derivatives:

- a) Isolated systems: Preparation and propertices of diphenyl, and diphenyl methane.
- b) Condensed ring systems: Preparation, properties, uses and structure of Naphthalene, anthracene, alizarin, phenanthrene.

UNIT – V:

Aromatic Acids:

- a) Preparation of benzoic acid Effect of substituents on acidic character.
- b) Substituted acids: Preparation, properties and uses of salicylic acid and anthranilic acid.
- c) Dicarboxylic acids: Preparation and properties of phthalic acid, terephthalic acid and phthalimide.
- d) Preparation and properties of cinnamic acid.
- e) Aromatic sulphonic acids: Preparation and uses of benzene sulphonic acid, saccharin and chloramines T.

TEXT BOOKS:

- 01. Bahl B.S., and ArunBahl, Advanced Organic Chemistry, S.Chand& Co., New Delhi, 2017.
- 02. Morrison R.T., and Boyd R.W., Organic Chemistry, Prentice Hall, New Delhi, 7th Edition, 2011.
- 03. Soni P.L., Organic Chemistry, S.Chand& Co., New Delhi, 2014.

REFERENCES:

- 01. Kalsi. P.S., Sterochemistry and Conformational Analysis, 2nd Edition Wiley Eastern Limited, NewDelhi, 2017.
- 02. Finar I.L., Organic Chemistry, Vol. I, 6th Edition, ELBS, England, 2002.
- 03. Finar I.L., Organic Chemistry, Vol. II, 5th Edition, ELBS, England, 2017.
- 04. Singh and Mukherji, Reaction Mechanism in Organic Compounds, McMillan, India, 2014.
- 05. Eliel. E.L., Stereochemistry of carbon compounds, Wiley Eastern, Newyork, 2008.
- 06. Course content & Teaching/Learning schedule

WEB RESOURCES:

- 01. https://en.wikipedia.org/wiki/Stereoisomerism#:~:text=In%20stereoc hemistry%2C%20stereoisomerism%2C%20or%20spatial,of%20their%2 0atoms%20in%20space.
- 02. https://www.britannica.com/science/isomerism/Conformationalisomers
- 03. https://byjus.com/jee/opticalisomerism/#:~:text=Asked%20Questions %20%E2%80%93%20FAQs,What%20is%20optical%20isomerism%3F,r otation%20of%20plane%20polarized%20light.
- 04. https://chem.libretexts.org/Courses/Purdue/Purdue%3A_Chem_2650 5%3A_Organic_Chemistry_I_(Lipton)/Chapter_3._Stereochemistry/3.6_ Cahn-Ingold_Prelog_Rules
- 05. https://en.wikipedia.org/wiki/Carbohydrate
- 06. https://chem.libretexts.org/Courses/University_of_Arkansas_Little_Ro ck/CHEM_4320_5320%3A_Biochemistry_1/09%3A_Carbohydrates/8. 3%3A_Disaccharides
- 07. https://en.wikipedia.org/wiki/Polysaccharide
- 08. http://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000005 CH/P000656/M009385/ET/1456899163CHE_P1_M5_e-Text.pdf
- 09. https://onlinecourses.nptel.ac.in/noc19_cy24/preview
- 10. https://www.uobabylon.edu.iq/eprints/publication_5_7911_1622.pdf
- 11.https://www.youtube.com/watch?v=vxPgyR75D6M
- 12. https://www.youtube.com/watch?v=zmnSZgaBAIU

PEDAGOGY: Chalk & Talk, LCD

COURSE CONTENTS & TEACHING / LEARNING SCHEDULE

Module No.	Торіс	No. of Lectures	Content Delivery Method	Teaching Aids
	UNIT – I [12 Hr	·s]		
1.1	Geometrical Isomerism: Definition – geometrical isomerism of maleic and fumaric acids – aldoximes	2	Lecture	Black Board
1.2	ketoximes – determination of configurations of geometrical isomers – $E - Z$ notation.	2	Lecture	Black Board
1.3	Optical activity – specific rotation – definition of optical isomerism – symmetry elements.	2	Lecture	Black Board
1.4	ptical isomerism of compounds containing asymmetric carbon atom – racemisation	2	Chalk & talk	Black Board
1.5	resolution of racemic mixtures – Walden inversion – asymmetric synthesis – chirality – CIP rule - R–S notations.	2	Chalk & talk	Black Board

1.6	Optical activity of compounds without asymmetric carbon atoms; allenes and biphenvls.	2	Chalk & talk	Black Board
	IINIT – II [12 H	rel		
	Introduction and classification:			
2.1	Monosaccharides – preparation, properties and structure of glucose and fructose	3	Chalk & talk	Black Board
2.2	configuration – Interconversion of glucose and fructose – descending and ascending of sugar series – epimerization and mutarotation.	3	Chalk & talk	Black Board
2.3	Disaccharides: Preparation , properties and configuration of sucrose and maltose (structural elucidation not necessary)	3	Lecture	Black Board
2.4	Polysaccharides: A general study of starch and cellulose – applications of cellulose derivatives (celluloid, Nitro cellulose, collodion, viscose)	3	Chalk & talk	Black Board
	UNIT – III 12 H	rs]		
3.1	Oxidising Agents: Oxidation reactions involving SeO ₂ , OsO ₄ , Leadtetraacetate, N –bromo succinimide, m-CPBA.	4	Chalk & talk	PPT & LCD
3.2	Reducting agents: NaBH ₄ , Lithium aluminium hydride, MeerweinPondorfVerley reduction, clemmenson reduction, Reduction by H ₂ PdC, H ₂ Ni.	4	Chalk & talk	PPT & LCD
3.3	Tautomerism – Definition – conditions – difference between resonance and tautomerism – prototropy, keto – enol, Lactam – Lactimtautomerism, Quinone monoxime – p – Nitrophenoltautomerism.	4	Chalk & talk	PPT & LCD
	UNIT - IV [12 H	rs		
4.1	Polynuclear Hydrocarbons and Their Derivatives	2	Chalk & talk	Black Board
4.2	Isolated systems: Preparation and propertices of diphenyl, and diphenyl methane.	2	Chalk & talk	Black Board
4.3	Condensed ring systems: Preparation, properties, uses and structure of Naphthalene, anthracene, alizarin, phenanthrene.	4	Chalk & talk	Black Board
	UNIT – V [12 H	rsj		
5.1	Preparation of benzoic acid – Effect of substituents on acidic character.	2	Lecture	Black Board
5.2	Substituted acids: Preparation, properties and uses of salicylic acid and anthranilic acid.	2	Chalk & talk	Black Board
5.3	Dicarboxylic acids: Preparation and properties of phthalic acid, terephthalic acid and phthalimide.	3	Chalk & talk	Black Board
5.4	Preparation and properties of cinnamic acid.	2	Chalk & talk	Black Board

	Aromatic	sulphor	ic	acids:			
5.5	Preparation sulphonic	and uses acid, sa	s of cchar	benzene rin and	3	Chalk & talk	Black Board
	chloramines	– T.					

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	3
CO2	3	3	3	3	3
CO3	3	2	3	3	3
CO4	3	3	2	2	3
CO5	3	3	3	3	2
	3 - Stro	ong 2 -	Medium	1- Low	

COURSE DESIGNER: Dr.T. Senthil Pandian & Dr. J. Jeyasundari

Core SubjectINORGANIC CHEMISTRY – IIICode: 212203502SEMESTER V4 Hrs/Week

Preamble:

∠ Basic concepts of Inorganic Chemistry.

The course enables the students to gain knowledge on coordination compounds, bio inorganic chemistry, organometallic compounds and 'f-block' elements. Discuss the basic concepts of acids, bases, non-aqueous solvents and the biological importance of metal compounds.

COURSE OUTCOMES (COs)

On Successful completion of the course, the student will be able to

No.	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO 1	The students become familiar with the nomenclature and theories of coordination compounds	Up to K3
CO2	Students will understand about biological importance of metal compounds.	Up to K3
CO3	The students will acquire knowledge of inner transition elements.	Up to K3
C04	To understand basic concepts of acids, bases and non-aqueous solvents.	Up to K3
C05	The students will able to identify the structure and bonding in organometallic compounds	Up to K3

K1- Knowledge K2 – Understand K3-Apply

UNIT – I:

[12 Hrs]

Credits 4

Coordination Chemistry

 a) Introduction – Nomenclature – isomerism in complexes – structural and stereo Isomerism – Werner's theory – EAN rule – Valence bond theory – magnetic properties – Limitations of VBT – crystal field theory – spilitting of d-orbitals in octahedral, tetrahedral and square planar complexes – colour of coordination complexes – low spin and High spin complexes – M.O. theory – Postulates of MO theory.

UNIT – II:

Organometallic chemistry

- a) Organometallic chemistry Definition Classification based on the nature of metal-carbon bond - hapticity - Classification of ligands based on hapticity.
- b) Ferrocene Methods of preparation, physical and chemical properties. Zeise's salt Preparation, structure and bonding.
- c) 18 electron rule, Oxidative addition reaction and Reductive elimination reaction (Definition only).

UNIT – III:

The Inner Transition Elements

- a) Lanthanoid series occurrence properties electronic configuration. Oxidation states, ionic radii lanthanide contraction and its causes, consequences colour of ions, magnetic properties, basic characters, double salts, complexes formation Extraction of lanthanides from monazite sand separation of lanthanides solvent extraction Ion exchange chromatography uses of lanthanoids.
- b) Actinoid series electronic configuration oxidation states colour of ions – Formation of complexes – Uses of actinoids - comparison of actinoids and lanthanoids.
- UNIT IV:

Acids, bases and Non-aqueous solvents

- a) Acids and bases: Arrhenius concept and its limitation Lowry & Bronsted concept – conjugate acid – base pairs – relative strengths of acids and bases – Lux-Flood concept and its limitations –Lewis concept and its limitations – Levelling effect – Usanovich concept – HSAB concept - (fundamentals only)
- b) Non aqueous Solvents: Classification of solvents chemical reaction in liquid ammonia – precipitation reaction, Acid base reactions, protolysis, Ammonolysis and Complex formation reaction – solution of alkali metals in liquid ammonia.

UNIT – V:

Metal ion transport and storage

Metallo porphyrins – Structure and functions of Chlorophyll and vitamin B12; Myoglobin and haemoglobin – structure (prosthetic group only) and biological functions - Bohr effect. Comparison of Myoglobin and haemoglobin; Biological functions of cytochrome P450 - sodium / potassium pump.

TEXT BOOKS:

- 01. Cotton F.A., and Wilkinson, Basic Inorganic Chemistry, Wiley Eastern Limited, New York, VI edition, 1976
- 02. Madan R.D., Modern Inorganic Chemistry, S.Chand& Co., New Delhi.
- 03. Malik, Madan and Tuli, Selected Topics in Inorganic Chemistry, S.Chand& Co., New Delhi, 2010.
- 04. Soni P.L., Text book of Inorganic Chemistry, S.Chand& Co., New Delhi.
- 05. Bhaghi&Chahoal, Text Book for Bioinorganic Chemistry.
- 06. Sharma. A.K., Bio Inorganic Chemistry, Random Publications, 2012.
- 07. Inorganic chemistry, Huheey,
- 08. Metal ions in biochemistry, P.K.Bhattacharya, Narso

[12 Hrs]

[12 Hrs]

[12 Hrs]

[12 Hrs]

REFERENCES:

- 01. Puri, Sharma and Kalia, Principles of Inorganic Chemistry, S.Chand& Co., New Delhi.
- 02. Lee.J.D., Concise Inorganic Chemistry, 5th Edition, 2014.
- 03. Simon Cotton, Lanthanides and Acitinides, Macmillan Education Ltd., 1991.
- 04. David. A. Atwood, The Rare Earth Elements: Fundamentals and Applications, Wiley, 2012.
- 05. Bioionorganic chemistry, I. Bertini, H.B. Gray, S.J. Lippard, J.S. Valentine

WEB RESOURCES:

- 01. https://nptel.ac.in/courses/104105033
- 02. https://nptel.ac.in/courses/104104109
- 03. https://www.youtube.com/watch?v=S6TEcml4fCA
- 04. https://archive.nptel.ac.in/content/storage2/courses/104103071/pdf /mod2.pdf
- 05. https://www.askiitians.com/iit-jee-chemistry/physicalchemistry/acids-and-bases.aspx
- 06. https://nptel.ac.in/courses/104101079
- 07. https://nptel.ac.in/content/storage2/courses/104101005/downloads /LectureNotes/chapter %207.pdf 2 https://youtu.be/BZ_tY88000I, Coordination chemistry, IIT Kharagpur, Prof. D. RaY.
- 08. https://youtu.be/FziKko-ZQww for bioinorganic chemistry.

PEDAGOGY: LCD, Black Board

COURSE CONTENTS & TEACHING / LEARNING SCHEDULE

Module No.	Topic	No. of Lectur es	Content Delivery Method	Teaching Aids
	UNIT – I [12 Hrs	s]		
1.1	Introduction – IUPAC Nomenclature	1	Lecture	Black Board
1.2	isomerism in complexes – structural and stereo Isomerism	1	Discussion	LCD
1.2	Werner's theory –EAN rule	1	Chalk & talk	Black Board
1.3	Sidgwick theory- Valence bond theory	1	Chalk & talk	Black Board
1.4	magnetic properties	1	Lecture	PPT & White Board
1.5	Limitations of VBT	1	Blended Learning	Black Board
1.6	crystal field theory (CFT) – splitting of d-orbitals in octahedral, tetrahedral and square planar complexes	2	Chalk & talk	Black Board
1.7	colour of coordination complexes	1	Chalk & talk	Black Board
1.8	low spin complexes	1	Lecture	Black Board
1.9	High spin complexes	1	Chalk & talk	Black Board
1.10	M.O. theory – Postulates of MO theory	1	Chalk & talk	Video lecture
	UNIT – II [12 Hı	rs]		
2.1	Metallo porphyrins – Structure and significance of Chlorophyll and vitamin B12.	2	Lecture	Black Board
2.2	structure and biological functions of Myoglobin	1	Discussion	LCD
2.3	structure and biological functions of haemoglobin	2	Chalk & talk	Black Board

2.4	Comparison of Hemoglobin and myoglobin	1	Chalk & talk	Black Board
2.5	Cytochrome p450 - Active site Structure and mechanism only	1	Lecture	PPT & White Board
2.6	Functions and significance of sodium - potassium pump.	1	Blended Learning	Black Board
2.7	Effect of excess and deficiency of iron, zinc and copper.	2	Chalk & talk	Black Board
2.8	Toxicity of Mercury, Lead, Cadmium and Arsenic	1	Chalk & talk	Black Board
2.9	Biological applications of radioactive isotopes.	1	Blended Learning	Black Board
	UNIT – III [12 H	rs]		
3.1	Lanthanide series – occurrence	1	Chalk & talk	PPT & LCD
3.2	properties – electronic configuration. Oxidation states, ionic radii	1	Chalk & talk	Black Board
3.3	lanthanide contraction and its causes, consequences	2	Lecture	Black Board
3.4	– colour of ions, magnetic properties, oxidation potential	2	Lecture	Black Board
3.5	basic characters, solubility of compounds, double salts, complexes formation	2	Chalk & talk	LCD
3.6	Extraction of lanthanides from monazite sand – separation of lanthanides	1	Chalk & talk	Black Board
3.7	solvent extraction – Ion exchange chromatography –uses of lanthanides	1	Discussion	Black Board
3.8	Actinides series – sources — colour of ions – Transuranic elements and their preparation	1	Chalk & talk	Black Board
3.9	electronic configuration – properties – oxidation states – Ionic radii- Formation of complexes – comparison of actinides and lanthanides	1	Discussion	Black Board
	UNIT – IV [12 H	rs]		
4.1	Acids and bases: Arrhenius concept and its limitation –	2	Chalk & talk	PPT & LCD
4.2	Lowry & Bronsted concept – conjugate acid – base pairs – relative strengths of acids and bases –	2	Chalk & talk	Black Board
4.3	Lux–Flood concept and its limitations –Lewis concept and its limitations –	1	Lecture	Black Board
4.4	Levelling effect – Usanovich concept – HSAB concept - (fundamentals only)	1	Lecture	Black Board
4.5	Non aqueous Solvents: Classification of solvents – chemical reaction in liquid ammonia – precipitation reaction,	2	Chalk & talk	LCD
4.6	Acid base reactions, protolysis, Ammonolysis and.	2	Lecture	Black Board
4.7	Complex formation reaction – solution of alkali metals in liquid ammonia	2	Lecture	Black Board
	<u>UNIT – V [12 Hr</u>	s]		
5.1	Metal carbonyls – bonding and structures of Ni(CO)4	1	Lecture	Black Board

F 0	E-(00)5	1	Chalk &	Video
5.2	Fe(CO)5	1	talk	lecture
5.3	Cr(CO)6,	1	Lecture	Black Board
5.4	Fe2(CO)9, Co2(CO)8	2	Blended Learning	Black Board
5.5	Organometallic chemistry - Definition - Classification based on the nature of metal–carbon bond - Ionic,	1	Chalk & talk	Black Board
5.6	sigma bonded, pi bonded	2	Lecture	Black Board
5.7	and electron deficient organometallic compounds.	1	Chalk & talk	Black Board
5.8	Hapticity – Classification of organometallic compounds on the basis of hapticity	1	Discussion	Black Board
5.9	Preparation, Structure and bonding in Zeise's salt.	2	Chalk & talk	Black Board

	PO1	PO2	PO3	PO4	PO5	
CO1	3	2	2	3	3	
CO2	3	3	3	2	3	
CO3	3	3	2	3	2	
CO4	3	3	2	3	1	
CO5	3	2	3	3	1	
3 - Strong 2 - Medium 1- Low						

COURSE DESIGNER: Dr. M. Ulaganatha Raja and Dr. K. Kavitha

Core Subject

PHYSICAL CHEMISTRY – III SEMESTER V

Code: 212203503 4 Hrs/Week Credits 4

Preamble:

- ${\scriptstyle \measuredangle}$ To study the fundamentals of thermodynamics and thermo chemistry
- To enumerate second law of thermodynamics, state functions of S, A, G and its applications
- \measuredangle To explain the third law of thermodynamics and chemical equilibrium
- \varkappa To study in detail about the laws of kinetics and to apply them in the laboratory and describe the theories of reaction rate
- \measuredangle To predict the symmetry element ad point group of a molecule

COURSE OUTCOMES (COs)

On Successful completion of the course, the student will be able to

No.	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO 1	Summaries the fundamental concepts of thermodynamics and enthalpy of reactions.	Up to K3
CO2	Analyze and explore the concept related to law of thermodynamics	Up to K3
CO3	To understand the importance of absolute zero and Examine the applications of equilibrium constant.	Up to K3
CO4	Apply the tools to derive rate law, order & molecularity of a reaction and understand the theories of reactions rates	Up to K3
CO5	Identify the symmetry elements and point groups for a given molecule	Up to K3
	K1- Knowledge K2 – Understand K	3-Apply

UNIT – I: Thermodynamics – I

Terms and concept – system, surroundings and boundary – state of a system and state variables – extensive and intensive properties – state functions and path functions – types of thermodynamic processes – exact and inexact differentials – Euler's theorem and cyclic rule – Zeroth law of thermodynamics and its significance. First law of thermodynamics – mathematical formulation – internal energy and enthalpy of system – relation between ΔH and ΔE – heat capacity and its types – relation between Cp and Cv –Joule Thomson effect – Joule Thomson Co-efficient in the case of ideal and real gases – inversion temperature – Thermo chemistry - relation between enthalpy of reaction at constant volume (qv) and at constant pressure (qp) – Variation of enthalpy change of reaction with temperature (Kirchoff's equation) – Hess's Law of constant heat summation and its applications – bond energies and application of bond energies (determination of resonance energy and enthalpies of reaction).

UNIT – II: Thermodynamics II

Limitation of I law of thermodynamics – Second law of thermodynamics – various statement of II law – Carnot's cycle and efficiency of heat engine and its problem – concept of entropy – definition and physical significance of entropy- entropy as a function of V and T variables & P and T variables – entropy of mixing of gases – concept of Helmholtz free energy (A) and Gibb's free energy function – variation of Gibb's free energy with temperature and pressure – free energy change during the isothermal and reversible expansion of an ideal gas – Gibbs-Helmholtz equation and its applications – Maxwell's relationships – criteria for reversible and irreversible processes in terms of entropy and free energy changes – Clapeyron equation & Clausius-Clapeyron equation and its significance -

UNIT – III: Thermodynamics III

Third law of Thermodynamics - Nernst heat theorem and its limitations – Statement of IIIrd law-Plank's statement, Lewis Randall statement determination of absolute entropies of solids, liquids and gases – Residual entropy - exception to third law with reference to examples of CO, N₂O, H₂O and NO molecules. Chemical equilibria – free energy of a spontaneous reaction – problem involving standard free energy - law of mass action - Van't Hoff reaction isotherm - relations between Kp and Kc - Homogeneous equilibria - Equilibrium constants in terms of pressure and concentration (dissociation of PCl_5) – temperature dependence of equilibrium constant -Heterogeneous equilibria (Dissociation of $CaCO_3$) - thermodynamic interpretation of Le Chatelier's principle (Concentration, temperature and pressure)

[12 Hrs]

[12 Hrs]

[12 Hrs]

UNIT – IV: Chemical Kinetics:

Introduction – rate of reaction – factors influencing rate of reaction – rate law and rate constant – order and molecularity of a reaction – Reaction of pseudo unimolecular reactions – hydrolysis of an ester by acid and inversion of cane sugar - Derivation of integrated rate equations for zero order, first order, second order ($2A \rightarrow P$) and third order - half life period - Method of determining order of a reaction - Graphical method, half life method and differential method - Influence of temperature on the rate of reaction – Arrhenius rate equation and its significance – measurement of parameters. Theory of reaction rates – bimolecular collision theory – unimolecular reactions – Lindemann's hypothesis.

UNIT – V:

[12 Hrs]

Group Theory:

Molecular symmetry elements and symmetry operations – operations – products of symmetry operations – properties of a group - similarity transformation – classes and sub groups – group multiplication table – C_{2v} - Cyclic rule and Inverse rule. Point groups – classification of molecule into point groups – C_{2v} , C_{3v} . C_2 h, D_2 h, D_3 h, D_4 h, D_6 h, T_d and O_h – Vector and matrix Algebra – symmetry operations and transformation matrices – Great orthogonality theorem – construction of character table for C_{2v} point group.

TEXT BOOKS:

- 01. Puri. B.R., Sharma. L.R., and Pathania. S., Principles of Physical Chemistry, 46th edition, Vishal Publishing Co., New Delhi, 2012.
- 02. Arun Bahl, Bahl. B.S. and Tuli. G.D., Essentials of Physical Chemistry, S. Chand & Co., New Delhi.
- 03. Soni.P.L., Text Book of Physical Chemistry, Sultan Chand & Sons, 2011.
- 04. Gopinathan. M.S., Ramakrishnan. V. Group theory in Chemistry, Vishal Publishing Co., New Delhi, 2013.

REFERENCES:

- 01. Alkins. P.W., Physical Chemistry, 9th edition, New York, Oxford University.
- 02. Glasstone S., Thermodynamics for Chemists, Van Nostrand Co., Inc., New York.
- 03. Rajaram.J., and Kuriacose, J.C., Thermodynamics, 3rd Edition, S. Chand & Co., New Delhi, 2012. Laidler. K.J., Chemical Kinetics, 3rd edition, McGraw Hill, New Delhi.
- 04. Cotton F.A., Chemical Applications of Group Theory, Wiley Easter Ltd., New Delhi.

05. Moore W.J, "Physical Chemistry" 1996, 6/E, MacGraw Hill Publication. **WEB RESOURCES:**

- 01. https://courseware.cutm.ac.in/wpcontent/uploads/2020/06/thermod ynamic-primciple.pdf
- 02. https://archive.org/download/crossref-pre-1909-scholarlyworks/10.1103%252Fphysrevseriesi.10.116.zip/10.1103%252Fphysre vseriesi.21.260.pdf
- 03. https://www.tau.ac.il/~tsirel/dump/Static/knowino.org/wiki/Entropy _(thermodynamics).html

[12 Hrs]

- 04. https://chem.libretexts.org/Bookshelves/General_Chemistry/Book%3 A_Chem1_(Lower)/11%3A_Chemical_Equilibrium/11.01%3A_Introduct ion_to_Chemical_Equilibrium
- 05. https://lavelle.chem.ucla.edu/forum/viewtopic.php?t=10290
- 06. https://chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry_Textbook_Maps/Supplemental_Modules_(Physical_and_Theoretical_Chemistry)/Equilibria/Le_Chateliers_Principle/Le_Chatelier's_Principle_Fundamentals
- 07. https://users.cs.duke.edu/~reif/courses/molcomplectures/Kinetics/K ineticsBookstaver/KineticsBookstaver.ppt
- 08. https://chem.libretexts.org/Courses/Pacific_Union_College/Quantum_ Chemistry/12%3A_Group_Theory_-
- _The_Exploitation_of_Symmetry/12.06%3A_Character_Tables **PEDAGOGY:** Chalk & Talk , LCD

COURSE CONTENTS & TEACHING / LEARNING SCHEDULE

Modu le No.	Торіс	No. of Lectur es	Content Delivery Method	Teaching Aids
	UNIT – I [12 Hrs]			
1.1	Terms and concept – system, surroundings and boundary – state of a system and state variables	2	Chalk & Talk	Black Board
1.2	extensive and intensive properties – state functions and path functions – types of thermodynamic processes	1	Chalk & Talk	Black Board
1.3	exact and inexact differentials – Euler's theorem and cyclic rule – Zeroth law of thermodynamics and its significance.	2	Chalk & Talk	LCD
1.4	First law of thermodynamics – mathematical formulation – internal energy and enthalpy of system – relation between ΔH and ΔE – heat capacity and its types – relation between Cp and Cv	2	Lecture	Black Board
1.5	Joule Thomson effect – Joule Thomson Co- efficient in the case of ideal and real gases – inversion temperature –	2	Chalk & Talk	Black Board
1.6	Thermo chemistry - relation between enthalpy of reaction at constant volume (q_v) and at constant pressure (q_p) – Variation of enthalpy change of reaction with temperature (Kirchoff's equation)	1	Chalk & Talk	Black Board
1.7	Hess's Law of constant heat summation and its applications – bond energies and application of bond energies (determination of resonance energy and enthalpies of reaction).	2	Chalk & Talk	LCD
	UNIT – II [12 Hrs]			
2.1	Limitation of I law of thermodynamics – Second law of thermodynamics – various statement of II law	1	Lecture	LCD
2.2	Carnot's cycle and efficiency of heat engine and its problems	1	Chalk & Talk	Black Board
2.3	concept of entropy – definition and physical significance of entropy- entropy as a function of V and T & P and T	2	Chalk & Talk	Black Board
2.4	entropy of mixing of gases	1	Chalk & Talk	Black Board
2.5	concept of Helmholtz free energy (A) and Gibb's free energy function – variation of Gibb's free energy with temperature and	1	Chalk & Talk	Black Board

-	11			
	pressure			
2.6	free energy change during the isothermal and reversible expansion of an ideal gas –	1	Chalk & Talk	Black Board
2.7	Gibbs-Helmholtz equation and its applications – Maxwell's relationships	2	Chalk & Talk	Black Board
2.8	criteria for reversible and irreversible processes in terms of entropy and free energy changes	2	Chalk & Talk	Black Board
2.9	Clapeyron equation & Clausius-Clapeyron equation and its significance	1	Chalk & Talk	Black Board
	UNIT – III [12 Hrs]			
3.1	Third law of Thermodynamics - Nernst heat theorem and its limitations	2	Chalk & Talk	LCD
3.2	Statement of III rd law-Plank's statement, Lewis Randall statement - determination of absolute entropies of solids, liquids and gases	2	Chalk & Talk	Black Board
3.3	Residual entropy - exception to third law with reference to examples of CO, N_2O , H_2O and NO molecules.	1	Chalk & Talk	Black Board
3.4	Chemical equilibria – free energy of a spontaneous reaction – problem involving standard free energy - law of mass action - Van't Hoff reaction isotherm - relations between Kp and Kc	2	Chalk & Talk	BlackBoar d
3.5	Homogeneous equilibria - Equilibrium constants in terms of pressure and concentration (dissociation of PCl ₅) - temperature dependence of equilibrium constant	3	Chalk & Talk	LCD
3.6	Heterogeneous equilibria (Dissociation of CaCO ₃) - thermodynamic interpretation of Le Chatelier's principle (Concentration, temperature and pressure)	2	Chalk & Talk	Black Board
	UNIT – IV [12 Hrs]		•	•
4.1	Introduction – rate of reaction – factors influencing rate of reaction - rate law and rate constant – order and molecularity of a reaction - Reaction of pseudo unimolecular reactions – hydrolysis of an ester by acid and inversion of cane sugar	3	Chalk & Talk	Black Board
4.2	Derivation of integrated rate equations for zero order, first order, second order (2A \rightarrow P) and third order - half life period	2	Chalk & Talk	LCD
4.3	Method of determining order of a reaction - Graphical method, half life method and differential method	3	Chalk & Talk	Black Board
4.4	Influence of temperature on the rate of reaction – Arrhenius rate equation and its significance – measurement of parameters.	2	Chalk & Talk	Black Board
4.5	Theory of reaction rates – bimolecular collision theory – unimolecular reactions – Lindemann's hypothesis.	2	Chalk & Talk	Black Board
	UNIT – V [12 Hrs]			
5.1	Molecular symmetry elements and symmetry operations – operations – products of symmetry operations –properties of a group - similarity transformation	2	LCD	Black Board
5.2	classes and sub groups – group multiplication table – C_{2v}	2	Chalk & Talk	Black Board

5.3	Cyclic rule and Inverse rule	1	Chalk & Talk	Black Board
5.4	Point groups – classification of molecule into point groups – C_2v , C_3v . C_2h , D_2h , D_3h , D_4h , D_6h , T_d and O_h	2	Chalk & Talk	LCD
5.5	Vector and matrix Algebra – symmetry operations and transformation matrices	3	Chalk &Talk	LCD
5.6	Great orthogonality theorem – construction of character table for C_{2v} point group.	2	Chalk &Talk	Black Board

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	3
CO2	3	2	3	3	3
CO3	3	3	3	3	3
CO4	3	3	2	3	3
CO5	2	3	3	3	2
	3 - Stro	ong 2 -	Medium	1- Low	

COURSE DESIGNER: Dr.K.VIJAYARAJ and Dr.M. MANIMEGALAI

Core Subject	ANALYTICAL CHEMISTRY AND APPLICA	TIONS OF
_	COMPUTERS IN CHEMISTRY	Code: 212203504
	SEMESTER V	3 Hrs/Week
		Credits 3
D 11		

Preamble:-

UNIT – I:

The course explains the structure of solids and nuclear chemistry. Discuss the errors in chemical analysis and electro analytical methods.

	Successiti completion of the course, the student will be able to				
No.	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)			
CO 1	students will understand about gravimetric analysis and colorimetric analysis	Up to K3			
CO2	to understand basic concepts in data and error analysis	Up to K3			
CO3	the students will acquire knowledge on electro analytical techniques	Up to K3			
CO4	to understand the basic concepts of Cheminformatics	Up to K3			
CO5	the students will gain the knowledge on various applications of cheminformatics	Up to K3			

COURSE OUTCOMES (COs) On Successful completion of the course, the student will be able to

K1- Knowledge K2 – Understand K3-Apply

[9 Hrs]

- a) Gravimetric Analysis Qualities of a good precipitate Methods of obtaining the precipitate conditions for effective precipitation choice of precipitants merits and demerits of organic precipitants Types specific and selective precipitants sequestering agents Paneth Fajans Hahn law co-precipitation post precipitation from homogeneous solution Methods to minimize co-precipitation and Post precipitation.
- b) Error Analysis: Errors definition types of errors minimization of errors - Precision: Ways of expressing precision- Accuracy: Ways of

expressing accuracy & rules for improving accuracy of data confidence limits - Rejection of data - Q - test - Significant figures computation rules.

UNIT – II:

[9 Hrs]

[9 Hrs]

[9 Hrs]

- a) Data Analysis: Graphical method - curve fitting - Aim - Method of least squares - scatter diagrams - correlation coefficient.
- Colorimetric Analysis: Principle Beer Lambert's law b) Limitation of Beer - Lambert's law - Advantage of Colorimetric Analysis: visual colorimeter - standard series method - Colorimetric titration method - Estimation of iron by Colorimetric titration method - Estimation of Nickel by standard series method.
- UNIT III:

Electroanalytical Methods: Primary and secondary Coulometry titrations - examples - potentiometric titration - polarography - Basic principle applications - Amperometry -voltammetry - basic principle of cyclic voltammetry -applications.

UNIT – IV:

Computer Representation of molecules in Database: Molecular model -Chemdraw - connection table - Linear notation - canonical representation substructure - sub graph isomerism based finger point. [9 Hrs]

UNIT – V:

Application of cheminformatics: Chemical databases - 2D substructure searching - 3D database searching - Generation and retrieval - use of QSAR and combinatorial library in drug design.

TEXT BOOKS:

- 01. Jurgen. W.E. and Reichenbacher. M., Challenges in Analytical Quality Assurance, Springer -Verlag Heidelberg Berlin, 2016.
- 02. Dinesh. P.M. and Sartaj.S., Handbook of Data Structures and Applications, 2nd Ed., 2018.
- 03. Nelu. G., Rodriguez.S., Ewing's Analytical Instrumentation Handbook, 4th Ed., 2019.
- 04. Ne'ser Neuman.E., Advanced Potentiometry: Potentiometric Titration and their Systematic Error, Springer, 2009.
- 05. Mukbanjani. O.V., Susanto.H. and Vakshrushev. A.V., Chemical Technology and Informatics in Chemistry with Applications, 1st Ed., 2019.

REFERENCES:

- 01. Dr. BajarangBaliLal., Dr. Srivashava, Dr. Amarnath Mishra, Fundamentals of Analytical Chemistry, Innovative Publication Book, 2016.
- 02. H.H.Trim., Analytical Chemistry: Methods and Applications, 1st Ed., Pearson Publication, April, 2011.
- 03. Skoog, West and Holler, Analytical Chemistry An Introduction, 8th Ed., Saunders College Publisher, New York, 2012.

WEB RESOURCES:

- 1. https://themasterchemistry.com/analytical-chemistry-introduction-historyand-applications/
- 2. https://www.thoughtco.com/definition-of-analytical-chemistry-604367
- 3. https://carla.umn.edu/learnerlanguage/error_analysis.html
- 4. https://www.technic.com/analytical-controls/capabilities/data-analysis
- 5. https://www.corrosionpedia.com/definition/4491/colorimetric-analysis
- 6. https://nptel.ac.in/courses/102106070
- 7. https://www.azolifesciences.com/article/How-is-Chemoinformatics-Used-in-Drug-Discovery.aspx

PEDAGOGY: Lecture, Chalk and Talk

COURSE CONTENTS & TEACHING / LEARNING SCHEDULE

Module No.	Торіс	No. of Lectur es	Content Delivery Method	Teaching Aids
	UNIT – I [9 Hi	rs]		
1.1	Qualities of a good precipitate - Methods of obtaining the precipitate	1	Lecture	Black Board
1.2	conditions for effective precipitation – choice of precipitants	1	Lecture	LCD
1.3	merits and demerits of organic precipitants	1	Blended Learning	Black Board
1.4	Types – specific and selective precipitants – sequestering agents	1	Lecture	LCD
1.5	Paneth – Fajans – Hahn law – co– precipitation – post precipitation from homogeneous solution – Methods to minimize co- precipitation and Post precipitation.	1	Chalk & talk	Black Board
1.6	Principle - Beer - Lembert's law - Advantage of Colorimetric Analysis - Limitation of Beer - Lambert's law	1	Chalk & talk	Black Board
1.7	visual colorimeter - standard series method - Balancing method - Dilution method	1	Chalk & talk	LCD
1.8	Colorimetric titration method - Estimation of iron by balancing method	1	Chalk & talk	LCD
1.9	Estimation of Nickel by standard series method	1	Chalk & talk	LCD
	UNIT – II [9 H	[rs]		
2.1	Graphical method - curve fitting	1	Chalk & talk	Black Board
2.2	Aim - Method of least squares - scatter diagrams	1	Chalk & talk	LCD
2.3	correlation coefficient	1	Chalk & talk	Black Board
2.4	Errors - definition - types of errors	1	Chalk & talk	Black Board
2.5	minimization of errors	1	Chalk & talk	Black Board
2.6	Precision: Ways of expressing precision	1	Chalk & talk	Black Board
2.7	Accuracy: Ways of expressing accuracy	1	Chalk & talk	Black Board

			1	
2.8	rules for improving accuracy of data- confidence limits - Rejection of data	1	Chalk & talk	Black Board
2.9	Q - test - Significant figures - computation rules.	1	Discussion	LCD
	UNIT – III [9 H	[rs]		
3.1	PrimaryCoulometry titrations	1	Chalk & talk	PPT & LCD
3.2	secondary Coulometry titrations	1	Chalk & talk	Black Board
3.3	examples	1	Lecture	Black Board
3.4	potentiometric titration	1	Lecture	Black Board
3.5	polarography – Basic principle	1	Chalk & talk	LCD
3.6	applications	1	Chalk & talk	Black Board
3.7	Amperometry	1	Discussion	Black Board
3.8	voltammetry	1	Chalk & talk	Black Board
3.9	basic principle of cyclic voltammetry –applications	1	Discussion	Black Board
	UNIT – IV [9 H	[rs]		
4.1	Computer Representation of molecules in Database	2	Lecture	PPT & LCD
4.2	Molecular model	1	Chalk & talk	Black Board
4.3	Chemdraw	1	Lecture	PPT & LCD
4.4	Connection table	1	Lecture	Black Board
4.5	Linear notation	1	Lecture	LCD
4.6	Canonical representation	1	Chalk & talk	Black Board
4.7	Substructure	1	Discussion	Black Board
4.8	Sub graph isomerism based finger point	1	Chalk & talk	Black Board
	UNIT – V [9 H	rs]		
5.1	Application of cheminformatics	1	Chalk & talk	PPT & LCD
5.2	Chemical databases	1	Lecture	Black Board
5.3	2D substructure searching	2	Lecture	PPT & LCD
5.4	3D database searching	2	Lecture	Black Board
5.5	Generation and retrieval	1	Chalk & talk	LCD
5.6	use of QSAR	1	Lecture	Black Board
5.7	combinatorial library in drug design	1	Chalk & talk	Black Board

	PO1	PO2	PO3	PO4	PO5
CO1	3	2	2	3	3
CO2	3	3	3	2	3
CO3	3	3	2	3	2
CO4	3	3	2	2	1
CO5	3	2	3	3	1
	3 - Stro	ong 2 -	Medium	1- Low	

COURSE DESIGNER: Dr. S. Madhupriya & Sakthi Athithan A S

Part - IV1. FOOD PROCESSING AND PRESERVATIONCode: 214403522Skill Based Elective - IIISEMESTER V2 Week/HrsCredits 2

Preamble:

The course briefly outlines the basic knowledge in food processing and its preservation techniques and also discusses the food quality.

COURSE OUTCOMES (COs)

On Successful completion of the course, the student will be able to

No.	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO1	Discuss the aims of food science and preparative operations in food industry.	Up to K3
CO2	Tell the food preservation methods, types of evaporators and types of driers.	Up to K3
CO3	Explain the dairy products preservation and processing operations.	Up to K3
CO4	Understand the concepts of storage of vegetables, fruits, meat, seafood ,egg and their production.	Up to K3
CO5	Summarize the food quality factors	Up to K3

K1- Knowledge K2 – Understand K3-Apply

UNIT – I:

Food Processing:Aims of food science and technology – Constituents of food, food as a source of energy. Preparative operations in food industry - cleaning, sorting and grading of food raw materials.

UNIT – II:

Food Preservation:Commercial heat preservation methods - sterilization, pasteurization and Balancing - Evaporation and drying - Types of evaporators, Types of driers. Low-temperature food processing and preservation methods - Refrigeration and cold storage only. UNIT - III: [6 Hrs]

Milk and Dairy Products Preservation:Milk production and quality control milk processing operations. Types of milk and milk products – Butter making – Manufacture of ice cream.

UNIT – IV:

(a) Vegetables and Fruits and their Products Preservation:Storage of vegetables, vegetable products, storage of fruits, fruit products, fruit juice production.

(b) Meat, Sea Food and Eggs Preservation:Types of meat, preservation, cooking of meat, storage and processing of fish and fish products. Egg and Egg products.

UNIT – V:

Food Quality: Sensory Evaluation of Food Quality - Appearance factors -Textural factors - Flavour factors - Quality factors for consumer safety -Nutritional quality - Sanitary Quality - Food Safety standards.

TEXT BOOKS:

- 01. Varzakas. T., Tzia. C., Handbook of Food Processing: Food Preservation, 2nd Edition, CRS Press, Delhi, 2015.
- 02. Shakuntal Manay. N., Food Facts and Principles, AA Press, Delhi, 2008.
- 03. Desukumar., Outline of Dairy Technology, 2nd Edition, CBS Publication, Delhi, 2001.
- 04. Hui. H.Y., Ozgul.E., Handbook of Vegetable Preservation and Processing, 2nd Edition, CRS Press, Nov. 2015.
- 05. Huang. Y., Whittakers.D.A., Lacey. R.E., Automation for Food Engineering, Food Quality, Quantization and Process Control, 1st Edition, CRC Press, 2001.

REFERENCES:

- 01. Siva Sankar B., Food Processing and Preservation, Prentice Hall of India Private Limited.
- 02. Srivastava., Fruit Vegetable Preservation, Principles and Practices, CRS Press, 2014.
- 03. Varzakas.T., Tzia.C., Handbook of Food Processing: Food Safety, Quality and Manufacturing Processes, CRC Press, 2015.
- 04. Course content & Teaching/Learning schedule

WEB RESOURCES:

- 1. https://byjus.com/biology/food-processing/
- 2. https://www.britannica.com/technology/food-processing

[6 Hrs]

[6 Hrs]

[6 Hrs]

[6 Hrs]

- 3. https://www.britannica.com/topic/food-preservation
- 4. https://www.usdairy.com/dairy-nutrition/products
- 5. https://www.myvmc.com/lifestyles/milk-and-milk-products-dairy-products/
- 6. https://www.fao.org/dairy-production-products/products/types-and-characteristics/en/
- 7. https://nutritionfoundation.org.nz/nutrition-facts/food-groups/milk-and-milk-products/
- 8. https://www.thespruce.com/how-to-preserve-fruits-and-vegetables-1402945
- https://opjsrgh.in/Content/Worksheet/PRACTICE-WS/2021-2022/day101/12-AGRICULTURE.pdf
- 10.https://egyankosh.ac.in/bitstream/123456789/12396/1/Unit-14.pdf
- 11.https://samples.jbpub.com/9781449694777/9781449603441_CH03.pdf

PEDAGOGY: Lecture, Chalk & Talk, PPT

COURSE CONTENTS & TEACHING / LEARNING SCHEDULE

Module No.	Торіс	No. of Lectures	Content Delivery Method	Teaching Aids
	UNIT – I [6 H	[rs]		
1.1	Aims of food science and technology	1	Lecture	Black Board
1.2	Constituents of food, food as a source of energy	2	Lecture	Black Board
1.3	Preparative operations in food industry	1	Lecture	Black Board
1.4	Cleaning and sorting	1	Chalk & talk	Video lecture
1.5	grading of food raw materials.	1	Lecture	PPT & White Board
	UNIT – II [6 I	Hrs]		
2.1	Commercial heat preservation methods	1	Lecture	Black Board
2.2	sterilization, pasteurization and Blanching	1	Chalk & talk	Black Board
2.3	Evaporation and drying	1	Lecture	Black Board
2.4	Types of evaporators, Types of driers.	1	Lecture	Black Board
2.5	Low-temperature food processing and preservation methods	1	Chalk & talk	Black Board
2.6	Refrigeration and cold storage only	1	Lecture	Black Board
	UNIT – III [6]	Hrs]		
3.1	Milk production and quality control	1	Chalk & talk	PPT & LCD
3.2	milk processing operations	1	Chalk & talk	Black Board
3.3	Types of milk and milk products	2	Lecture	Black Board
3.4	Butter making – Manufacture of ice cream.	2	Chalk & talk	PPT & LCD
	UNIT – IV [6]	Hrs]		
4.1	Storage of vegetables, vegetable products,	2	Chalk & talk	Black Board
4.2	storage of fruits, fruit products, fruit juice production.	1	Chalk & talk	Black Board
4.3	Types of meat, preservation, cooking of meat	1	Chalk & talk	Black Board
4.4	storage and processing of fish and fish products. Egg and Egg products.	2	Chalk & talk	Black Board

UNIT – V [6 Hrs]					
5.1	Sensory Evaluation of Food Quality	1	Lecture	Black Board	
5.2	Appearance factors - Textural factors - Flavour factors	2	Chalk & talk	Black Board	
5.3	Quality factors for consumer safety	1	Chalk & talk	Black Board	
5.4	Nutritional quality - Sanitary Quality - Food Safety standards	2	Chalk & talk	Black Board	

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	2	2	3	3
CO4	2	3	2	3	3
CO5	3	3	2	3	3
	3 - Stro	ong 2 -	Medium	1- Low	

COURSE DESIGNER: Dr. S. Packianathan

Part - IV 2.1 INDUSTRIAL CHEMICALS AND ENVIRONMENT Code:218203522 Skill Based Elective - III SEMESTER V 2 Hrs/Week Credits 2

Preamble:

K To understand the fundamentals of environmental chemistry

 \varkappa To study water, soil, energy and environment

COURSE OUTCOMES (COs)

On Successful completion of the course, the student will be able to

No.	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO 1	To understand the fundamental concepts of environmental chemistry	Up to K3
CO2	To understand the impact of pollutant in water	Up to K3
CO3	To study the impact of chemical composition in atmosphere	Up to K3
CO4	To understand the impact of chemical component & pollutant in soil to know the detailed issues of hazards chemicals in environmental	Up to K3
CO5	To know the detailed study of energy, environmental and waste management	Up to K3

K1- Knowledge K2 – Understand K3-Apply

UNIT – I: Fundamentals

Concept and Scope of Environmental Chemistry; Environmental segments; Natural Cycles – Hydrological Cycle, Carbon Cycle, Oxygen Cycle, Nitrogen Cycle, Phosphorus Cycle, Sulphur Cycle. Natural and Man-made Disasters – Recent Natural Disasters; Anthropogenic Effects.

UNIT – II: Water Chemistry

Water chemistry:Water resources - Properties of water – standards of quality of water – water pollution and its effects. Eutrophication concept of DO, BOD, COD, sedimentation. Sampling techniques for water.

[6 Hrs]

[6 Hrs]

Methods for treatment of effluents: Screening, neutralization, equalization, primary treatment, secondary treatment, tertiary treatment.

UNIT – III: Atmospheric Chemistry

Atmosphere- Composition of atmosphere, Evolution of the atmosphere, chemical and photochemical, reactions in the atmosphere –Particulates, ions and radicals in the atmosphere; Chemical processes for formation of organic and inorganic particulate matter – Global warming and effects of CO, SO2, NOx. Sampling techniques for air.

UNIT – IV: Soil Chemistry and Hazardous Wastes [6 Hrs]

Soil chemistry- Sources of soil pollution, Chemical pollutants, metallic pollutants, industrial effluents, agricultural wastes, radioactive pollutants, biological agents, pesticides, detergents -

Sampling techniques for soil.

Environmental chemistry of hazardous wastes - Health effects of hazardous wastes - Preventive Measurements.

UNIT – V: Energy and Environment

Fuel and energy resources- Renewable and Non Renewable energy resources-Coal, petroleum, natural gas, nuclear fission, fusion solar energy, hydrogen, gasohol, world energy resources – consumption and conservation. Energy from Wastes - Water-Based Biomass, Solid Wastes, Biogas.

TEXT BOOKS:

- 01. Sharma and Kaur, **Environmental Chemistry**, Krishna Publishers, New Delhi, 2000.
- 02. A.K. De, **Environmental Chemistry**, Wiley Eastern Ltd, New Delhi, 2014.
- 03. S.E Manahan, **Environmental Chemistry**, Lewis Publishers, London, 2001.
- 04. S.K. Banerji, **Environmental Chemistry**, Prentice Hall of India, New Delhi, 2005.

05. S.C.Bhatia, Environmental Chemistry, CBS Publishers, 2003.

REFERENCES:

- 01. J.Rose, **Environmental Toxicology**, Gordon and Breach Science Publication, New York, 1998.
- 02. S.Ladsberger and Creatchman (Ed.), **Elemental Analysis of Airborne Particles**, Gordon and Breach Science Publication New York, 1998.
- 03. S.M. Khopkar, **Environmental Pollution analysis**, Wiley Eastern, New Delhi, 1994.
- 04. V.P. Kudesia, Environmental chemistry, 2000, Pragati publications.
- 05. Thomas G. Spiro, William M. Stigliani, Chemistry of the environment, 2nd eddition, New Delhi, 2002.

WEB RESOURCE:

- 1. https://www.egyankosh.ac.in/bitstream/123456789/79927/1/Unit-1.pdf
- 2. https://byjus.com/chemistry/environmental-chemistry/
- 3. https://ncert.nic.in/textbook/pdf/kech207.pdf
- 4. https://stannescet.ac.in/cms/staff/qbank/CSE/Notes/CY8151-Engineering%20Chemistry-1098045625-unit_1%20(1).pdf
- https://www.lkouniv.ac.in/site/writereaddata/siteContent/20200324112607
 5319ranvijay_engg_water_technology.pdf
- 6. http://cires1.colorado.edu/jimenez/AtmChem/CHEM-5151_S05_L1.pdf

[6 Hrs]

- 7. https://www.nswai.org/docs/Solid%20and%20Hazardous%20Waste%20Man agement%20(1).pdf
- $8. \ http://tumkuruniversity.ac.in/oc_pg/es/HAZARDOUS\%20WASTE.pdf$
- 9. https://wgbis.ces.iisc.ernet.in/energy/HC270799/RWEDP/acrobat/rm29.pdf
- 10.https://madeeasy.in/uploads/examsolution/BasicsofEneryandEnvironment. pdf

PEDAGOGY: Chalk-Talk class room activities, Group Discussion, Seminar, Quiz through ICT- Mode

Module No.	Торіс	No. of Lectures	Content Delivery Method	Teaching Aids
	UNIT – I [6	Hrs]		
1.1	Environmental segments;	1	Chalk & Talk	Black Board
1.2	Natural Cycles - Hydrological Cycle, Carbon Cycle	1	Chalk & Talk	Black Board
1.3	Oxygen Cycle, Nitrogen Cycle	1	Lecture	Black Board
1.4	Phosphorus Cycle, Sulphur Cycle.	1	Chalk & Talk	Black Board
1.5	Natural and Man-made Disasters	1	Chalk & Talk	Black Board
1.6	Recent Natural Disasters, Anthropogenic Effects	1	Chalk & Talk	Black Board
	UNIT – II [6 Hrs]	1	
2.1	Water resources - Properties of water, standards of quality of water	1	Lecture	LCD
2.2	water pollution and its effects	1	Chalk & Talk	Black Board
2.3	Eutrophication concept of DO, BOD, COD	1	Chalk & Talk	Black Board
2.4	sedimentation. Sampling techniques for water	1	Chalk & Talk	Black Board
2.5	Methods for treatment of effluents: Screening,	1	Chalk & Talk	Black Board
2.6	neutralization, equalization, primary treatment, secondary treatment, tertiary treatment	1	Chalk & Talk	Black Board
	UNIT – III [6 Hrs]		
3.1	Composition of atmosphere- Evolution of the atmosphere, chemical and photochemical	1	Lecture	LCD
3.2	Particulates and ionsin the atmosphere- Radicals in the atmosphere	1	Chalk & Talk	Black Board
3.3	Chemical processes for formation of organic particulate matter	1	Chalk & Talk	Black Board
3.4	Chemical processes for formation of inorganic particulate matter	1	Chalk & Talk	Black Board
3.5	Global warming, Effects of global warming	1	Chalk & Talk	Black board
3.6	effects of CO, SO2, NOx. Sampling techniques for air	1	Chalk & Talk	Black Board
	UNIT – IV	6 Hrs]		
4.1	Sources of soil pollution	1	Chalk & Talk	Black Board
4.2	Chemical pollutants, metallic pollutants	1	Chalk & Talk	Black Board

COURSE CONTENTS & TEACHING / LEARNING SCHEDULE

4.3	industrial effluents, agricultural wastes, radioactive pollutants, biological agents	1	Chalk & Talk	Black Board	
4.5	pesticides, detergents, sampling technique for soil	1	Chalk & Talk	Black Board	
4.6	Environmental chemistry of hazardous wastes	1	Chalk & Talk	Black Board	
4.7	Health effects of hazardous wastes - Preventive Measurements.	1	Chalk & Talk	Black Board	
UNIT – V [6 Hrs]					
5.1	Fuel and energy resources - Renewable and Non Renewable energy resources	1	Chalk & Talk	Black Board	
5.2	Coal, petroleum, natural gas	1	Chalk & Talk	Black Board	
5.3	nuclear fission, fusion solar energy	1	Chalk & Talk	Black Board	
5.4	hydrogen, gasohol	1	Chalk & Talk	Black Board	
5.5	world energy resources - consumption and conservation	1	Chalk & Talk	Black Board	
5.6	Energy from Wastes - Water- Based Biomass- Solid Wastes, Biogas	1	Chalk & Talk	Black Board	

	PO1	PO2	PO3	PO4	PO5		
CO1	2	2	3	2	2		
CO2	2	2	3	2	3		
CO3	2	2	3	2	2		
CO4	2	2	3	2	3		
CO5	2	2	3	2	3		
3 - Strong 2 - Medium 1- Low							

COURSE DESIGNER: Dr. S. Packianathan

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Self Learning Course–Major	CHEMISTRY IN DAILY LIFE	Code: 218003522
	SEMESTER V	Addl. Credits 4

Preamble:-

🖉 To have a knowledge Pharmaceutical Chemistry and Forensic Science.

UNIT – I: Pharmaceutical Chemistry:

Introduction – Classification of drugs – Principle of drug action – Basic structure and mode of action of analgesics – Sulpha drugs, antibiotics (pencillin) antineoplastic agents and HIV drugs.

UNIT – II: Forensic Science:

Physical evidence collection and preservation of physical evidence – Techniques of analysis of physical evidence. Forensic examination of hair, fibre, drugs and alcohol. Analysis of finger prints and documents.

UNIT – III: Soil Chemistry:

Introduction – Properties of soil – Colloidal acidity and alkalinity of soil – Soil p^{H} – Micro and macro nutrients in soil – Soil erosion – Liming of soil – Application of fertilizers to soil – biofertillizers.

UNIT – IV: Textile Chemistry:

Introduction to fibre polymers – Classification – Fibre properties – Physical chemical and thermal chemical finishing of textiles – dyeing and printing – Colour in textiles.

UNIT – V: Non–Conventional Energy:

Need for non-conventional energy – Renewable energy sources – Solar energy – Collection and storage applications – Wind energy – Conversion and applications – Biomass energy – Anaerobic and biomass gasification.

TEXT BOOK:

01.Jayashree Ghose, A Text Book of Pharmaceutical Chemistry, S.Chand and Co, Limited, New Delhi.

REFERENCES:

- 1. Firman Bear, Chemistry of the Soil, 2nd Edition, Oxford and IBH Publishers, New Delhi, 1964.
- 2. Rai G.D., Non-Conventional Sources of Energy, Khanna Publishers, New Delhi, 1996 (July).
- 3. Richard Safarstin, Criminalistics, Prentice Hall of India Private Limited, New Delhi, 1978.

WEB RESOURCES:

- 1. https://pharmaedu.in/pharmaceutical-organic-chemistry-1-notes-pdf/
- 2. https://www.carewellpharma.in/B_Pharmacy/Notes/4th_Sem/Medicinal_Ch eimstry-I/Unit_1/
- 3. https://byjus.com/chemistry/forensic-chemistry/
- https://sites.ffclrp.usp.br/enqfor/arquivos/Conferencia%2010%20-%20Forensic%20Chemistry___.pdf
- 5. https://www.dcr.virginia.gov/soil-and-water/document/nmagscbsc.pdf
- 6. https://agrigyan.in/soil-science-agricultural-chemistry-sknau-all-notes/
- 7. https://www.slideshare.net/shahzadebaujiti/soil-chemistry-144860044
- 8. https://showcase.uhi.ac.uk/atom/resources/BORAS/Textile%20chemistry/t extile-chemistry/pdf/pdfVersion.pdf
- 9. https://www2.cs.arizona.edu/patterns/weaving/books/ctw_chem_2.pdf
- 10.https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SMEA3013.pdf
- 11. https://www.toppr.com/guides/physics/sources-of-energy/nonconventional-sources-of-energy/
- 12. https://byjus.com/physics/conventional-and-nonconventional-sources-of-energy/

Course Designer: Dr. S. Packianathan & Dr. A. Sakthiathithan

Core Subject

INORGANIC CHEMISTRY - IV SEMESTER VI

Code: 212203601 3 Hrs/Week Credits 3

Preamble:

The course explains the application of chemistry in the industry and a basic knowledge about the medicinal chemistry.

 \varkappa To be exposed to the applications of chemistry in the industry.

 \varkappa To have a basic knowledge about the medicinal chemistry

COURSE OUTCOMES (COs)

On Successful completion of the course, the student will be able to

No.	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO1	Outline the chemistry of Bioinorganic and applications	Up to K3
CO2	Acquire the knowledge on the preparation, properties of Silicates	Up to K3
CO3	Knowledge about the Mono and Polyneculear Metal Carbonyls	Up to K3
CO4	Understand the different types of Organometallic compounds and Inorganic Polymers	Up to K3
C05	Recall their knowledge on structure and Industrial Applications of Inorganic Compounds	Up to K3

K1- Knowledge K2 – Understand K3-Apply

UNIT-I:

Bioinorganic Chemistry

Essential and trace elements: Role of Na+, K+, Mg2+, Ca2+, in biological systems. Biological functions of iron, zinc and copper. Toxicity of Mercury, Lead, Cadmium and Arsenic. Biological applications of radioactive isotopes.

UNIT – II:

Silicates

Introduction – general properties of silicates, structure – types of silicates – ortho silicates(zircon), pyrosilicates (thortveitite), chain silicates(pyroxenes), double chain silicates or Amphiboles (asbestos), ring/cyclic silicates(beryl), sheet silicates (talc, mica), silicates having three dimensional structure (feldspars, zeolites, ultramarines)

UNIT – III:

Metal Carbonyls

Mono and polynuclear carbonyls, General methods of preparation of carbonyls – structure and bonding in Ni(CO)₄, Fe(CO)₅, Cr(CO)₆, Fe₂(CO)₉ and Co₂(CO)₈. EAN rule as applied to the above metal carbonyls.

UNIT – IV:

Organometallic compounds in Organic Synthesis

Preparation and applications of Grignard Reagents. Preparation and catalytic applications of Ziegler – Natta catalyst and Wilkinson catalyst.

Inorganic Polymers

Preparation, structure and applications of phosphonitrilic chloride [NPCl2]3 and sulphur nitride [SN]4

[9 Hrs]

[9 Hrs]

[9 Hrs]

[9 Hrs]

UNIT – V:

[9 Hrs]

Industrial Applications of Inorganic Compounds

- a) Fertilizers: Definition Benefits of fertilizers Manufacture of urea and super phosphate preparation of K₂SO₄ and potassium nitrate.
- b) Raw materials needed for match industry manufacturing process of matchsticks - Raw materials and manufacturing process of cement. Paints - Requirements of a good paint - constituents of paints.

TEXT BOOKS:

- 1. Jain P.C., and Monica Jain, Engineering Chemistry, Dhanpat Rai & Sons, Delhi, 1995.
- 2. Soni P.L., Organic Chemistry, S.Chand & Co., New Delhi.
- 3. Sharma. B.K., Industrial Chemistry Including Chemical Engineering , Goal Publisher Ltd.,
- 4. Cotton F.A., and Wilkinson, Basic Inorganic Chemistry, Wiley Eastern Limited, New York, VI edition, 1976
- 5. Madan R.D., Modern Inorganic Chemistry, S.Chand & Co., New Delhi.
- 6. Malik, Madan and Tuli, Selected Topics in Inorganic Chemistry, S.Chand & Co., New Delhi, 2010.
- 7. Soni P.L., Text book of Inorganic Chemistry, S.Chand & Co., New Delhi.
- 8. Bhaghi & Chahoal, Text Book for Bioinorganic Chemistry.
- 9. Sharma. A.K., Bio Inorganic Chemistry, Random Publications, 2012.

REFERENCES:

- 1. Gowarikar, Viswanathan and Jayadev Sreedhar, Polymer Science, Wiley Eastern Ltd., New Delhi, 1995.
- 2. Subba Rao A.S., Bio Fertilzers in Agriculture, Oxford and Ibh Publishing, Co., New Delhi, 1982.
- 3. De.A.K., Environmental Chemistry, Willey Eastern Ltd., 2nd Edition, 1987.
- 4. Swayer. W., Experimental Cosmetics Dovav Publishers, New York, 2000.
- 5. Kafarom, Wasteless Chemical Processing, Mir Publishers, 1995.
- 6. Graham. L. Patrick, An Introduction to Medical Chemistry , 4th edition, Oxford University, 2009.
- 7. Puri, Sharma and Kalia, Principles of Inorganic Chemistry, S.Chand & Co., New Delhi.
- 8. Lee.J.D., Concise Inorganic Chemistry, 5th Edition, 2014.
- 9. Simon Cotton, Lanthanides and Acitinides, Macmillan Education Ltd., 1991.
- 10. David. A. Atwood, The Rare Earth Elements: Fundamentals and Applications, Wiley, 2012.

WEB RESOURCES:

- 01. https://nptel.ac.in/courses/104105033
- 02. https://nptel.ac.in/courses/104104109
- 03. https://www.youtube.com/watch?v=S6TEcml4fCA
- 04. https://archive.nptel.ac.in/content/storage2/courses/104103071/pdf /mod2.pdf
- 05. https://www.askiitians.com/iit-jee-chemistry/physicalchemistry/acids-and-bases.aspx
- 06. https://nptel.ac.in/courses/104101079
- 07. https://nptel.ac.in/content/storage2/courses/104101005/downloads /LectureNotes/chapter %207.pdf 2 https://youtu.be/BZ_tY88000I, Coordination chemistry, IIT Kharagpur, Prof. D. RaY.
- 08. https://youtu.be/FziKko-ZQww for bioinorganic chemistry.

PEDAGOGY: Chalk and Talk, LCD, Lecture

Module No.	Торіс	No. of Lectur es	Content Delivery Method	Teaching Aids		
UNIT – I [9 Hrs]						
1 1	Role of Na+, K+, Mg2+, Ca2+, in	2	Challs & Talls	Diantz Doord		
1.1	biological systems.	3	Chaik & Taik	Black Board		
1.0	Biological functions of iron, zinc	0	Challs & Talls	Dia ala Daama		
1.2	and copper.	2	Chaik & Taik	Black Board		
1.2	Toxicity of Mercury, Lead,	0	Challs & Talls	LCD		
1.5	Cadmium and Arsenic.	2	Chaik & Taik	LCD		
1.4	Biological applications of	0	Lootuno	Dia ala Da and		
1.4	radioactive isotopes.	2	Lecture	Black Board		
	UNIT – II [9	Hrs]				
2.1	Introduction – general properties	2	Lecture	ICD		
2.1	of silicates	4	Lecture	LCD		
2.2	structure – types of silicates	1	Chalk & Talk	Black Board		
2.3	Ortho silicates(zircon),	2	Chalk & Talk	Black Board		
	pyrosilicates (thortveitite),					
0.4	chain silicates (pyroxenes), double chain silicates or Amphiboles		<u>01 11 0 75 11</u>			
2.4	(asbestos), ring/cyclic	2	Chalk & Talk	Black Board		
	silicates(beryl),					
	sheet silicates (talc, mica),					
2.5	silicates having three dimensional	2	Chalk & Talk	Black Board		
	ultramarines)					
	UNIT – III [9) Hrsl				
	Mono and polynuclear carbonyls,					
3.1	General methods of preparation	4	Chalk & Talk	Black board		
	of carbonyls					
	structure and bonding in $Ni(CO)_4$,					
3.2	$Fe(CO)_5$, $Cr(CO)_6$, $Fe_2(CO)_9$ and $Co_2(CO)_2$, FAN rule as applied to	5	Chalk & Talk	Black Board		
	the above metal carbonyls.					
	UNIT – IV [9	Hrs]		1		
4 1	Organometallic compounds in	1	Challe & Talle	Black Board		
7.1	Organic Synthesis	1		DIACK DUALU		
4.2	Preparation and applications of	2	Chalk & Talk	Black Board		
	Grignard Reagents.					
4.3	applications of Ziegler	2	Chalk & Talk	Black Board		
	Natta catalyst and Wilkinson		<u> </u>			
4.4	catalyst.	2	Chalk & Talk	Black Board		
	Preparation, structure and					
4.5	applications of phosphonitrilic	2	Chalk & Talk	Black Board		
1.0	chloride [NPCl2]3 and sulphur					
	1100000000000000000000000000000000000	Hrol				
5.1	Fertilizers: Definition	2	Chalk & Talk	Black Board		
	Benefits of fertilizers –			2 0414		
5.2	Manufacture of urea and super	2	Chalk & Talk	Black Board		
	phosphate					
5.3	preparation of K_2SO_4 and	1	Chalk & Talk	Black Board		
	potassium nitrate.					
5.4	industry	1	Chalk & Talk	Black Board		

5.5	manufacturing process of matchsticks	1	Chalk & Talk	Black Board
5.6	Raw materials and manufacturing process of cement.	1	Chalk & Talk	Black Board
5.7	Paints - Requirements of a good paint - constituents of paints.	1	Chalk & Talk	Black Board

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	2
CO2	3	3	3	3	3
CO3	3	2	3	2	3
CO4	3	3	3	3	3
CO5	3	3	3	2	3
	0 0	0	λσ 1'	1 T	

3 - Strong 2 - Medium 1- Low

COURSE DESIGNER: Dr.M. ULAGANATHA RAJA & Dr. K. KAVITHA

Core Subject

ORGANIC CHEMISTRY – IV SEMESTER VI

Code: 212203602 4 Hrs/Week Credits 4

Preamble:

The course explains the chemistry of heterocyclic compounds, dyes, natural products, amino acids, peptides, proteins and enzymes. It describes the mechanism of photochemical reactions. The basic principles and applications of green chemistry are also discussed in this course. To learn the details of Molecular rearrangements conformation and Spectroscopy

COURSE OUTCOMES (COs)

On Successful completion of the course, the student will be able to

No.	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO 1	Recall the chemistry of heterocyclics and their applications in dye industry.	Up to K3
CO2	Explain the role of heterocyclics in natural product chemistry.	Up to K3
CO3	Compare thermal and photochemical reactions.	Up to K3
CO4	Understanding the chemistry of structure and synthesis of terpeniods, alkaloids and heterocyclic compounds	Up to K3
C05	Understanding the theory of colour and constituent and applications in dye industry	Up to K3

K1- Knowledge K2 – Understand K3-Apply

UNIT – I:

Alicyclic Compounds:

- a) Preparation and properties of alicyclic compound Bayer's strain theory and its modifications. Civetone and Muscone- any one method of synthesis (No structural elucidation).
- b) Conformational Analysis: Difference between configuration and conformations. Fischer and Newman projection formulae – conformational analysis of ethane and mono substituted cyclohexane.

[12 Hrs]

UNIT – II:

- a) Molecular rearrangements:
 - i. Rearrangement to electron deficient carbon: 1,2 Shift- Pinacol pinacolone, Benzil Benzillic acid
 - ii. Aromatic rearrangements from oxygen to ring carbon: Claisen, Fries, and Benzidine
 - iii. Rearrangement to electron deficient Nitrogen: Hofmann, Beckmann, curtius
- b) Free radicals: Definition preparation, detection of free radicals and reactions of free radicals stability of free radicals- Sand Mayer reaction and Gomberg reaction and its mechanism.

UNIT – III:

Principles and Applications of Spectroscopy:

- a) UV: Introduction Types of electronic transition absorption laws bathochromic shift, hypsochromic shift, hyperchromic shift and hypochromic effect applications of UV to organic compounds Woodward Fieser rule –calculation of λ_{max} .
- b) IR: Introduction mode of vibrations overtone and combination bands. Applications of IR to organic compounds – finger print region – effect of hydrogen bonding.
- c) NMR: Introduction chemical shift shielding and deshielding effect – factors influencing chemical shift – solvent used – splitting of signals – coupling constants – NMR spectra of ethanol – temperature variation NMR.

UNIT – IV:

- a) Heterocyclic compounds: Preparation and properties of furan, pyrrole, thiophene, pyridine, indole, quinoline, and isoquinoline.
- b) Alkaloids: Definition occurrence extraction of alkaloids general methods of determining the structure of alkaloids – classification of alkaloids – structure and synthesis of following – coniine and piperine.
- c) Terpenes: Introduction classification isolation. Isoprene rule general methods of determining structure – structural elucidation of Citral, ∞-terpineol and Menthol.

UNIT – V:

Dyes:

Department of Chemistry

Definition – Theories of colour and constitution – Otto Witt theory – VB theory – MO theory classification of dyes according to structure and mode of application.

1. Azo dyes: Preparation and uses of methyl orange, congored and Bismark brown.

[12 Hrs]

[12 Hrs]

[12 Hrs]

- 2. Triphenyl methane dyes: Preparation and uses of Malachite green and Rosaniline.
- 3. Phthalein dyes: Preparation and uses of phenolphthalein, Fluorescein and eosin.
- 4. Vat dyes: Preparation and uses of indigo.

TEXT BOOKS:

- 01. Bahl S., ArunBahl, Advanced Organic Chemistry, S.Chand& Co., New Delhi, 2017.
- 02. Morrison R.T., and Boyd R.W., Organic Chemistry, 7thEdition,Prentice Hall, New Delhi, 2011.
- 03. Silverstein B.M., Bassler G.C., and Morrill T.C., Spectrometric Identification of Organic Compound, 8th Edition, Wiley, New Delhi, 2015.
- 04. Soni. P.L., Organic Chemistry, S.Chand& Co., New Delhi, 2014.

REFERENCES:

- 01. Eliel E.L., Stereo chemistry of carbon compounds, Wiley Eastern, New York, 2008.
- 02. Finar I.L., Organic Chemistry. Vol. I, 6th Edition, ELBS, England, 2002.
- 03. Finar I.L., Organic Chemistry. Vol. II, 5th Edition, ELBS, England, 2017.
- 04. Kalsi P.S., Stereochemistry and Conformational Analysis, 2nd Edition, Wiley Eastern Limited, New Delhi, 2017.
- 05. Kemp, Organic Spectroscopy, 3rd Edition, ELBS, Hampshise, 2008.
- 06. Singh and Mukherji, Reaction Mechanism in Organic compounds, McMillan, India, 2014.

WEB RESOURCES:

- 01. https://www.vedantu.com/chemistry/alicyclic-compound
- 02.https://www.youtube.com/watch?v=eFjvPGwq1EM
- 03.https://www.youtube.com/watch?v=XPJqzSs924E
- 04.https://www.youtube.com/watch?v=ZiD3UUNA7tM
- 05. https://www.youtube.com/watch?v=7jOSbtR8mTs
- 06.https://www.youtube.com/watch?v=czG3YjLpVkM
- 07.https://www.youtube.com/watch?v=4j5cMHVPStc
- 08.https://www.youtube.com/watch?v=nnVGa8OjkFo&list=PL9m2Lkh6o dgIEq94ERJIAaPg0z_1WeCrl
- 09.https://www.youtube.com/watch?v=7yOuZ3jO7A8&list=PLbMVogVj5n JQ9-OJPLXXPjMMuwc0VvQCs
- 10.https://www.youtube.com/watch?v=KsASeYmPKAQ
- 11. https://en.wikipedia.org/wiki/Terpene
- 12. https://www.youtube.com/results?search_query=Terpenes
- 13. https://www.youtube.com/watch?v=aJLzyjH6Dcc

PEDAGOGY: Chalk and Talk, PPT

COURSE CONTENTS & TEACHING / LEARNING SCHEDULE

Module No.	Торіс	No. of Lectures	Content Delivery Method	Teaching Aids
	UNIT – I [12 Hrs	8]		
1.1	Preparation and properties of alicyclic compound – Bayer's strain theory and its modifications	2	Lecture	Black Board
1.2	Civetone and Muscone- any one method of synthesis (No structural elucidation).	2	Lecture	Black Board
1.3	Conformational Analysis: Difference between configuration and conformations	2	Lecture	Black Board

1.4	Fischer and Newman projection	2	Chalk &	Black Board
1.5	conformational analysis of ethane	2	Chalk & talk	Black Board
1.6	conformational analysis of mono substituted cyclohexane.	2	Lecture	Black Board
	$\frac{12 \text{ Hr}}{12 \text{ Hr}}$	sl		I
2.1	Rearrangement to electron deficient carbon: 1,2 Shift- Pinacol – pinacolone, Benzil – Benzillic acid	2	Chalk & talk	Black Board
2.2	Aromatic rearrangements from oxygen to ring carbon: Claisen, Fries, and Benzidine	2	Chalk & talk	PPT & LCD
2.3	Rearrangement to electron deficient Nitrogen: Hofmann, Beckmann, curtius	2	Lecture	PPT & LCD
2.4	Free radicals: Definition – preparation, detection of free radicals	2	Chalk & talk	Black Board
2.5	reactions of free radicals – stability of free radicals	2	Lecture	Black Board
2.6	Sand Mayer reaction and Gomberg reaction and its mechanism.	2	Lecture	Black Board
	UNIT – III [12 Hr	s		
3.1	UV: Introduction – Types of electronic transition	1	Chalk & talk	Black Board
3.2	absorption laws – bathochromic shift, hypsochromic shift,hyperchromic shift and hypochromic effect	1	Chalk & talk	Black Board
3.3	applications of UV to organic compounds – Woodward – Fieser rule –calculation of λmax	2	Chalk & talk	Black Board
3.4	IR: Introduction – mode of vibrations – overtone and combination bands.	1	Lecture	Black Board
3.5	Applications of IR to organic compounds, finger print region – effect of hydrogen bonding	1	Lecture	PPT & LCD
3.6	NMR: Introduction – chemical shift – shielding and deshielding effect	1	Lecture	PPT & LCD
3.7	factors influencing chemical shift – solvent used	2	Lecture	PPT & LCD
3.8	splitting of signals – coupling constants	2	Lecture	PPT & LCD
3.9	NMR spectra of ethanol – temperature variation NMR	1	Lecture	PPT & LCD
	UNIT – IV [12 Hr	ːs]		
4.1	Heterocyclic compounds: Preparation and properties of furan, pyrrole, thiophene	2	Chalk & talk	Black Board
4.2	Heterocyclic compounds: Preparation and properties of pyridine, indole, quinoline, and isoquinoline	2	Chalk & talk	Black Board
4.3	Alkaloids: Definition – occurrence – extraction of alkaloids – general methods of determining the structure of alkaloids	2	Chalk & talk	Black Board
4.4	classification of alkaloids – structure and synthesis of following – coniine and piperine	2	Chalk & talk	Black Board

4.5	Introduction – classification – isolation. Isoprene rule – general methods of determining structure	2	Chalk & talk	Black Board
4.6	structural elucidation of Citral, α- terpinol and Menthol	2	Chalk & talk	Black Board
	UNIT – V [12 Hr	s]		
5.1	Definition – Theories of colour and constitution – Otto Witt theory – VB theory – MO theory classification of dyes.	4	Lecture	Black Board
5.2	Azo dyes: Preparation and uses of methyl orange, congo-red and Bismark brown	2	Chalk & talk	Black Board
5.3	Triphenyl methane dyes: Preparation and uses of Malachite green and Rosaniline.	2	Chalk & talk	Black Board
5.4	Phthalein dyes: Preparation and uses of phenolphthalein, Fluorescein and eosin.	2	Chalk & talk	Black Board
5.5	Vat dyes: Preparation and uses of indigo.	2	Chalk & talk	Black Board

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3
CO2	3	3	3	2	3
CO3	3	3	2	3	3
CO4	3	2	3	3	3
CO5	3	3	2	2	3
	3 - Stro	ong 2-	Medium	1- Low	

3 - Strong 2 - Medium

COURSE DESIGNER: Dr. T. Senthil pandian & Dr. J. Jeyasundari

Core Subject

PHYSICAL CHEMISTRY – IV SEMESTER VI

Code: 212203603 4 Hrs/Week **Credits 4**

Preamble:

- \varkappa To provide students with strong foundations on ions, electrolytes, and the laws governing ionic mobilities.
- S To know the types and an importance of electrochemical cells, potentials and measuring the potentials of cells.
- S To generate an understanding of light induced/triggered/controlled chemical reactions and to measure the kinetics of such reactions.
- z To enlighten students about electromagnetic spectrum and interaction of electromagnetic waves with molecules, and to provide an understanding of IR spectroscopy
- Z To train students with advanced concepts such as Raman spectroscopy, ESR and NMR Spectrums.

COURSE OUTCOMES (COs)

On Successful completion of the course, the student will be able to

No.	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO 1	Solve numerical problems related to ionic mobilities in electrochemical cells and its applications of electrolytic conductivity	Up to K3
CO2	Acquire basic knowledge about electrode potential, electrochemical cell and potentiometric titrations	Up to K3

CO3	Gain the knowledge about the photochemical and photosensitized process	Up to K3
CO4	Know about basic principles of microwave and IR spectrum and solve problems using various spectra	Up to K3
CO5	Study basic principles of Raman, NMR and ESR spectroscopy will apply this during their project.	Up to K3

K1- Knowledge K2 – Understand K3-Apply

UNIT – I: Electrochemistry – I

[12 Hrs]

Introduction – definition and determination of specific, equivalent and molar conductance – variation of equivalent conductance with dilution – Strong and weak electrolytes – anomaly of strong electrolytes – Debye-Huckel-Onsager equation (no derivation) – Kohlrausch's law of ionic mobilities and its applications and problems in Kohlrausch's law – Applications of conductivity measurements: (i) degree of dissociation (ii) solubility product of a sparingly soluble salt and problems in Ksp (iii) conductometric titrations - acid-base titration, precipitation titration (iv) determination of ionic product of water. Ionic equilibrium - pH of solutions and its calculations – buffer solutions – theory of buffer action – Determination of pH of Buffer Solutions (Henderson-Hasselbach equation) and its numerical problems

UNIT – II: Electrochemistry – II

Concept of electrochemical cells – difference between electrolytic and electrochemical cells – cell diagram and cell terminology – Conventions regarding signs of cell e. m. f – single electrode potential – standard electrode potential and its determination – Nernst equation and its application – calculation of cell emf from single electrode potential and its problems in single electrode potentials – types of electrodes – reference electrodes (primary and secondary). Commercial cells – primary and secondary cells: Dry cell, lead storage cell, Ni-Cd cell, H_2 -O₂ fuel cell. Applications of emf measurements: (i) Determination of solubility and solubility products of sparingly soluble salt and its problem in Ksp (ii) Determination of pH using hydrogen electrode, glass electrode and quinhydrone electrode (iii) Potentiometric titrations (redox titration only)

UNIT – III: Photochemistry:

Definition of photochemical reactions – comparative study of thermal and photochemical reaction – laws of absorption – Lambert and Beer law – laws of photochemistry – Grothus - Drapper law – Stark-Einstein law – quantum efficiency and its determination – consequence of light absorption by atoms and molecules – Photo physical processes – fluorescence and phosphorescence – Jablonski diagram – Photosensitization – photosynthesis

[12 Hrs]

[12 Hrs]

in plants. Photochemical processes – Importance of photochemical reactions – photochemical rate law – kinetics of H₂-Br₂ photochemical reaction

UNIT – IV: Molecular Spectroscopy - I: [12 Hrs]

Introduction: Electromagnetic radiation – different regions – absorption spectroscopy – molecular spectra – various types of molecular spectra. Rotational spectra of diatomic molecules – determination of moment of inertia and bond length – problem in internuclear distance of HCl and CN molecules only – application of microwave spectroscopy – microwave oven. Principles of IR spectra – vibration spectra of diatomic molecule using Hooke's law – problem in force constant – Modes of vibration in polyatomic molecules – calculate vibrational degrees of freedom in H_2O , CO_2 , NH_3 , C_2H_2 and C_6H_6 .

UNIT – V: Molecular Spectroscopy - II

[12 Hrs]

Basic principle of Raman spectra – Raman effect – stokes and anti stokes lines – quantum theory of Raman effect – experimental study – comparison between IR and Raman spectra – applications of Raman spectra. Electronic spectra – Born - Oppenheimer approximation – Franck-Condon principle – Nuclear magnetic resonance spectroscopy – Principle and Chemical shift of NMR spectra and its problem in NMR frequency and magnetic field strength – Electrons spin resonance spectroscopy – principle of EPR spectra and its problem in EPR frequency – hyperfine structure in hydrogen atom and methyl radical – difference between NMR and ESR spectroscopy.

TEXT BOOKS:

- 01. Puri B.R, Sharma. L.R and Pathania. S, Principles of Physical Chemistry, 46th Edition, Vishal Publishing Co., New Delhi, 2012.
- 02. Arun Bahl, Bahl B.S. and Tuli G.D., Essentials of Physical Chemistry, S. Chand & Co., New Delhi.
- 03. Soni P.L., Text Book of Physical Chemistry, Sultan Chand and Sons, 2011.

REFERENCES:

- 01. Glasstone S., Introduction to Electrochemistry, Van Nostrand Co., Inc., New York.
- 02. Crow D.R., Principles and Applications of Electrochemistry, Springer, 1994.
- 03. Rohatgi K.K., and Mukherji, Fundamentals of Photochemistry, 3rd Edition, New Age Publishers, 2017.
- 04. Banwell C.N., Molecular Spectroscopy, 4th Edition, McGraw Hill Education, New Delhi, 2017.
- 05. Chang R., Basic Principles of Spectroscopy.

WEB RESOURCES:

- 01. https://www.vedantu.com/chemistry/weak-electrolytes
- 02. https://www.doubtnut.com/question-answer-chemistry/statekohlrausch-law-of-independent-migration-of-ions-why-does-theconductivity-of-a-solution-decrea-555577069
- 03. https://www.khanacademy.org/test-prep/mcat/chemicalprocesses/acid-base-equilibria/v/buffer-solutions
- 04. https://www.frontiersin.org/articles/10.3389/fchem.2014.00079/full

- 05. https://resources.pcb.cadence.com/blog/2020-nernst-equationexample-for-electrochemical-systems-design
- 06. https://www.merriam-webster.com/dictionary/quantum%20efficiency
- 07. http://ijates.com/images/short_pdf/1412074200_130(1-4).pdf
- 08. https://byjus.com/chemistry/infrared-spectroscopy/
- 09. https://www.eng.uc.edu/~beaucag/Classes/Characterization/Raman CALTECH.pdf
- 10. https://www.jeolusa.com/RESOURCES/Analytical-Instruments/NMR-Basics
- 11. https://www.slideshare.net/chemsant/principles-of-esr

PEDAGOGY: Chalk and Talk , LCD

COURSE CONTENTS & TEACHING	/ LEARNING SCHEDULE
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Modul e No.	Торіс	No. of Lectur es	Content Delivery Method	Teaching Aids
	UNIT – I [12 Hrs]			
1.1	Introduction to electrochemistry – definition and determination of specific, equivalent and molar conductance	2	Chalk & Talk	Black Board
1.2	variation of equivalent conductance with dilution – Strong and weak electrolytes	1	Chalk & Talk	Black Board
1.3	anomaly of strong electrolytes – Debye- Huckel-Onsager equation (no derivation)	1	Chalk & Talk	LCD
1.4	Kohlrausch's law of ionic mobilities and its applications and problems in Kohlrausch's law	2	Lecture	Black Board
1.5	Applications of conductivity measurements: (i) degree of dissociation (ii) solubility product of a sparingly soluble salt and problems in Ksp (iii) conductometric titrations - acid-base titration, precipitation titration (iv) determination of ionic product of water.	3	Chalk & Talk	Black Board
1.6	Ionic equilibrium - pH of solutions and its calculations – buffer solutions – theory of buffer action - Determination of pH of Buffer Solutions (Henderson-Hasselbach equation) and its numerical problems	3	Chalk & Talk	Black Board
	UNIT – II [12 Hrs]			
2.1	Concept of electrochemical cells – difference between electrolytic and electrochemical cells – cell diagram and cell terminology –	2	Lecture	LCD
2.2	Conventions regarding signs of cell e.m. f – single electrode potential – standard electrode potential and its determination	2	Chalk & Talk	Black Board
2.3	Nernst equation and its application – calculation of cell emf from single electrode potential and its problems in single electrode potentials – types of electrodes – reference electrodes (primary and secondary).	3	Chalk & Talk	Black Board
2.4	Commercial cells – primary and secondary cells: Dry cell, lead storage cell, Ni-Cd cell, H ₂ -O ₂ fuel cell.	2	Chalk & Talk	Black Board

	Applications of amf maggingments			
2.5	 (i) Determination of solubility and solubility products of sparingly soluble salt and its problem in Ksp (ii) Determination of pH using hydrogen electrode, glass electrode and quinhydrone electrode (iii) Potentiometric titrations (redox titration only) 	3	Chalk & Talk	Black Board
	UNIT – III [12 Hrs]			
3.1	Definition of photochemical reactions – comparative study of thermal and photochemical reaction – laws of absorption – Lambert and Beer law – laws of photochemistry – Grothus-Drapper law – Stark-Einstein law – quantum efficiency and its determination – consequence of light absorption by atoms and molecules	4	Chalk & Talk	Black board
3.2	Photo physical processes – fluorescence and phosphorescence – Jablonski diagram – Photosensitization – photosynthesis in plants. Photochemical processes	4	Chalk & Talk	Black Board
3.3	Importance of photochemical reactions – photochemical rate law – kinetics of H ₂ -Br ₂ photochemical reaction	4	Chalk & Talk	Black Board
	UNIT – IV [12 Hrs]		1	
4.1	Introduction: Electromagnetic radiation – different regions – absorption spectroscopy – molecular spectra – various types of molecular spectra.	2	Chalk & Talk	Black Board
4.2	Rotational spectra of diatomic molecules – determination of moment of inertia and bond length – problem in internuclear distance of HCl and CN molecules only – application of microwave spectroscopy – microwave oven.	5	Chalk & Talk	Black Board
4.3	Principles of IR spectra – vibration spectra of diatomic molecule using Hooke's law – problem in force constant – Modes of vibration in polyatomic molecules – calculate vibrational degrees of freedom in H ₂ O , CO ₂ , NH ₃ , C ₂ H ₂ and C ₆ H ₆ .	5	Chalk & Talk	Black Board
	UNII - V [12 Hrs]			
5.1	effect – stokes and anti stokes lines – quantum theory of Raman effect – experimental study – comparison between IR and Raman spectra – applications of Raman spectra.	4	Chalk & Talk	Black Board
5.2	Electronic spectra – Born - Oppenheimer approximation – Franck-Condon principle – Nuclear magnetic resonance spectroscopy – Principle and Chemical shift of NMR spectra and its problem in NMR frequency and magnetic field strength	4	Chalk & Talk	Black Board

5.3	EPR spectroscopy – principle of EPR spectra and its problem in EPR frequency – hyperfine structure in hydrogen atom and methyl radical – difference between NMR and ESR spectroscopy	4	Chalk & Talk	Black Board
	and ESR spectroscopy			

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3
CO2	3	3	3	2	3
CO3	3	3	2	3	3
CO4	3	2	3	3	3
CO5	3	3	2	2	3

3 - Strong 2 - Medium 1- Low

COURSE DESIGNER: Dr.K.VIJAYARAJ and Dr. M. MANIMEGALAI *****

ORGANIC ANALYSIS AND ESTIMATION LAB Core Lab Code:212203604 SEMESTER V & VI 3 Hrs/Week

Preamble:

- 🖉 To acquire skill in organic qualitative analysis and estimation.
 - 01. Aromatic Organic Compounds like mono and dicarboxylic acids.
 - 02. Aromatic primary amines.
 - 03. Aromatic amides.
 - 04. Aromatic aldehyde and ketones.
 - 05. Phenols
 - 06. aromatic Nitro compounds.
 - 07. anilide
 - 08. Aliphatic diamides.
 - 09. Aliphatic carbohydrates

ORGANIC ESTIMATIONS

- 01. Estimation of Phenol
- 02. Estimation of Aniline

REFERENCES:

- 01. A Handbook of Organic analysis: Qualitative and Quantitative by Clarke.A
- 02. Qualitative Chemical analysis W.J.Criddle, G.P.Ellis.
- 03. Elementary Practical Organic chemistry: Qualitative organic analysis Part 2, A.I. Vogel.

COURSE DESIGNER: Ms. K. Jothilakshmi & Dr. P. Meenatchi

Credits 3

Core Lab

GRAVIMETRIC ANALYSIS LAB SEMESTER V & VI

Code: 212203605 3 Hrs/Week Credits 2

Preamble:-

- \varkappa This lab course enables the students to acquire practical knowledge on quantitative estimation of inorganic metal ions by gravimetric analysis also enhances the laboratory skill of preparing few organic compounds.
- I. Gravimetric Analysis:
 - 1. Estimation of Barium as Barium chromate.
 - 2. Estimation of Lead as Lead chromate.
 - 3. Estimation of Nickel as Ni-DMG complex.
- II. Organic Preparations:
 - 1. Benzoic acid from Ethyl Benzoate
 - 2. m– dinitrobenzene from nitro benzene
 - 3. Glucosazone from glucose.
 - 4. Methylorange (Diazotisation)
 - 5. Benzoic acid from Benzamide

REFERENCES:

- 01. Text book of Quantitative chemical analysis, A.I.Vogel.
- 02. Elementary Practical organic chemistry small scale preparation second Edition, A.I.Vogel.

COURSE DESIGNER: Ms. K. Jothilakshmi & Dr. S. Packianathan

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Core Lab	PHYSICAL CHEMISTRY EXPERIMENTS	Code:212203606
	SEMESTER VI	3 Hrs/Week
		Credits 3

Preamble:-

- \varkappa To apply the theory knowledge to laboratory work.
- I. Determination of molecular weight by,
 - a. Transition temperature method sodium thiosulphate penta hydrate, sodium acetate trihydrate and strontium chloride hexa hydrate (Solvent).
 - b. Cryoscopic method Rast method Naphthalene (solvent)
- II. Phase diagram involving simple eutectic.
- III. Critical solution temperature Determination of critical solution temperature of phenol – water system
- IV. Effect of impurity on CST Phenol-water system strength of unknown Nacl.
- V. Partition co-efficient experiments: Study of the equilibrium constant for the reaction, $KI + I_2 \rightleftharpoons KI_3$ by determining the partition co- efficient of I_2 between water and CCl₄.
- VI. Kinetics:- Determination of relative strength of acids by acid catalyzed hydrolysis of ester.

VII. Electrochemistry:

- Determination of strength of acid (or) base by conductometric titration between an acid and a base.
- Determination of strength of the given FAS solution by titrating it against a standard solution of KMnO₄ potentiometrically.

REFERENCES:

- 01. Physical Chemistry Laboratory Manual: An interdisciplinary approach, Ramesh Kumari, Amirtha Anand.
- 02. Physical chemistry experiments for undergraduate students Dr.R. Rajalakshmi.

COURSE	DESIGNER: Ms. K	. Jothilakshmi	i & Dr. A. Sakthi Athithan
*******	******	*****	***************************************
Elective	PRO	JECT	Code: 212203607
	SEME	STER VI	5 Hrs/Week
			Credits 5

Undergraduate students of Chemistry will do projects under the guidance of staff members of chemistry during VI semester. The projects will be on chemistry and chemistry related fields. The project diary signed by the project guide and HOD must be submitted in the month of April. The viva on project will be conducted jointly by the guide and the HOD.

Internal = 40	Marks External	= 60 Marks
Report =	30 Repo	rt = 50
Viva =	10 Viva	= 10
Total =	40 Total	= 60
*****	****	***

Allied Chemistry

INORGANIC AND PHYSICAL CHEMISTRY

[For Physics Major Students] SEMESTER V Code: 212203521 4 Hrs/Week Credits 4

Preamble:-

✓ To develop the basic knowledge on adsorption

🖉 To study the basic idea of chromatographic techniques

- 🖉 To know the fundamental concepts and applications of photo chemistry
- To learn Solid state chemistry
- To impart knowledge of catalysis and polymers

COURSE OUTCOMES (COs)

On Successful completion of the course, the student will be able to

No.	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)		
CO1	To differentiate adsorption from absorption and describe the theories of adsorption isotherm To explain the principle and application of various chromatographic techniques	Up to K3		
CO2	To enumerate the laws of photochemistry and explain the different types of photo physical processes	Up to K3		
CO3	To understand the concept of solid state chemistry and also its application	Up to K3		
CO4	To be aware of the different types coordination compounds	Up to K3		
CO5	To illustrate the different types of catalysis and polymers	Up to K3		
K1- Knowledge K2 – Understand K3-Apply				

UNIT – I:

[12 Hrs]

- Adsorption : Definition difference between adsorption and absorption – adsorbate, adsorbent – Chemical adsorption, Physical adsorption – differences between these two types – factors influencing adsorption gases on solids– adsorption isotherm – Langmuir isotherm (No derivation, statement only)
- Chromatographic techniques: Principle and application thin layer chromatography – column chromatography – paper chromatography – gas – solid and gas – liquid chromatography.

UNIT – II:

[12 Hrs]

[12 Hrs]

Photo chemistry: Comparison of thermal and photo chemical reactions – definition of photochemical reactions – Beer – Lambert's Law – Quantum efficiency – reasons for low and high quantum yield with examples – Jablonski diagram – fluorescence – phosphorescence – photosensitization – application of photochemistry.

UNIT – III:

Solid state – I

- a. Crystallography : Definition unit cell, face and edge of a crystal. Interfacial angle and crystal lattice
- b. Laws of Crystallography.

- i. Laws of symmetry symmetry elements plane, axis and centre of symmetry.
- ii. Law of constancy of interfacial angle
- iii. Law of rational indices.
- c. Crystallographic system: Bravais lattices simple cubic face centred cubic and body centered cubic.
- d. X-ray diffraction Braggs equation.

UNIT – IV:

Co – ordination compounds

Definition, nomenclature – definition of various terms involved in coordination chemistry – Werner's theory – EAN rule – Valence bond theory – low spin and High spin complexes – magnetic properties – limitations of VB theory - Chelates (preliminary idea)

UNIT – V:

[12 Hrs]

[12 Hrs]

- O1. Catalysis: Definition different types of catalysis acid base catalysis auto catalyst catalytic poisoning promoters.
- 02. Polymers: Definition properties of polymers addition and condensation polymerization reactions with examples Natural rubber isoprene unit preparation and application of polystyrene, Urea formaldehyde resin.

TEXT BOOKS:

- 01. Madan R.D., Satyaprakash, Modern Inorganic Chemistry, S.Chand and Co., New Delhi.
- 02. Puri, Sharma, Pathania, Principles of Physical Chemistry, S.Chand and Co., New Delhi, 2012.

REFERENCES:

- 01. Bahl.B.S., Tuli G.D. Arun Bahl, Essentials of Physical Chemistry, S.Chand and Co., New Delhi.
- 02. Puri, Sharma, Pathania, Text book of Physical Chemistry, S.Chand and Co., New Delhi.
- 03. Soni P.L., Text book of Inorganic Chemistry, S.Chand and Co., New Delhi

WEB RESOURCES:

- $1.\ https://www.vssut.ac.in/lecture_notes/lecture1543821158.pdf$
- 2. https://byjus.com/jee/adsorption/
- 3. https://microbenotes.com/chromatography-principle-types-and-applications/
- 4. https://ncert.nic.in/pdf/publication/sciencelaboratorymanuals/classXII/che mistry/lelm105.pdf
- 5. https://www.chemistryabc.com/photo-chemistry-hand-written-notes-pdf/
- 6. https://byjus.com/jee/solid-state-jee-notes/
- 7. https://www.askiitians.com/iit-jee-Solid-State/
- 8. https://www.esaral.com/coordination-compounds-class-12-notes-for-iit-jee-neet/
- 9. https://www.askiitians.com/iit-jee-chemistry/physicalchemistry/catalysis.aspx
- 10.https://byjus.com/jee/polymers/

PEDAGOGY: Chalk & Talk, LCD, Lecture

Module No.	Торіс	No. of Lectur es	Content Delivery Method	Teaching Aids			
UNIT – I [12 Hrs]							
1.1	Introduction to adsorption Differences between the following (i) adsorption and absorption, (ii) adsorbate and adsorbent	2	Chalk & Talk	Black Board			
1.2	chemical adsorption and physical adsorption factors influencing adsorption Langmuir isotherm	3	Chalk & Talk	Black Board			
1.3	Principle of partition and adsorption chromatography	3	Chalk & Talk	LCD			
1.4	thin layer chromatography and column chromatography	2	Lecture	Black Board			
1.5	paper chromatography	1	Chalk & Talk	Black Board			
1.6	gas – solid & gas liquid chromatography	1	Chalk & Talk	Black Board			
	UNIT – II [12 H	Irs]		I			
2.1	Photochemistry: Comparison of thermal and photo chemical reactions–Beer-Lambert Law– Laws of photochemistry	3	Lecture	LCD			
2.2	Quantum efficiency – reasons for low and high quantum yield with examples and Jablonski diagram	4	Chalk & Talk	Black Board			
2.3	Photosensitized reaction – Application to Photosynthesis in plants.	4	Chalk & Talk	Black Board			
2.5	gas – liquid chromatography	5	Chalk & Talk	Black Board			
	UNIT – III [12	Hrs]					
3.1	Crystallography : Definition – unit cell, face and edge of a crystal. Interfacial angle and crystal lattice	4	Chalk & Talk	Black board			
3.2	Laws of Crystallography. Laws of symmetry – symmetry elements – plane, axis and centre of symmetry. Law of constancy of interfacial angle Law of rational indices.	4	Chalk & Talk	Black Board			
3.3	Crystallographic system: Bravais lattices – simple cubic face centred cubic and body centered cubic. X-ray diffraction – Braggs equation.	4	Chalk & Talk	Black Board			
UNIT – IV [12 Hrs]							
4.1	Definition, nomenclature – definition of various terms involved in co–ordination chemistry	4	Chalk & Talk	Black Board			
4.2	Werner's theory – EAN rule – Valence bond theory – low spin and High spin complexes – magnetic properties	4	Chalk & Talk	Black Board			
4.3	limitations of VB theory - Chelates (preliminary idea)	4	Chalk & Talk	Black Board			

COURSE CONTENTS & TEACHING / LEARNING SCHEDULE

5.1	Catalysis: Definition – positive and negative catalyst – homogeneous and heterogeneous catalysis - acid-base catalysis – auto catalyst – catalytic poisoning – promoters.	4	Chalk & Talk	Black Board		
5.2	Polymers: Definition – properties of polymers – addition and condensation - polymerization reactions with examples.	4	Chalk & Talk	Black Board		
5.3	Natural rubber – isoprene unit – preparation and uses of polystyrene and Urea – formaldehyde resin	4	Chalk & Talk	Black Board		

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3
CO2	3	2	3	3	3
CO3	3	3	3	3	3
CO4	3	3	2	3	3
CO5	2	3	3	3	2
	3 - Strong 2 - Medium 1- Low				

3 - Strong 2 - Medium

COURSE DESIGNER: Dr. S. Packianathan & Dr. T. Senthil Pandian.

Allied Chemistry

ORGANIC AND PHYSICAL CHEMISTRY

[For Physics Major Students] **SEMESTER - VI**

Code: 212203621 4 Hrs/Week **Credits 4**

Preamble:-

🖉 To have a knowledge of chemotherapy, Thermodynamics, solid state, Chemical Kinetics and Spectroscopy.

Course Objectives:

- 🗷 To develop the basic knowledge on alkaloids and vitamins and their applications
- To state the various aspects of thermodynamics
- 🖉 To learn the basic idea about chemical kinetics
- S To understand the fundamentals of solid state
- ✗ To study the fundamentals of various spectroscopy

COURSE OUTCOMES (COs)

On Successful completion of the course, the student will be able to

No.	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)				
CO1	To describe the properties of chemotherapy, antibiotics and explain the different types of vitamins	Up to K3				
CO2	To demonstrate familiarity with the first and second law of thermodynamics	Up to K3				
CO3	To understanding the concept of chemical kinetics and determine the first order of reaction	Up to K3				
CO4	To identify the different types of solids and explain laws of crystallography	Up to K3				
CO5	To apply the principles of UV, IR and NMR spectroscopy	Up to K3				
	V1 Vacuated as VO Understand V2 Apple					

K1- Knowledge K2 – Understand K3-Apply

UNIT – I:

Chemotheraphy, Antibiotics and Vitamins:

- (a) Chemotherapy: Preparation structure and uses of the following: Sulpha drugs - sulphadiazine - Prontosil and Prontosil-s.
- (b) Antibiotics: Definition Penicillin and streptomycin structure and uses.
- (c) Vitamins: Classification sources, deficiency diseases and biological function of vitamin A, B₆, C, D, E and K (Structural elucidation not necessary)

UNIT – II:

Thermodynamics: Importance of thermodynamics - terms used in thermodynamics - open and closed systems - state functions and path functions - extensive and intensive properties. Reversible and irreversible statement and mathematical form of first law of processes Thermodynamics - Heat capacity at constant volume and pressure - relation between Cp and Cv - Statement of second law of thermodynamics - entropy - physical significance of entropy - Gibb's free energy and its significance. UNIT – III: [12 Hrs]

Chemical Kinetics: Reactions rate - order and molecularity of a reaction - Zero order - first order - first order rate equation and Half - life period - derivation - Examples of first order reactions, second order reactions.

Enzyme catalysis - Michaelis - Menten mechanism - Lineweaver -Burk Plot - Significance of Km.

UNIT – IV:

Solid State - II:

- a) Experimental methods of determine interplanar spacing X-ray spectrophotometer – Debye – Scherrer method.
- b) Types of Crystals ionic, molecular, covalent and metallic crystals (Elementary idea).
 - i. Ionic crystal Analysis of NaCl, CsCl.
 - ii. Molecular Crystal Water
 - iii. Metallic bonds in metals
 - iv. Covalent crystals Diamond and Graphite.
- c) Conductors, Insulators and semiconductors Frenkel and schottky defects.

UNIT – V:

Spectroscopy: Basic principles of UV and IR spectroscopy Identification of simple organic molecules - ethanol and dimethyl ether, acetaldehyde and acetone, ethylene and acetylene, cis - 2 – butene and trans - 2 - butene, methyl amine, dimethyl amine and trimethyl amine - proton NMR spectroscopy - Principle - Chemical shift - spectrum of ethanol.

[12 Hrs]

[12 Hrs]

[12 Hrs]

[12 Hrs]

TEXT BOOKS:

- 01. Bahl B.S., and Arun Bahl, Advanced Organic Chemistry, S.Chand & Co., Ltd, 2017, New Delhi.
- 02. Bahl B.S., and Tuli G.D., Arun Bahl, Essentials of Physical Chemistry, S.Chand and Co., New Delhi, 2010.
- 03. Puri, Sharma, Pathania, Principles of Physical Chemistry, S.Chand and Co., New Delhi, 2012.
- 04. Jayashree ghosh, Fundamental concepts of Appliedchemistry S.Chand & Co, New Delhi 2008.

REFERENCES:

- 01. Soni P.L., Text book of Organic Chemistry, S.Chand and Co., New Delhi.
- 02. Puri, Sharma, Pathania., Text book of Physical Chemistry, S.Chand and Co., New Delhi.
- 03. Banwell C.N., Fundamentals of Molecular Spectroscopy, 4th Edition, Tata McGraw Hill, New Delhi, 2017.
- 04. Course content & Teaching/Learning schedule

WEB RESOURCES:

- 1. https://en.wikipedia.org/wiki/Chemotherapy
- 2. https://www.mdpi.com/2079-6382/10/11/1354
- 3. https://www.medicalnewstoday.com/articles/10278
- https://www.iare.ac.in/sites/default/files/TD%20Lecture%20Notes%2008%2 0AUG.pdf
- 5. https://www3.nd.edu/~powers/ame.20231/notes.pdf
- 6. https://www.askiitians.com/iit-jee-chemistry/chemical-kinetics.aspx
- 7. https://www.esaral.com/chemical-kinetics-class-12-notes-iit-jee-neet/
- 8. https://www.askiitians.com/iit-jee-Solid-State/
- 9. https://www.uou.ac.in/sites/default/files/slm/BSCPH-203.pdf
- 10.https://www.vedantu.com/physics/spectroscopy
- 11. https://mazams.weebly.com/uploads/4/8/2/6/48260335/spectroscopyovrvi ew.pdf

PEDAGOGY: Lecture, Chalk & Talk

COURSE CONTENTS & TEACHING / LEARNING SCHEDULE

Module No.	Торіс	No. of Lectur es	Content Delivery Method	Teaching Aids
	UNIT – I [12 Hrs]			
1.1	Chemotherapy: Preparation – structure and uses of the following: Sulpha drugs – sulphadiazine – Prontosil and Prontosil-s.	4	Lecture	Black Board
1.2	Antibiotics: Definition – Penicillin – and streptomycin structure and uses.	4	Discussion	LCD
1.3	Vitamins: Classification sources, deficiency diseases and biological function of vitamin A, B ₆ , C, D, E and K (Structural elucidation not necessary)	4	Chalk & talk	Black Board
	UNIT – II [12 Hrs]			
2.1	Importance of thermodynamics – terms used in thermodynamics – open and closed	4	Lecture	Black Board
2.2	state functions and path functions – extensive and intensive properties. Reversible and irreversible processes – statement and mathematical form of first law of Thermodynamics	4	Chalk & talk	Video lecture

2.3	systems Heat capacity at constant volume and pressure - relation between Cp and Cv - Statement of second law of thermodynamics – entropy – physical significance of entropy – Gibb's free energy and its significance.	4	Lecture	Black Board
	UNIT – III [12 Hrs]			
3.1	Reactions rate – order and molecularity of a reaction – Zero order – first order	4	Chalk & talk	PPT & LCD
3.2	first order rate equation and Half – life period – derivation – Examples of first order reactions, second order reactions.	4	Chalk & talk	Black Board
3.3	Enzyme catalysis – Michaelis – Menten mechanism – Lineweaver – Burk Plot – Significance of Km.	4	Lecture	Black Board
	UNIT – IV [12 Hrs]			
4.1	Experimental methods of determine interplanar spacing – X-ray spectrophotometer – Debye – Scherrer method.	4	Chalk & talk	Black Board
4.2	Types of Crystals – ionic, molecular, covalent and metallic crystals (Elementary idea). Ionic crystal – Analysis of NaCl, CsCl. Molecular Crystal – Water Metallic bonds in metals Covalent crystals – Diamond and Graphite.	4	Chalk & talk	LCD
4.3	Conductors, Insulators and semiconductors – Frenkel and schottky defects.	4	Chalk & talk	Black Board
	UNIT – V [12 Hrs]			
5.1	Spectroscopy: Basic principles of UV and IR spectroscopy proton NMR spectroscopy	4	Lecture	Black Board
5.2	Identification of simple organic molecules – ethanol and dimethyl ether, acetaldehyde and acetone, ethylene and acetylene, $\operatorname{cis} - 2$ – butene and trans – 2 – butene, methyl amine, dimethyl amine and trimethyl amine	4	Lecture	LCD
5.3	Principle – Chemical shift – spectrum of ethanol.	4	Blended Learning	Black Board
	MAPPING OF COS WITH	rus		

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3
CO2	3	2	3	3	3
CO3	3	3	3	3	3
CO4	3	3	2	3	3
CO5	2	3	3	3	2
	3 - Stro	ong 2 -	Medium	1- Low	

COURSE DESIGNER: Dr. T. Senthil Pandian & Dr. S. Packianathan

Allied Chemistry Lab

ORGANIC ANALYSIS LAB [For Physics Major Students] SEMESTER V & VI Code: 212203622 2 Hrs/Week Credits 3

Preamble:

This lab course enables the students to acquire practical skill on qualitative analysis of simple organic compounds. Further, this lab course describes the practical procedure for the quantitative estimation of organic compounds.

Organic Analysis:

Analysis of an Organic compound containing one functional group – aliphatic / aromatic – saturated / unsaturated – elements present other than C, H and O – functional groups – colour reactions for functional groups (acids, phenols, aldehydes, ketones, esters, amines, amides, anilides, aliphatic, diamide and monosaccharide.)

REFERENCES:

- 01.Elementary Practical Organic Chemistry, Qualitative organic analysis, I. Vogel, Second Edition.
- 02.Practical manual of qualitative organic analysis Dr. Hetal R. Prajapati, vipul M.Vaghela.

Course Designer: Dr. T. Senthil Pandian & Dr. S. Packianathan