DEPARTMENT OF CHEMISTRY

COURSE STRUCTURE & SYLLABI (For the students admitted from year 2023-2024 onwards)

Programme : B.Sc. Chemistry





JAMAL MOHAMED COLLEGE (AUTONOMOUS)

Accredited with A++ Grade by NAAC (4th Cycle) with CGPA 3.69 out of 4.0 (Affiliated to Bharathidasan University) **TIRUCHIRAPPALLI – 620 020**

Sam	Course Code Part	Dout	rt – Course Category – – – – – – – – – – – – – – – – – – –	Course Title	Ins. Hrs/	Credit	Ma	rks	Total
Sem	Course Code	Part	Course Category	Course The	HFS/ Week	Creat	CIA	ESE	Total
	23U1LT1/LA1/	-			WCCK	-			100
	LF1/LH1/LU1	Ι	Language - I		6	3	25	75	100
	23UCN1LE1	II	English - I	English for Communication - I	6	3	25	75	100
	23UCH1CC1		Core - I	Inorganic, Organic and Physical Chemistry - I	5	5	25	75	100
Ι	22110110020		Corro II	Volumetric Estimation and Flame Photometric	2	2	20	80	100
	250CHICC2P	III	Core - II	Identification of Metals - Practical	3	3	20	80	100
	23UPH1AC1		Allied - I	Fundamentals of Physics	5	4	25	75	100
	23UPH1AC2P		Allied - II	Properties of Matter - Practical	3	2	20	80	100
	23UCN1AE1	IV	AECC - I	Value Education	2	2	-	100	100
				Total	30	22			700
	23U2LT2/LA2/LF2/	T	Language - II		6	3	25	75	100
	LH2/LU2				0	5	25	15	100
	23UCN2LE2	II	English - II	English for Communication - II	6	3	25	75	100
	23UCH2CC3		Core - III	Inorganic, Organic and Physical Chemistry - II	6	6	25	75	100
	23UCH2CC4P	ш	Core - IV	Industrial Chemistry - Practical	3	3	20	80	100
II	23UPH2AC3		Allied - III	Essentials of Physics	4	4	25	75	100
	23UPH2AC4P		Allied - IV	Optical, Thermal and Electricity - Practical	3	2	20	80	100
	23UCN2SS	IV	Soft Skills Development	Soft Skills Development	2	2	-	100	100
	23UCN2CO	V	Community Outreach	JAMCROP	-	@	-	-	@
	23U2BT1/		Basic Tamil - I/	எழுத்தும் இலக்கியமும் அறிமுகம் - I/				100#	
	23U2AT1		Advanced Tamil - I	தமிழ் இலக்கியமும் வரலாறும் - I	-	-	-	100	-
	[@] Only grades will b	e given		Total	30	23			700
	23U3LT3/LA3/LF3/	T	I anguage - III		6	3	25	75	100
	LH3/LU3	1	Language III		0	5	25	15	100
	23UCN3LE3	II	English - III	English for Communication - III	6	3	25	75	100
	23UCH3CC5		Core - V	Inorganic, Organic and Physical Chemistry - III	4	4	25	75	100
ш	23ПСНЗССер		Core - VI	Analysis of Domestic Products and Food	3	3	20	80	100
111	25001150001	III		Samples - Practical	5	5	20	00	100
	23UMA3AC5:3		Allied - V	Calculus	4	3	25	75	100
	23UMA3AC6:3		Allied - VI	Algebra and Trigonometry	3	3	25	75	100
	23UCH3GE1	IV	Generic Elective - I		2	2	-	100	100
	23UCN3AE2	1,	AECC - II	Environmental Studies	2	2	-	100	100
				Total	30	23			800
	23U4LT4/LA4/LF4/	T	Language - IV		6	3	25	75	100
	LH4/LU4	-			0				100
	23UCN4LE4	II	English - IV	English for Communication – IV	6	3	25	75	100
	23UCH4CC7		Core - VII	Inorganic, Organic and Physical Chemistry - IV	5	5	25	75	100
	23UCH4CC8P		Core - VIII	Semimicro Qualitative Analysis of Inorganic	3	3	20	80	100
	2017 () () () () ()	III		Salt Mixture - Practical	-	-			100
IV	23UMA4AC7:3		Allied - VII	Differential Equations	4	3	25	75	100
	23UMA4AC8:3		Allied - VIII	Statistics and Vector Calculus	4	3	25	75	100
	23UCH4GE2	IV	Generic Elective - II		2	2	-	100	100
	23UCN4EL		Experiential Learning	Internship	-	2	-	100	100
	23UCN4EA	V	Extension Activities	NCC, NSS, etc.,	-	1	-	-	-
	23U4BT2/		Basic Tamil - II/	எழுத்தும் இலக்கியமும் அறிமுகம் - II/	-	-	-	100#	-
	23U4A12		Advanced 1 amil - II	ு தயழ இலக்கியமும் வரலாறும் – II கட்ட	20	25			000
<u> </u>	2311CH5CC0		Coro IV	n Block alamants and Nuclear Chamiotry	<u> </u>	4 3	25	75	100
	230003009		Core - IA	p-block elements and Nuclear Chemistry	0	0	25	/5	100
	23UCH5CC10		Core - X	Oxygen, Nurogen and Suprur Containing	6	6	25	75	100
	23UCH5CC11	III	Core - XI	Thermodynamics and Solutions	6	6	25	75	100
X 7	23UCH5CC12D		Core - XII	Physical Chemistry Electrical Dractical	3	2	20	7.5 80	100
v	23UCH5DE1 AD/DD		Discipline Specific Elective	r nysicar chemistry Electricar - Flacticar	5		20	80	100
	23UCH50E1AP/BP		Skill Enhancement Course J	Analytical Chemistry	2	4	20	100	100
	23UCH5SE1	IV	Skill Enhancement Course - I	Clinical Chemistry	2	1	-	100	100
	23UCH35E2		Skill Elifialdelliefit Course - II	Online Course	Z	*	-	100	100
	25UCHJECI		Extra Credit Course - I	Total	- 20	27	-	-	- 700
<u> </u>				L'otal Coordination Complexes and Chamisters of	30	21			/00
	23UCH6CC13		Core - XIII	Lanthanides and Actinides	6	6	25	75	100
				Electrochemistry Molecular Spectroscopy and					
	23UCH6CC14		Core - XIV	Group Theory	6	6	25	75	100
	23UCH6CC15P	III	Core - XV	Organic Analysis and Insilico Studies - Practical	5	5	20	80	100
	23UCH6PW		Project Work	Project Work	3	2	25	75	100
VI	23UCH6DE2 A/R		Discipline Specific Elective II	LIGJOOL WOLK	5		25	75	100
	23UCH6DE2A/D		Discipline Specific Elective - II		Л	- - /	20	80	100
	23UCN6AE2	IV.	AECC III	Gender Studies	4	4	20	100	100
	23UCHOALS 23UCHAEC2	1 V	Extra Cradit Course II*	Online Course	1	*	-	100	100
	23UCHECA		Extra Credit Course for all ^{**}	Online Course	-	**			-
	23UCHECA 23UCN6ECA1		Extra Credit Course for all ⁺	Entrepreneurshin Development	-	+	-	_	-
	*Drogramma Specific Opling Course for Advanced Learners						-	-	-
	r rogramme specific Omme Course for Advanced Learners					28			700
	⁺ Course for Enhanci	ng Entra	enreneurial Skills	Total	50	20			700
		ng Entre		Cran	d Tatal	148			4400
				Gian		1.0			

B.Sc. CHEMISTRY (WITH ALLIED MATHEMATICS)

B.Sc. CHEMISTRY (WITH ALLIED BOTANY)

a	Course Code Dort	5		Ins.	is.	Marks			
Sem	Course Code	Part	Course Category	Course Title	Hrs/ Week	Credit	CIA	ESE	Total
	231111 T1/L A1/L F1/				week		-		
	LH1/LU1	Ι	Language - I		6	3	25	75	100
	23UCN1LE1	II	English - I	English for Communication - I	6	3	25	75	100
	23UCH1CC1		Core - I	Inorganic, Organic and Physical Chemistry - I	5	5	25	75	100
Ι	23UCH1CC2P		Core II	Volumetric Estimation and Flame Photometric	3	3	20	80	100
	25001110021	III		Identification of Metals - Practical	5	5	20	00	100
	23UPH1AC1		Allied - I	Fundamentals of Physics	5	4	25	75	100
	23UPHIAC2P	15.7	Allied - II	Properties of Matter- Practical	3	2	20	80	100
	23UCNTAET	IV	AECC - I	Value Education	2	2	-	100	700
	231121 T2/I A2/I F2/			10tai	30	22			700
	LH2/LU2	Ι	Language - II		6	3	25	75	100
	23UCN2LE2	II	English - II	English for Communication - II	6	3	25	75	100
	23UCH2CC3		Core - III	Inorganic, Organic and Physical Chemistry - II	6	6	25	75	100
	23UCH2CC4P	ш	Core - IV	Industrial Chemistry - Practical	3	3	20	80	100
п	23UPH2AC3	m	Allied - III	Essentials of Physics	4	4	25	75	100
	23UPH2AC4P		Allied - IV	Optical, Thermal and Electricity-Practical	3	2	20	80	100
	23UCN2SS	IV	Soft Skills Development	Soft Skills Development	2	2	-	100	100
	23UCN2CO	V	Community Outreach	JAMCROP	-	w	-	-	W
	23U2BT1/ 23U2AT1		Basic Tamil - I/	எழுத்தும் இலக்கியமும் அறிமுகம் - I/ சமிம் வைச்சியமும் வரலாளம் I	-	-	-	100#	-
	@Only grades will h	e given	Advanced Tahin - I	தமழ் இலக்கியமும் வரலாறும் - I Total	30	23		<u>ا</u> ــــــــــــــــــــــــــــــــــــ	700
	23U3LT3/LA3/LF3/	c given		Total	50	20			100
	LH3/LU3	Ι	Language - III		6	3	25	75	100
	23UCN3LE3	II	English - III	English for Communication - III	6	3	25	75	100
	23UCH3CC5		Core - V	Inorganic, Organic and Physical Chemistry - III	4	4	25	75	100
	23UCH3CC6P		Core - VI	Analysis of Domestic Products and Food	3	3	20	80	100
III	25001150001	III		Samples - Practical		5	20		100
	23UBO3AC5		Allied - V	Applied Botany – I	4	4	25	75	100
	23UBO3AC6P		Allied - VI	Laboratory Course for Applied Botany - 1 Practical	3	2	20	80	100
	23UCH3GE1		Generic Elective - I		2	2	_	100	100
	23UCN3AE2	IV	AECC - II	Environmental Studies	2	2	-	100	100
	20001101102		ince n	Total	30	23		100	800
	23U4LT4/LA4/LF4/	T	Language IV		6	2	25	75	100
	LH4/LU4	1	Language - 1v		0	3	23	15	100
	23UCN4LE4	II	English - IV	English for Communication – IV	6	3	25	75	100
	23UCH4CC7		Core - VII	Inorganic, Organic and Physical Chemistry - IV	5	5	25	75	100
	23UCH4CC8P		Core - VIII	Semimicro Qualitative Analysis of Inorganic	3	3	20	80	100
	23UB0//AC7	III	Allied - VII	Applied Botany - II	5	4	25	75	100
IV	250D04AC7		Anicu - Vii	Laboratory Course for Applied Botany - II	5	-4	23	15	100
	23UBO4AC8P		Allied - VIII	- Practical	3	2	20	80	100
	23UCH4GE2	137	Generic Elective - II		2	2	-	100	100
	23UCN4EL	IV	Experiential Learning	Internship	-	2	-	100	100
	23UCN4EA	V	Extension Activities	NCC, NSS, etc.,	-	1	-	-	-
	23U4BT2/		Basic Tamil - II/	எழுத்தும் இலக்கியமும் அறிமுகம் - II/	-	-	-	100#	-
	23U4A12		Advanced Tamil - II	தமிழ் இலக்கியமும் வரலாறும் - II கூடிப்	20	25			000
	2211CH5CC0		Com IV	n Block elements and Nuclear Chemistry	<u> </u>	 	25	75	100
	250CH5CC9		Cole - IX	Oxygen Nitrogen and Sulphur Containing	0	0	23	13	100
	23UCH5CC10		Core - X	Organic Compounds and Name Reactions	6	6	25	75	100
	23UCH5CC11	III	Core - XI	Thermodynamics and Solutions	6	6	25	75	100
V	23UCH5CC12P		Core - XII	Physical Chemistry Electrical - Practical	3	3	20	80	100
	23UCH5DE1AP/BP		Discipline Specific Elective - I		5	4	20	80	100
	23UCH5SE1	IV	Skill Enhancement Course - I	Analytical Chemistry	2	1	-	100	100
	23UCH5SE2	11	Skill Enhancement Course - II	Clinical Chemistry	2	1	-	100	100
	23UCH5EC1		Extra Credit Course - I	Online Course	-	*	-	-	-
				Total	30	27			700
	23UCH6CC13		Core - XIII	L anthanides and Actinides	6	6	25	75	100
				Electrochemistry Molecular Spectroscopy and					
	23UCH6CC14		Core - XIV	Group Theory	6	6	25	75	100
	23UCH6CC15P	III	Core - XV	Organic Analysis and Insilico Studies - Practical	5	5	20	80	100
T 7 T	23UCH6PW		Project Work	Project Work	3	2	25	75	100
VI	23UCH6DE2A/B		Discipline Specific Elective - II		5	4	25	75	100
	23UCH6DE3AP/BP		Discipline Specific Elective - III		4	4	20	80	100
	23UCN6AE3	IV	AECC - III	Gender Studies	1	1	-	100	100
	23UCH6EC2		Extra Credit Course - II*	Online Course	-	*	-	-	-
	23UCHECA		Extra Credit Course for all*	Unline Course	-	+	-	-	-
	23UUN6ECA1 Extra Credit Course for all* Entrepreneurship Development					<u> </u>	-	<u> </u>	-
	Programme Specific Unline Course for Advanced Learners					28			700
	* Course for Enhanci	ng Entre	preneurial Skills	Total	50	20			700
		0		Gran	d Total	148			4400

GENERIC ELECTIVE COURSES

Semester	Course Code	Course Title
III	23UCH3GE1	Food and Nutrition
IV	23UCH4GE2	Chemistry in Everyday Life

[#]Self-Study Course – Basic and Advanced Tamil (Applicable to the candidates admitted from the academic year 2023 -2024 onwards)

Semester	Course Code	Course Title
п	23U2BT1	Basic Tamil – I (எழுத்தும் இலக்கியமும் அறிமுகம் - I)
11	23U2AT1	Advanced Tamil – I (தமிழ் இலக்கியமும் வரலாறும் - I)
IV	23U4BT2	Basic Tamil – II (எழுத்தும் இலக்கியமும் அறிமுகம் - II)
1 V	23U4AT2	Advanced Tamil – II (தமிழ் இலக்கியமும் வரலாறும் - II)

Mandatory

Basic Tamil Course - I and II are offered for the students who have not studied Tamil Language in their schools and college.

Advanced Tamil Course - I and II are offered for those who have studied Tamil Language in their schools but have opted for other languages under Part - I.

Semester Course Code COURSE Course		Course Title	
т	23UCH1AC1:1	Allied - I	Inorganic, Organic and Physical Chemistry - I
1	23UCH1AC2P	Allied - II	Volumetric Estimations - Practical
п	23UCH2AC3:1	Allied - III	Inorganic, Organic and Physical Chemistry - II
11	23UCH2AC4P	Allied - IV	Organic Analysis - Practical

ALLIED CHEMISTRY FOR B.Sc. PHYSICS

ALLIED CHEMISTRY FOR B.Sc. BOTANY & ZOOLOGY

Semester	Course Code	COURSE	Course Title
т	23UCH1AC1:2	Allied - I	Inorganic, Organic and Physical Chemistry - I
1	23UCH1AC2P	Allied - II	Volumetric Estimations - Practical
п	23UCH2AC3:2	Allied - III	Inorganic, Organic and Physical Chemistry - II
11	23UCH2AC4P	Allied - IV	Organic Analysis - Practical

DISCIPLINE SPECIFIC ELECTIVES

Semester	Course Code	Course Title
V	23UCH5DE1AP	Gravimetric Estimation and Spectrophotometric study of Metal Complexes - Practical
v	23UCH5DE1BP	Quantitative Analysis of metal ions by Photometric Method - Practical
	23UCH6DE2A	Stereochemistry, Molecular Rearrangements and Natural Products
VI	23UCH6DE2B	Essentials of Bioinorganic Chemistry
	23UCH6DE3AP	Physical Chemistry Non-Electrical - Practical
	23UCH6DE3BP	Advanced Physical Chemistry - Practical

Somostor	Course Code	Course Category	Hours /	Cradita	Marks for Evaluation			
Semester	Course Coue		Week	Creuits	CIA ESE Tot			
Ι	23UCH1CC1	Core-I	5	5	25	75	100	
	•		-					

Inorganic, Organic and Physical Chemistry-I

SYLLABUS				
Unit	Contents	Hours		
I	Contents ATOMIC STRUCTURE AND PERIODIC PROPERTIES 1.1 Structure of atom: Plank's quantum theory of radiation, Photoelectric effect, Bohr's theory, De Broglie equation, Heisenberg's Uncertainty Principle, Energy spectrum of Hydrogen atom, Shapes of s, p, d and f orbital, Quantum numbers, Rules for filling the orbitals with electrons –Pauli's exclusion principle, Slater's rule, Hund's rule, Aufbau Principle. Stability of completely and half-filled subshells; degeneracy of orbitals. *Periodic Table - Long form of periodic table*, Classification of elements. 1.2 Periodic properties: Atomic, ionic radii, covalent, metallic and van der Waals radii. Ionic radii - determination of the radii of Na ⁺ and F ⁻ in NaF crystal by Pauling's method - Factors influencing magnitude of ionic radii–Periodic trend. Ionization energy - periodic variation, factors influencing ionization energy, Electron affinity - periodic variation. Electronegativity– Periodic variation, Mullikan's scale and its calculation. Metallic to non-metallic character along a period, relative reactivity,	Hours 15		
II	reducing power and basic character of elements. QUALITATIVE AND QUANTITATIVE ANALYSIS 2.1 Qualitative Analysis: Solubility, solubility product and common ion effect– Definition, applications in semi-micro qualitative analysis. Identification of anions: Nitrate - Brown ring test; Chloride - chromyl chloride test; Borate - ethyl borate test; Phosphate, arsenate-ammonium molybdate test; Carbonate, sulphate, chromate– reaction with HCl. Interfering anions– elimination of fluoride, oxalate, borate and phosphate. Cations: Group separation, identification of cations-Lead, copper, manganese, nickel, cobalt, barium, calcium, magnesium and ammonium. 2.2 Volumetric Analysis: Primary and secondary standards, preparation of standard solutions – Normality, Molarity, mole percentage, parts per million, equivalent weight calculation for acids, bases and metal salts in different medium, equivalence point and end point. Types of titrations: acid-base, redox, precipitation, iodimetry, iodometry and complexometric (EDTA) titrations, [*] theory of indicators [*] , phenolphthalein, methyl orange and Eriochrome Black–T.	15		

	3.1 Nomenclature of Organic Compounds				
	Rules of IUPAC system of Nomenclature - General procedure for IUPAC names				
	of alkanes, alkenes and alkynes with branched chains and functional groups (-OH,				
	-COOH, -CHO,-C=O, -NH ₂ and Halogens) and its application.				
	3.2 Structure of Organic Molecules				
III	Orbital structure of atom - electron configuration, shapes and orientation of	15			
	orbitals, bond length, bond angle and bond energy - Types of covalent bonds sigma				
	and pi bonds -Hybridization- sp^3 , sp^2 and sp hybridization of carbon - Lewis and Line				
	- Bond structure-Formal charge - Electro negativity – Definition - Polar and non-				
	polar molecules (H2O, CO2, CH ₃ Cl, CCl4) - Resonance Concept - Rules governing				
	Resonance - *Use of Arrows*.				
	ORGANICREACTION MECHANISMS 4.1 Electroneic Effect: Inductive Electromeric Mesomeric effects hyper				
	conjugation Steric effect -Definition Factors influencing and applications Energy				
	requirements of organic reactions-Energy of activation. *transition state*				
	intermediates using energy profile diagram.				
IV	4.2 Reactive Intermediates : Homolytic and Heterolytic fissions - carbonium ions,				
	carbanions, free radicals and carbenes – formation, structure, stability and reactions.				
	Classification of reagents-Electrophilic and Nucleophilic-Types of organic				
	reactions-substitution, addition, elimination, rearrangement and radical.				
	GASEOUS STATE				
	5.1 Gas Laws: Kinetic theory of gases, Kinetic equation of gases, Derivation of				
	various gas laws from Kinetic gas equation. Molecular velocities – Root Mean				
	Square velocity, Average velocity and Mean velocity (calculations). Boltzmann,				
	5.2 Europainity and compressibility Devile temperature. Mean free with				
v	5.2 Expansivity and compressionity -Boyle temperature, Mean free path,	15			
	Determination of heat capacity ratio and Degree of freedom of gaseous molecules				
	5 3 Real gases and ideal gases. Deviation of real gases from the ideal behavior				
	derivation of van der Waals equation for real gases significance of van der Waals				
	constants Critical phenomenon and Calculation of critical constants (Simple				
	problems using van der Waals equation)				
	Current Trends (For CIA only)				
VI	Recent discoveries in Periodic elements-Niholium, Moscovium, Tennessin and Ogan	esson –			
· -	atomic number, atomic weight and discoverer.				

..... Self Study

Text Books:

- B.R.Puri and L.R.Sharma, Principles of Inorganic Chemistry, Shoban Lal Nagin Chand and Co., New Delhi, 55th Edition, 2020
- 2. P. L.Soni, Text Book of Inorganic Chemistry, S. Chand & Co., NewDelhi, Revised Edition, 2017
- P.K. Mani and A.O.Thomas, Text book For Practical Chemistry for B.Sc. Main Students, Xavier press, Cannanore, 1stEdition, 2006
- P. L.Soni and H.M.Chawla, Text Book of Organic Chemistry, Sulthan and Chand company, New Delhi, 28thEdition, 1999
- B.R.Puri, L.R.Sharma and M.S.Pathania, Principles of Physical Chemistry, Vishal Publications, Jalandhar, 48th Edition, 2019

Reference Books:

1. R. D. Madan, Modern Inorganic Chemistry, S.Chand & Co., New Delhi, 2ndReprint, 1987

2. B. R. Puri, L.R.Sharma and K.C.Kalia, Principles of Inorganic Chemistry, Vishal Publications,

Jalandhar, NewPaper back Edition, 2020

3. M. K. Jain, Organic Chemistry, Sulthan and Chand Company, NewDelhi, 12th Edition, 2003

4. Bahl and Arun Bahl, Advanced Organic Chemistry, Sulthan and Chand Company, New Delhi,

19thEdition, 2005

5. R. L. Madan and G.D.Tuli, Simplified Course in Physical Chemistry, S.Chand & Co., NewDelhi, 5th Revised and Enlarged Edition, 2009

Web Resources:

- 1. <u>https://onlinecourses.nptel.ac.in/noc23_cy25/preview</u>
- 2. https://nptel.ac.in/content/syllabus_pdf/104101121.pdf
- 3. https://www.vedantu.com/chemistry/qualitative-chemical-analysis
- 4. <u>https://en.wikipedia.org/wiki/IUPAC_nomenclature_of_organic_chemistry</u>

Course Outcomes					
Upon suc	Upon successful completion of this course, the student will be able to:				
CO No.	CO Statement	Cognitive Level (K-Level)			
CO1	Describe the structure of atoms and periodic properties.	K1			
CO2	Identify anions and cations of the salt and electronic effects of various groups.	K2			
CO3	Calculate different concentration solutions and apply IUPAC nomenclature for organic compounds.	К3			
CO4	Evaluate molecular velocities	K4			
CO5	Defend the stability of reactive intermediates and half and completely filled sub-shells.	K5			

Relations	hip Ma	trix:				-					
Course	Pro	gramm	e Outco	omes (P	Os)	Progra	Programme Specific Outcomes (PSOs)				
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Cos
CO1	2	3	3	2	3	1	3	2	3	3	2.5
CO2	3	3	2	1	2	3	2	1	1	1	1.9
CO3	2	1	2	1	3	2	2	1	2	3	1.9
CO4	3	2	1	1	2	3	2	1	1	1	1.7
CO5	3	1	1	1	1	3	2	1	1	1	1.5
Mean Overall Score										1.9	
Correlation										Medium	

Mean Overall Score	Correlation
< 1.5	Low
\geq 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. S. Mohamed Rabeek

C	~			Hours/	0	Marks	s for Eva	luation	
Semester	C	ourse Code	Course Category	Week	Credits	CIA	ESE	Total	
Ι	231	UCH1CC2P	Core-II	3	3	20	80	100	
Course Title Volumetric Estimation and Flame Photometric Identification of Metals - P									
Contents									
Volumet	ric E	Estimation							
	1.	Estimation	of oxalic acid (FeSO ₄ Vs K	MnO ₄ Vs	$H_2C_2O_4$).				
	2.	Estimation	of ferrous sulphate (H ₂ C ₂ O	4 Vs KMn	O4 Vs FeS	SO ₄).			
	3.	Estimation	of hydrochloric acid (H ₂ C ₂ G	D ₄ Vs NaO	OH Vs HC	1).			
	4.	Estimation	of K ₂ Cr ₂ O ₇ (Std. K ₂ Cr ₂ O ₇ V	s Na ₂ S ₂ O	3 Vs K ₂ Cr	₂ O ₇).			
	5.	Estimation	of Mg (II) by EDTA (MgS0	D ₄ Vs ED	ГА Vs Mg	(SO4)			
II. Flame	e pho	otometric Est	imation						
	1.	Estimation	of sodium ion						
	2.	Estimation	of potassium ion						
:	3.	Estimation	of calcium ion					45	
Scheme	of va	luation						43	
I. Volum Pro	etric cedu	Estimation re writing - 0	- 35 marks 5 marks						
1-2 % error - 30 marks									
2-3 % error - 25 marks									
3-4 % error - 20 marks									
4% error - 15 marks									
II. Spect	roph	otometric Es	timation- 35 marks						
Pro		re writing - 0	5 marks						
1-2	% e	rror - 30 mark	S						

2-3 % error - 25 marks

3-4 % error - 20 marks 4 % error - 10 marks

Text Books:

1. Venkateswaran V. Veerasamy R. Kulandaivelu A.R, Basic Principles of Practical Chemistry, S. Chand & Co Pvt. Ltd, New Delhi, 2019, 2nd Edition.

2. K. B. Baliga et al., College Analytical Chemistry, Himalaya Publishing House, 2011, 19th Edition.

3. J. Merdharn, R.C. Denney, J.D. Barnes, M. Yhomas, Vogels's Textbook of Quantitative Chemical Analysis, Pearson Education Limited, New Delhi, 2006, 6th Edition.

Reference Books:

1. Henry W. Schimpf, Essentials of Volumetric Analysis, New York John Wiley Sons, London, 1917, 3rd Edition.

2. R.C. Mukarjee, Modern Approach to Chemical Calculations, Bharati Bhawan Publishers, New Delhi, 2008, 2nd Edition.

3. Boris Balitsky, Laboratory Exercise in General Chemistry, MIR Publishers, Moscow, 1968, 2nd Edition.

Web Resources:

 $1. https://nitsri.ac.in/Department/Civil%20 Engineering/CWE301_WATER_QUALITY_AND_ENVIRONMENT_Flame_Photometry.pdf$

	Course Outcomes								
Upon suc	cessful completion of this course, the student will be able to:								
CO No.	CO Statement	Cognitive Level (K-Level)							
CO1	Understand the principles of volumetric technique	K1							
CO2	Estimate the quantity of chemical substance present in a solution	K2							
CO3	Explain the principle of flame photometric method	K3							
CO4	Calculate the weight required for preparing different concentrated solutions	K4							
CO5	Apply the flame photometric method to analyze the metal ion from soil samples and water samples	K5							

Course	Pro	gramm	e Outco	omes (P	Os)	Programme Specific Outcomes (PSOs)					Mean Score of
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	COs
CO1	3	3	3	2	0	3	3	2	2	1	2.4
CO2	3	3	3	2	1	3	3	2	1	0	1.9
CO3	3	3	3	2	1	3	2	2	1	1	1.9
CO4	3	3	3	2	1	3	1	2	1	1	2.0
CO5	3	3	3	2	1	3	1	2	1	1	2.0
Mean Overall Score										2.0	
Correlation									Medium		

Mean Overall Score	Correlation
< 1.5	Low
\geq 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. S. Syed Abuthahir

Semester Course Code Course Category Week Creation CIA ESE Total I 23UPH1AC1 Allied – I 5 4 25 75 100	Somester	Course Code	Course Cotogory	Hours/	Credita	Marks for Evaluation			
I 23UPH1AC1 Allied – I 5 4 25 75 100	Semester	Course Coue	Course Category	Week	Creats	CIA	ESE	Total	
	Ι	23UPH1AC1	Allied – I	5	4	25	75	100	

Course Title

FUNDAMENTALS OF PHYSICS

	SYLLABUS	
Unit	Contents	Hours
I	Elasticity: Hooke's law – Young's modulus, Rigidity modulus & Bulk modulus – Expression for bending moment - determination of Young's modulus by non-uniform bending (Pin and Microscope) - surface tension:- definition –determination of surface tension by drop weight method –Viscosity: co-efficient of viscosity –determination of co-efficient of viscosity by burette method (variable pressure head) – *comparison of viscosities*	15
Π	Mechanics: Newton's law of gravitation –Kepler's laws of planetary motion–gravitation contstant- determination of 'G' by Boy's method- friction- laws of friction – centre of gravity - centre of gravity of solid cone and solid hemisphere – meta center – meta centric height – *determination of the metacentric height of a ship*	15
III	Sound: Simple harmonic motion (SHM) –equation of simple harmonic motion – composition of two SHM's in a straight line – composition of two SHM's at right angles to each other – Lissajou's figures (Basic concept only) –ultrasonic – properties – production by piezo- electric method- *applications of ultrasonics*– reverberation and reverberation time- conditions for a good auditorium	15
IV	Heat: Newton's law of cooling -determination of specific heat capacity of a liquid by cooling – thermal conductivity – co-efficient of thermal conductivity – determination of thermal conductivity of a bad conductor by Lee's disc method – solar constant – * determination of solar constant by Angstrom's Pyrheliometer*-temperature of the sun	15
V	 Diffusion and Osmosis: Diffusion: Diffusion of liquids – Graham's laws of diffusion in liquids –*Ficks' law of diffusion* – analogy between liquid diffusion and heat conduction – experimental determination of coefficient of diffusion. Osmosis: osmosis and osmotic pressure – laws of osmotic pressure -experimental determination of osmotic pressure (Berkeley and Hartley method) 	15

Text Book(s):

R. Murugesan, Properties of matter, S.Chand& Co, reprint (2022)
 Unit – I: Sec: 1.1,1.2,1.15.1.21, 3.1, 3.17, 2.1, 2.5, 2.7
 Unit – III: 11.1, 11.2, 12.1,12.2, 12.4, 11.9, 11.10,11.16, 11.17, 11.21
 Unit – II: Sec: 6.1-6.3, 22.1-22.3, 20.1- 20.3
 R. Murugesan, Properties of matter, S.Chand& Co, 4th Edition, 2005
 Unit – V: Sec: 2.21, 8.1- 8.28
 Brijlal&Subramaniam, Heat & thermodynamics, S.Chand Publications, 7th Edition, 2008.
 Unit – IV: Sec: 4.1- 5.5

Reference Book(s):

BrijLal&Subramaniam,Properties of Matter, S.Chand Publications, 4th edition, 2008.
 MathurD.S, Elements of Properties of Matter ,Eleventh edition, Shyamlal Charitable Trust, New Delhi, 1993.

Web Resource(s):

- 1. https://www.askiitians.com/physics/mechanics/surface-tension.aspx
- 2. <u>https://www.esaral.com/oscillations-class-11-simple-harmonic-motion-notes</u>
- 3. <u>https://www.adda247.com/teaching-jobs-exam/heat-and-temperature/</u>

	Course Outcomes								
Upon suc	cessful completion of this course, the student will be able to:								
CO No.	CO Statement	Cognitive Level (K-Level)							
CO1	understand the basic principles of certain physical properties of the materials around us	K2							
CO2	Applications of different constants associated with different materials	К3							
CO3	analyze viscosity, surface tension, diffusion, osmosis, properties of liquid	K4							
CO4	analyze the centre of gravity of various objects	K4							
CO5	interpret the physical properties of new materials	K5							

Relationship Matrix:

Course	Pro	gramm	e Outco	omes (P	Os)	Progra	Mean Sears of				
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	COs
CO1	2	3	3	2	2	3	3	3	2	2	2.5
CO2	3	3	3	2	2	3	2	1	1	2	2.2
CO3	3	1	3	1	3	2	2	2	2	3	2.2
CO4	3	3	2	3	2	3	3	3	1	2.6	
CO5	1	3	2	2	2	2	3	2.2			
Mean Overall Score										2.34	
Correlation										MEDIUM	

Mean Overall Score	Correlation
< 1.5	Low
\geq 1.5 and $<$ 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. C. Hariharan

Someston	Co	urse Code	Course Cotogony	Hours/	Credita	Marks for Evaluation			
Semester	CO	urse Coue	Course Category	Week	Creatis	CIA	ESE	Total	
Ι	231	23UPH1AC2P ALLIED –II 3 2		20	80	100			
Course Title			PROPERTIES OF MA	TTER – P	RACTICAL	L			

List of Experiments:

- 1. Young's Modulus Non Uniform bending (Scale & Telescope)
- 2. Surface tension and interfacial surface tension by drop weight method.
- 3. Potentiometer Low range voltmeter calibration
- 4. Air wedge Thickness of a thin wire.
- 5. Comparison of viscosities by capillary flow method.
- 6. AND, OR and NOT logic gates using discrete components .

Books for reference:

1. M.N. Srinivasan, S. Balasubramaniyan, R. Ranganathan, A text book of Practical Physics, S.Chand&Sons, reprint 2010.

2. C.C. Ouseph, U.J. Rao& V. Vijayendran, Practical physics and electronics, S. Viswanathan, Pvt,Ltd, First edition,2007.

	Course Outcomes					
Upon suc	Upon successful completion of this course, the student will be able to:					
CO No. CO Statement						
CO1	Recall the basic principles of properties of matter and understand the concepts of bending behaviour beams	K2				
CO2	Make practical skills essential for experimentation.	K3				
CO3	Apply experimental approaches to correlate with physics theory to develop practical understanding.	К3				
CO4	Analyze themselves the concept of heat, optics and acoustics	K4				
CO5	evaluate the ideas required for their higher studies	K5				

Relations	hip Ma	trix:									
Course	Pro	gramm	e Outco	omes (P	Os)	Progra	amme Sp	ecific O	utcomes	(PSOs)	Mean
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	COs
CO1	3	3	3	2	2	2	1	2	2	2	2.2
CO2	2	3	2	3	2	2	2	2	3	2	2.3
CO3	2	2	2	3	3	2	3	3	2	2	2.4
CO4	2	1	2	2	2	2	2	3	2	2	2.0
CO5	2	3	3	2	3	3	2	1	2	2	2.3
Mean Overall Score								2.22			
									Cor	relation	Medium

Mean Overall Score	Correlation
< 1.5	Low
\geq 1.5 and < 2.5	Medium
≥2.5	High

Course Coordinator: Dr. S. Abbas Manthiri

Somostor	Course Code	Course Category	Hours/	Credite	Marks for Evaluation			
Semester	Course Coue	Course Category	Week	Creuits	CIA	ESE	Total	
II	23UCH2CC3	Core-III	6	6	25	75	100	
			-	-	-	-		

Course Title Inorganic, Organic and Physical Chemistry- II

	SYLLABUS	
Unit	Contents	Hours
Ι	 CHEMICALBONDING-I 1.1 Ionic Bond: Electronic theory of valency, Properties of ionic compounds, Variable Electrovalence, Inert Pair effect, Lattice energy – Born Haber cycle – application, factors affecting lattice energy, solubility and solvation energy. Radius ratio rule (ZnS, NaCl). 1.2 Covalent Bond: Valence Bond concept, *types of over lapping of orbitals (ss, pp, sp)* sigma and pi–bonds: Polarity of bonds–ion polarization–degree of ionic character; Significance of dipole moment of polar molecules– Fajan's Rules –Applications. 1.3 Molecular Orbital Theory: LCAO method, Bonding and anti–bonding MO, mixing of orbitals, bond order, relationship between bond order, bond stability, bond length. MO diagrams of H₂, He₂, N₂, O₂, O₂⁺, O₂⁻ CO, HF and NO – Calculation of bond order and magnetism spin only formula, Comparison of valence bond theory and molecular orbital theory. 	18
II	 CHEMICALBONDING-II 2.1. Shapes of covalent Molecules: Hybridisation, formula for prediction of hybridization, sp (BeF₂, CO₂), sp² (BF₃, NO⁻ ion), sp³ (NH₄⁺ H₂O, SO₄²⁻), sp³d (PCl₅) –Bond strength, energy and length. Resonance - Canonical forms of CO₂, NO₂, CO₃²⁻ – Resonance energy, conditions. VSEPR – Postulates, shapes of BeCl₂, BH₃, CH₄, H₂O, NH₃, PCl₅ and SF₆. 2.2. Metallic Bond: Properties of solids based on *Electron sea theory*, valence bond theory and band theory 2.3. Intermolecular forces: van derWaals forces, ion-dipole, dipole-dipole, induced dipole, instantaneous-induced dipole interactions - Hydrogen Bond: Nature, types, effects on physical and chemical properties. 	18
III	 3.1. Alkanes Homologous series, Isomerism - Methods of preparation - Wurtz synthesis, Corey-House Alkane Synthesis and Kolbe's synthesis – Physical properties, Chemical Properties – Chlorination, Nitration, Sulphonation, Oxidation, isomerisation, Pyrolysis (cracking). Preparation, Properties and uses of methane and ethane. 3.2. Cycloalkanes (3 to 6 membered rings): Nomenclature, Methods of Preparation-Dieckmann, Simmons-Smith reaction. Properties -Physical and Chemical - Substitution and Ring-Opening reaction - Stability of Cycloalkanes -Bayer's strain Theory. 3.3. Petroleum: Composition, mining, Refining–Cracking-Synthetic Petrol-Octane Number, Cetane Number, Flash Point and fire point. Petrochemicals – Definition, Composition and uses of Compressed Natural Gas (CNG), Biodiesel, Liquefied Natural Gas (LNG) and *Liquefied Petroleum Gas (LPG)*.	18
IV	 LIQUIDS AND COLLOIDS 4.1. Liquids: Physical properties of liquids-Vapour pressure, Measurement by isoteniscopic method, Heat of vaporization, Trouton's rule - Surface tension, Measurement by Capillary-Rise Method, Variation with temperature and pressure. Viscosity – Variation with temperature and pressure. Reynolds number 4.2.Liquid crystals: definition, classification, theory of liquid crystals, molecular arrangements in various states of liquid crystals, physical properties of liquids, molar volume-parachor, atomic and *structural parachor*, applications. 4.3. Colloids: Definition, differences between true solution, colloidal solution and suspension, phases of colloidal solution-Electrical properties–Zeta potential, charge on colloidal particles, double layer and zeta potential. Electrophoresis and Electro osmosis, Brownian movement, Tyndall effect (definition and uses only) - protection of colloids – Gold number, stabilities of sols, medicinal applications of colloids.*Surfactants, Emulsion and Gels-definition, types and their uses*. 	18

3

V	 SOLID STATE AND ADSORPTION 5.1. Solid state: *Classification- crystalline and amorphous solids, isotropic and anisotropic solids, symmetry elements, unit cell, space lattice*, Bravais lattice, seven crystal systems, Law of rational indices, Weiss indices and Miller indices. Crystal structure of NaCl and CsCl. Packing in crystals –hcp, ccp and bcc. 5.2. X- ray diffraction: Derivation of Bragg's equation – Determination of crystal structure by Laue's powder method – Determination of Avogadro's number. (Simple problems from Bragg's equation) 5.3. Adsorption on solids: Chemisorption and physisorption. Postulates and mathematical form of Freundlich, Langmuir and BET adsorption isotherms. 	18
VI	Current Trends (For CIA only) Nanocolloids: Medicinal applications of nanocolloids	
*	* Self Study	

Text Books:

1. P.L. Soni, Text book of Inorganic Chemistry, S.Chand & Co., NewDelhi, Revised Edition, 2017.
2. P.L. Soni and H.M. Chawla, Text Book of OrganicChemistry, Sulthan and Chand company,
New Delhi, 28 th Edition, 1999
2 P. S. Pohl C. D. Tuli and Amun Pohl Eccontials of Physical Chamistry, S. Chand, & Co. New Dolhi

- 3. B. S. Bahl, G.D.Tuli and ArunBahl, Essentials of PhysicalChemistry, S.Chand &Co.,NewDelhi 28th Edition, 2020.
- 4. B. R. Puri, L. R. Sharma and M. S. Pathania, Principles of Physical Chemistry, Vishal Publications, Jalandhar, 48th Edition, 2019.

Reference Books:

- 1. R.D. Madan, Modern Inorganic Chemistry, S.Chand& Co., NewDelhi, 2ndReprint, 1987
- 2. B.R.Puri, L.R.Sharmaand K.C.Kalia, Principles of Inorganic Chemistry, Vishal Publications, Jalandhar, NewPaper back Edition, 2020
- 3. Bahl and ArunBahl, Advanced Organic Chemistry, Sulthan and Chand Company, New Delhi, 19thEdition, 2005

4. R.L.Madan and G.D. Tuli, Simplified Course in Physical Chemistry, S.Chand & Co., NewDelhi, 5th Revised and Enlarged Edition, 2009

5. J. N. Gurtu and A. Gurtu, Advanced PhysicalChemistry, Pragathi Prakashan, Meerut, 4th Edition, 2017

Web Resources:

- 1. https://onlinecourses.nptel.ac.in/noc23_cy25/preview
- 2. <u>https://nptel.ac.in/content/syllabus_pdf/104101121.pdf</u>
- 3. https://byjus.com/jee/chemical-bonding/
- 4. https://en.wikipedia.org/wiki/Colloid

Course Outcomes						
Upon suc	Upon successful completion of this course, the student will be able to:					
CO No.	CO Statement	Cognitive Level (K-Level)				
CO1	Remember the concepts of ionic bond, covalent bond and metallic bonds	K1				
CO2	Understand the properties of petroleum products	K2				
CO3	Apply Molecular Orbital theory, VSEPR to study the properties of molecules	К3				
CO4	Analyze nature of bonds present in the molecules	K4				
CO5	Compare the salient features of solids, crystals, liquids, liquid crystals and colloids	К5				

Course Programme Outcomes (POs)						Programme Specific Outcomes (PSOs)				
PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Cos
3	3	3	3	2	3	3	3	3	3	2.9
3	3	1	2	1	3	1	2	1	1	1.8
3	2	2	3	2	3	3	3	1	2	2.4
3	3	3	3	2	3	3	3	2	2	2.7
3	1	1	1	1	3	1	1	1	1	1.4
							Me	an Overa	all Score	2.24
								Cor	relation	Medium
	Pro PO1 3 3 3 3 3 3	Programm PO1 PO2 3 3 3 3 3 2 3 3 3 1	Programme Outcom PO1 PO2 PO3 3 3 3 3 3 1 3 2 2 3 3 3 3 1 1	Programme Outcomes (P PO1 PO2 PO3 PO4 3 3 3 3 3 3 1 2 3 2 2 3 3 3 3 3 3 1 1 1	Programme Outcomes (POs) PO1 PO2 PO3 PO4 PO5 3 3 3 3 2 3 3 1 2 1 3 2 2 3 2 3 3 3 3 2 3 3 3 3 2 3 3 3 3 2 3 1 1 1 1	Programme Outcomes (POs) Programme PO1 PO2 PO3 PO4 PO5 PS01 3 3 3 3 2 3 3 3 1 2 1 3 3 2 2 3 2 3 3 3 3 3 2 3 3 3 3 3 2 3 3 1 1 1 3	Programme Outcomes (POs) Programme Sp PO1 PO2 PO3 PO4 PO5 PS01 PS02 3 3 3 3 2 3 3 3 3 1 2 1 3 1 3 2 2 3 2 3 3 3 3 3 3 2 3 3 3 3 3 3 2 3 3 3 1 1 1 3 1	Programme Outcomes (POs) Programme Specific O PO1 PO2 PO3 PO4 PO5 PS01 PS02 PS03 3 3 3 3 2 3 3 3 3 3 1 2 1 3 1 2 3 2 2 3 2 3 3 3 3 3 3 3 2 3 3 3 3 3 3 3 2 3 3 3 3 3 3 3 2 3 3 3 3 1 1 1 3 1 1 4 1 1 1 3 1 1	Programme Outcomes (POs) Programme Specific Outcomes PO1 PO2 PO3 PO4 PO5 PS01 PS02 PS03 PS04 3 3 3 3 2 3 3 3 3 3 3 1 2 1 3 1 2 1 3 3 1 2 1 3 1 2 1 3 3 3 2 3 3 3 1 1 3 3 3 2 3 3 3 1 1 3 3 3 2 3 3 3 2 3 3 2 3 3 2 3 3 2 3 3 2 3 3 2 3 3 2 3 3 3 2 3 3 3 2 3 3 3 2 3 3 3 2 3 3 1 1 1 3 3 3 3	Programme Outcomes (POS)Programme Specific Outcomes (PSOS)PO1PO2PO3PO4PO5PSO1PSO2PSO3PSO4PSO53332333333312131213223233123332332231113111Hereitation

Mean Overall Score	Correlation
< 1.5	Low
\geq 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. J. Muneer Ahamath

Samaatan	Course Code	Course Cotogomy	Hours/	Credita	Marks for Evaluation				
Semester	Course Coue	Course Category	Week		CIA	ESE	Total		
II	23UCH2CC4P	Core – IV	3	3	20	80	100		

Course	Titla
Course	I itie

Industrial Chemistry- Practical

	Contents	Hours				
1.	1. Estimation of total hardness of water using EDTA					
2.	Determination of Iodine value of oil by Hanus method.					
3.	Determination of saponification value of an oil					
4.	Estimation of ascorbic acid (Vitamin – C)					
5.	5. Determination of percentage purity of washing soda					
6.	6. Estimation of available chlorine in bleaching powder					
7.	. Determination of percentage of calcium in lime stone					
8.	Determination of acid value of an edible oil					
	Scheme of valuationRecord -10 MarksProcedure writing -10 MarksFor Estimation -60 MarksFor Estimation Results: $1-2\% - 60$ marks $2-3\% - 50$ marks $3-4\% - 40$ marks>4\% - 30 marks					

Text Books:

1. Venkateswaran V. Veerasamy R. Kulandaivelu A.R, Basic Principles of Practical Chemistry, S. Chand & Co Pvt. Ltd, New Delhi, 1997, 2nd Edition.

2. K.B. Baliga et al., College Analytical Chemistry, Himalaya Publishing House, 2011, 19th Edition.

3. J. Merdharn, R.C. Denney, J.D. Barnes, M. Yhomas, Vogels's Textbook of Quantitative Chemical

Analysis, Pearson Education Limited, New Delhi, 2006, 6th Edition.

Reference Books:

1. Henry W. Schimpf, Essentials of Volumetric Analysis, New York John Wiley Sons,. London, 1917, 3rd Edition.

2. Michal J. Sienko, Robert A. Plane, Stanley T. Marcus, Experimental Chemistry, MCGraw-Hill Book Company, New Delhi, 1985, 6th Edition.

3. D.V. Jahagirdar, Experiments in Chemistry, Himalaya Publishing House, Mumbai, 2018, 2nd Edition.

Web Resources:

1. https://collegedunia.com/courses/industrial-chemistry

2. https://www.gsfcuni.edu.in/bsc-industrial-chemistry

	Course Outcomes							
Upon suc	Upon successful completion of this course, the student will be able to:							
CO No.	CO Statement	Cognitive Level (K-Level)						
CO1	Identify the purity of commercial samples	K1						
CO2	Express the total hardness of water	K2						
CO3	Determine the availability of chemical constituents in various commercial products	K3						
CO4	Analyse the quality of oil samples	K4						
CO5	Measure the percentage of additives in washing powder	K5						

Course	Programme Outcomes (POs)						Programme Specific Outcomes (PSOs)					
Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Score of COs	
CO1	3	3	3	2	1	3	3	2	2	1	2.3	
CO2	3	3	3	2	1	3	3	2	1	1	2.2	
CO3	3	3	3	2	1	3	2	2	1	1	2.2	
CO4	3	3	3	2	2	3	2	2	2	1	2.3	
CO5	3	3	3	2	1	3	2	2	2	1	2.2	
Mean Overall Score										2.2		
									Cor	relation	Medium	

Mean Overall Score	Correlation
< 1.5	Low
\geq 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. S. Farook Basha

Somestan	Course Code	Course Cotogony	Hours/ Credits		Marks for Evaluation			
Semester	Course Code	Course Category	Week	Creats	CIA	ESE	Total	
II	23UPH2AC3	ALLIED – III	4	4	25	75	100	

Course Title

ESSENTIALS OF PHYSICS

	SYLLABUS	
Unit	Contents	Hours
I	OPTICS Spherical Aberration in a lens – Methods of minimizing Spherical Aberration – Interference– Air-wedge – Thickness of a thin wire (Theory and Experiment) – Newton's rings – Radius of curvature of the lens-Diffraction-Determination of wavelength of light using grating- *Polarization* –Specific Rotatory Power- Laurent's Half Shade Polarimeter	12
II	ELECTRICITY Coulomb's law – Gauss law - Principle of capacitor –Energy stored in a charged capacitor – Loss of energy due to sharing of charges – *Kirchhoff's laws* – Application of Kirchhoff's laws to Wheatstone bridge – Carey Foster bridge – Determination of specific resistance – Potentiometer - Calibration of low range voltmeter and ammeter	12
ш	ATOMIC AND NUCLEAR PHYSICS Vector atom model – Quantum numbers – Coupling schemes – The Pauli's Exclusion Principle – Zeeman Effect – Experimental arrangement for normal Zeeman effect – Liquid drop model –Construction and working of an Ionization chamber and Geiger Muller Counter – *Nuclear fission* – Energy released in fission –Nuclear fusion	12
IV	ELECTRONICS Formation of P-N Junction Diode – Forward and Reverse biasing of a Junction diode – V-I Characteristics of a Junction Diode – *Junction diode as bridge rectifier* – Zener diode – V-I Characteristics of a Zener Diode – Construction and Working of a transistor – Characteristics of a transistor in Common Emitter (CE) and Common Base (CB) configurations	12
v	NUMBER SYSTEMS AND LOGIC CIRCUITS Conversion between Decimal, Binary, Octal and Hexadecimal number systems – *The basic logic gates (AND, OR, NOT) using discrete components – NAND and NOR as universal gates – The Exclusive OR gate* – Laws of Boolean algebra – De- Morgan's theorems – Half Adder– Full Adder	12

..... Self Study

Text Books:
1. R. Murugeshan, KiruthigaSivaprasath, Optics and Spectroscopy, S. Chand & Company PVT. Ltd, New Delhi
Reprint, 2016.
Unit–I:Section1.16 – 1.7, 2.1,2.7-2.9, 3.17,4.19,4.20
Unit – VI: Section $5.3 - 5.6$
2. R. Murugeshan, Electricity and Magnetism, S. Chand & Company PVT. Ltd, New Delhi,
Tenth Edition, 2017.
Unit–II: Section 1.2, 2.2, 4.1, 4.9, 4.11, 6.6 – 6.8R. Murugeshan, KiruthigaSivaprasath, Modern Physics Chand & Company PVT. Ltd, New Delhi, Eighteenth Edition, 2016.
Unit –III: Section 4.12 – 4.23, 17.10, 18.3, 18.6, 22.1, 22.6 – 22.6.1
Unit –IV: Section 33.1 – 33.2.1, 33.5.3, 34.1, 35.1 – 35.3
Unit – V: Section 41.1 – 41.15
3. N. Subrahmanyam, Brijlal and M.N. Avadhanulu, A Textbook of Optics, S. Chand & Company PVT. Ltd, N
Delhi, Twenty Fourth Edition, 2015.
Unit – VI: Section 22.8, 22.14 – 22.19
Reference Books :
1. Arthur Beiser, Concepts of Modern Physics, McGraw Hill, Fifth edition, 2002.
2. V.K.Mehta, RohitMehta, Principles of Electronics, S.ChandPublications, Reprint 2016
Web Resources:
1. https://www.classcentral.com/course/edx-electricity-and-magnetism-part-1-3032

- 2. <u>https://www.electronics-tutorials.ws/</u>
- 3. <u>https://www.nuclear-power.net/nuclear-power/reactor-physics/atomic-nuclear-physics/</u>

Course Outcomes								
Upon suc	Upon successful completion of this course, the student will be able to:							
CO No.	CO Statement	Cognitive Level (K-Level)						
CO1	Recall the basic principles and contemporary concepts on various fields on physics like optics, electrostatics, atomic and nuclear physics	K1						
CO2	Understand the basic ideas of geometric optics	K2						
CO3	Construct digital circuits for simple real world problems	К3						
CO4	List the applications of electronics in modern gadgets	K4						
CO5	Explain the fundamental concepts of electricity	K5						

Course	Pro	gramm	e Outco	omes (P	POs)	Progra	Mean Score				
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	01 COS
CO1	2	2	1	3	2	2	3	1	2	3	2.1
CO2	2	3	1	2	3	2	3	2	3	2	2.3
CO3	2	3	2	3	1	1	3	2	1	3	2.1
CO4	3	2	3	1	1	3	2	2	2	3	2.2
CO5	3	2	3	3	2	3	2	2	3	1	2.4
Mean Overall Score									2.22		
Correlation										MEDIUM	

Mean Overall Score	Correlation
< 1.5	Low
\geq 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:

Dr. S. Shek Dhavud Dr.P. Revathi

Somester	Course Code		Course Cotogomy	Hours/	Credita	Marks for Evaluation			
Semester			Course Category	Week	Creans	CIA	ESE	Total	
п	23UI	PH2AC4P	ALLIED – IV	3	2	20	80	100	
Course Title			OPTICAL, THERM	AL AND EL	ECTRICIT	Y - PRAC	TICAL		

List of Experiments:

- 1. Young's modulus Cantilever depression method
- 2. Potentiometer Ammeter calibration.
- 3. Compound Pendulum: Determination of the radius of Gyration
- 4. Comparison of radii: Capillary flow method.
- 5. Sonometer Verification of transverse laws of vibration (I & II Law)
- 6. Meter bridge resistance.
- 7. Verification of De Morgan's theorems using ICs.
- 8. Determination of the resistance of a material using post office box.

Books for Reference:

- 1. M.N. Srinivasan, S. Balasubramaniyan, R. Ranganathan, A text book of Practical Physics, S.Chand&Sons, reprint 2010.
- C.C. Ouseph, U.J. Rao& V. Vijayendran, Practical physics and electronics, S. Viswanathan, Pvt,Ltd, First edition,2007.

Course Outcomes								
Upon suc	Upon successful completion of this course, the student will be able to:							
CO No.	CO Statement	Cognitive Level (K-Level)						
CO1	Recall the basic principles of properties of matter and underlying the concepts of bending behaviour beams	К2						
CO2	Make practical skills essential for experimentation.	K3						
CO3	Apply experimental approaches to correlate with physics theory to develop practical understanding.	К3						
CO4	Analyze the concepts of heat and acoustics and understood the measurements of some physical quantities through heat and electricity experiments	K4						
CO5	evaluate the circuit construction in the electronics	K5						

Course	Programme Outcomes (POs)					Progra	Mean				
Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Score of COs
CO1	3	3	3	2	2	2	1	2	2	2	2.2
CO2	2	3	2	3	2	2	2	2	3	2	2.3
CO3	2	2	2	3	3	2	3	3	2	2	2.4
CO4	2	1	2	2	2	2	2	3	2	2	2.0
CO5	2	3	3	2	3	3	2	1	2	2	2.3
								Me	an Overa	all Score	2.22
									Cor	relation	Medium

Mean Overall Score	Correlation
< 1.5	Low
\geq 1.5 and < 2.5	Medium
≥2.5	High

Course Coordinator: Mr. S. Mohamed Ibrahim Sulaiman Sait

Someston	Course Code	Course Cotogony	Hours/ Crodi		Marks for Evaluation			
Semester	Course Coue	Course Category	Week	Creans	CIA	ESE	Total	
III	23UCH3CC5	Core - V	4	4	25	75	100	
							-	

Course Title INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY - III

	SYLLABUS										
Unit	Contents	Hours									
	s - BLOCK ELEMENTS, HALOGENS AND NOBLE GASES 1.1. Hydrogen: Position of hydrogen in the periodic table. Alkali metals: Comparative study of the elements with respect to oxides, hydroxides, halides, carbonates, and bicarbonates.										
Ι	1.2. Halogens: General characteristics of halogen with reference to electronegativity, electron affinity, oxidation states and oxidizing power. Peculiarities of fluorine. Preparation, properties, and uses of Halogen acids-HF, HCl, HBr, HI and oxy acids.	12									
	1.3. Noble Gases : Position in the periodic table. Preparation, properties and structure of XeF ₂ , XeF ₄ , [*] XeF ₆ [*] and XeO ₄ uses of noble gases-clathrate compounds.										
п	 p - BLOCK ELEMENTS 2.1. Boron Group: Structure, preparation, properties, and uses of borax, diborane, boron nitride, borazine and borazole. Comparative study of boron group elements. 2.2. Carbon Group: Comparative study of carbon group and their hydrides, halides andoxides. Preparation and properties of *carbon disulphide,* cyanogens, HCN and pseudo halogens. 2.3. Oxygen Group: Structure and allotropy of elements - chemistry of ozone - Classification and properties of oxides – oxides of sulphur and selenium–Oxyacids of sulphur(Caro's and Marshall's acids) 	12									
III	OLEFINS AND ACETYLENES 3.1. Alkenes – Preparation and properties of alkenes – electrophilic and free radical addition. *Markownikoff's and anti-Markownikoff's rules.* 3.2.Alkadienes- Nomenclature-classification- isolated,conjugatedandcumulateddienes,stabilityofconjugateddienes,mechanismofelectrophili cadditiontoconjugated dienes - 1, 2 and 1, 4 additions-free radical additions to conjugateddienes,Diels-Alder reactions. 3.3. Alkynes –Preparation from dihalides. Addition reactions - hydrogen, halogens, halogen acids, water, oxidation by KMnO4, ozonolysis. acidity of alkynes.	12									
IV	 ALCOHOLS AND ALKYL HALIDES 4.1 Alcohols: Classification, isomerism, preparation and properties. Distinction between primary, secondary and tertiary alcohols by Lucas and Victor Meyer methods. *Glycol – preparation and properties.* Glycerol – preparation and properties. 4.2 Aromatic alcohols Nomenclature, benzyl alcohol – methods of preparation – hydrolysis, reduction of benzaldehyde, Cannizzaro reaction. 4.3.Alkyl halides: Vicinal dihalides and gem dihalides - Preparation and properties. Aliphatic Nucleophilic substitution reactions - mechanism of SN¹, SN² and SNi reactions. Elimination reactions - mechanisms of E₁ and E₂ reactions – Saytzeff's and Hofmann rules. 	12									
V	ELECTRICAL AND MAGNETIC PROPERTIES OF MATTER 5.1 Electrical Properties of Matter : *Polar and non-polar molecules, dipole moment, Stark effect*, Polarization of molecules in an electric field - electronic polarization, atomic polarization and orientation polarization – Clausius - Mosotti equation (noderivation) and Debye equation (no derivation)- Methods to determine dipole moment – Temperature method and dilute solution method - applications of dipole moment - determining the percentage of ionic character of bonds- shapes of simple molecules (H ₂ O, CO ₂ and NH ₃). 5.2 Magnetic Properties of Matter : Magnetic flux, Magnetic Permeability, Magnetic susceptibility, Types of magnetism - dia, para, ferro and antiferro magnetism. Determination of magnetic susceptibility by Guoy balance method. Application to solving of simple structural problems.	12									

Text Book(s):

- 1. B.R. Puri, L.R. Sharma and K.C. Kalia, Principles of Inorganic Chemistry, Milestone Publishers and distributors, New Delhi, 1st Edition, 2012
- 2. Bahl and ArunBahl, Advanced Organic Chemistry, Sulthan and Chand Company, New Delhi, 19th Edition, 2005
- 3. P.W. Atkins, Physical Chemistry, Oxford University Press, 7th edition, 2009

Reference Book(s):

- 1. B.R. Puri, L.R. Sharma and K.C. Kalia, Principles of Inorganic Chemistry, Milestone Publishers and distributors, New Delhi, 1st Edition, 2012
- 2. V. K. Ahluwalia, Text book of Organic Chemistry Vol-I &Vol-II, Ane's Student edition, New Delhi,
 - 1st Edition, 2010
- 3. J. N. Gurtu and A.Gurtu, Advanced Physical Chemistry, PragathiPrakashan, Meerut, 3rd Edition, 2016

Web Resource(s):

1. https://nptel.ac.in/courses/113/105/113105024/

- 2. https://www.khanacademy.org/science/organic-chemistry/aromatic-compounds
- 3. <u>https://study.com/academy/topic/ethers-carbonyl-compounds.html</u>

	Course Outcomes								
Upon suc	cessful completion of this course, the student will be able to:								
CO No.	CO Statement	Cognitive Level							
CO1	Describe the chemistry of binary compounds and alloys and metallurgy	(K-Level) K1							
CO2	Analyse the aromaticity of the organic compounds and their mechanism towards electrophilic substitution.	K1 K2							
CO3	Understand the properties of carbonyl compounds and ethers.	K3							
CO4	Infer the concepts of acids and bases.	K4							
CO5	Explain the kinetics of chemical reactions.	K5							

Relationship Matrix:

Course	Prog	gramm	e Outco	omes (I	POs)	Programme Specific Outcomes (PSOs)					Mean
Outcomes	DO1	DO1	DU3		DO5	DSO1	DSO2	DSO3	DSO4	DSO5	Score of
(COs)	rui	FU2	F03	FU4	F05	1301	r502	1303	1304	1305	COs
CO1	3	2	2	2	3	2	1	3	1	2	2.0
CO2	3	2	2	2	3	2	2	2	2	2	2.0
CO3	3	2	2	1	3	2	1	2	2	2	2.0
CO4	3	3	2	1	2	2	1	2	3	2	2.1
CO5	2	3	2	2	2	3	2	2	2	2	2.2
								Mea	n Overa	ll Score	2.04
									Cor	relation	Medium

Mean Overall Score	Correlation
< 1.5	Low
\geq 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator:

1. Dr. K. Riaz Ahamed

2. Dr. J. Muneer Ahamath

Somester	Course Code	Course Cotogory	Hours/	Credita	Marks for Evaluation			
Semester	Course Coue	Course Category	Week	Creatis	CIA	ESE	Total	
III	23UCH3CC6P	Core - VI	3	3	20	80	100	

Course Title

Analysis of Domestic Products and Food Samples - Practical

SYLLABUS		
Contents		Hours
 I. List of experiments Preparation of Detergent washing powder and determination of its pH, Surface Cleaning ability and Foaming ability Preparation of Utensils cleaning powder and determination of its pH, Surface Cleaning ability, Foaming ability Preparation of Normal shampoo and determination of its pH, Cleaning ability Preparation of Tooth paste and determination of its pH, Abrasiveness, Cleaning ability Preparation of Decarbonizes and determination of its pH and Cleaning ability Preparation of Soap and determination of its pH, Surface tension, Cleaning a bility Preparation of Soap and determination of its pH, Surface tension, Cleaning a bility Preparation of LCD screen cleaner a. Preparation of Sanitizer Preparation of Hand and Body lotion a. Preparation of Pain relieving balm Preparation of Rose water Preparation of Rose water 	40 marks ce tension, e tension, y and Foaming ng ability and bility and	
II Video Presentation Preparation of 3-5 minutes video presentation for marketing the products	10 marks	45
III Spectrophotometric Estimation 1. Estimation of chromium in foods 2. Estimation of Iron in foods	20 marks	
IV. Record	10 marks	
Scheme of Valuation I& II Preparation and Quality Measurements of Domestic Products Procedure writing : 10 marks Preparation of Domestic Product : 30marks Video presentation : 10 marks III. Spectrophotometric Estimation – 20 marks 1-2% error - 20 marks 2 3% error - 15 marks	50 marks	
2-5 //crior - 15 marks 3-4 %error - 10 marks >4%error - 5 marks		

Text Book(s):

1. Hilda Butler, Pouchers-Perfumes, Cosmetics and Soaps, Springer, New Delhi, 12th Edition, 2012 2. Howard, Perfumes Cosmetics And Soaps Volume-I, Springer, Meri Pustak publications, New Delhi, 9th Edition, 2018.

Reference Book(s):

 1.fssai Manual of Methods of Analysis of Foods Metals, Food Safety and Standards Authority of India, Ministry of Health and Family Welfare, Government of India, New Delhi, 2016.
 2. Manual of Laboratory Methods for Fortified Foods, East, Central and Southern African Healthy Community, Part-III, 1st Edition, 2007.

Web Resource(s):

1. https://fssai.gov.in/upload/uploadfiles/files/Manual_Metals_25_05_2016(1).pdf

2. https://www.fssai.gov.in/flipbook.php?bookid=362&doc2=0#book2/

	Course Outcomes							
Upon suc	cessful completion of this course, the student will be able to:							
CO No.	CO Statement	Cognitive Level (K-Level)						
CO1	Select the chemicals required for the domestic product preparation.	K1						
CO2	Produce the products in small scale	K2						
CO3	Appraise the quality of domestic products.	K3						
CO4	Formulate the combination for commercialization	K4						
CO5	Become an enterperuner.	K5						

Relationship Matrix:

Course Programme Outcomes (POs)						Progra	Mean Score of				
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	COs
CO1	3	3	3	3	3	3	3	3	3	3	3.0
CO2	3	3	3	3	3	3	2	3	3	3	2.9
CO3	3	3	3	3	3	3	3	3	3	2	2.9
CO4	3	3	2	3	3	3	3	3	3	3	2.9
CO5	3	3	3	3	3	3	3	3	2	3	2.9
								Me	an Overa	all Score	2.92
									Cor	relation	High

Mean Overall Score	Correlation
< 1.5	Low
\geq 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:

1. Dr. M. Syed Ali Padusha

2. Dr. R. Abdul Vahith

Semester	Course Code	Course Cotogowy	Hours/	Credita	Marks for Evaluation			
	Course Code	Course Calegory	Week	Creans	CIA	ESE	Total	
III	23UMA3AC5:3	Allied – V	4	3	25	75	100	
				•				

Course Title

CALCULUS

SYLLABUS				
Unit	Contents	Hours		
I	Successive Differentiation – The n th derivatives of Standard result – Trigonometrical transformation of functions - * Formation of equations involving derivatives* - Leibnitz formula for the n th derivative of a product (Statement only) - Related problems.	12		
II	Partial Differentiation – Successive partial derivatives – Function of function rule - *Total differential coefficient and special case* – implicit functions - Homogeneous functions - Partial derivatives of a function of two functions.	12		
III	Properties of definite integrals – Integration by parts - Reduction formulae $\int x^n e^{ax}$, $\int sin^n x$, $\int cos^n x$, and $\int sin^m x cos^n x$ - Related problems.	12		
IV	Curvature: Circle, Radius and Center of Curvature - Cartesian Formula for the Radius of Curvature - Coordinates of the Center of Curvature.	12		
V	Evolute and Involute – Radius of curvature when the curve is given in polar co- ordinates – p-r equation – pedal equation of a curve.	12		

..... Self Study

Text Book(s):

T. K. Manicavachagom Pillay and Others, Calculus Volume-I, S. Viswanathan Publishers Pvt. Ltd. (2004).

UNIT I	Chapter III	Sections 1.1 – 1.6, 2.1, 2.2 (Section 2.1: statement only
		Section 2.2: problems only)
UNIT II	Chapter V	Sections 1.2, 1.3, 1.5(Section 1.2 and 1.3: Theorems statement only,
		Section 1.5: Working Rules and problems only)
	Chapter VIII	Sections 4, 5
UNIT III	Chapter VIII	Sections $1.1 - 1.7$
UNIT IV	Chapter X	Sections $2.1 - 2.4$
UNIT V	Chapter X	Sections 2.5 – 2.8

Reference Book(s):

1. A. Abdul Rasheed, Allied Mathematics, Tata McGraw Hill Education (2006)

2. S. Arumugam and A. Thangapandi Isaac, Calculus, New Gamma Publishing House (2008).

Web Resource(s):

1. https://nptel.ac.in/courses/111104092

2. https://nptel.ac.in/courses/111105122

	Course Outcomes					
Upon suc	cessful completion of this course, the student will be able to:					
CO No.	CO Statement	Cognitive Level (K-Level)				
CO1	Find the nth derivatives of a function and apply the Leibnitz's theorem for finding n th derivative of product of two functions.	K1				
CO2	Explain the concept of curvature of a curve and to find the radius and center of curvature of a given curve.	K2				
CO3	Solve maxima and minima for a function of one, two variables.	K3				
CO4	Understand the concept of evolute, involute and to find radius of curvature using polar co-ordinates and forming pedal equation of a curve.	K4				
CO5	Discuss the partial derivatives of a function of functions depending on two independent variables and to understand the concepts of homogeneous function, Euler's theorem, total differentiation and implicit functions.	К5				

Course Programme Outcomes (POs)							Programme Specific Outcomes (PSOs)				
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	COs
CO1	3	3	2	3	3	3	3	3	3	2	2.8
CO2	3	1	3	3	3	3	1	3	1	3	2.4
CO3	3	3	1	3	2	3	3	1	3	3	2.5
CO4	3	3	3	1	3	3	3	3	3	3	2.8
CO5	3	1	3	3	3	1	3	3	1	3	2.4
								Me	an Overa	all Score	2.58
									Cor	relation	High

Mean Overall Score	Correlation
< 1.5	Low
\geq 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:

- Dr. P. Muruganatham
 Mr. T. Rabeeh Ahamed

Somester	Course Code	Course Cotogowy	Hours/	Credita	Marks for Evaluation			
Semester	Course Coue	Course Calegory	Week	Creatis	CIA	ESE	Total	
III	23UMA3AC6:3	Allied – VI	3	3	25	75	100	
	•		•	•		•	•	

Course Title

ALGEBRA AND TRIGONOMETRY

SYLLABUS				
Unit	Contents	Hours		
I	Theory of equations: *Nature of roots* – Relation between the coefficients and the Roots of an algebraic equation – Transformation of equations – Reciprocal equations.	9		
II	Matrices- *Special types of matrices*- Scalar multiplication of a matrix- Equality of matrices, Addition of matrices- Subtraction- Symmetric matrix-Skew symmetric matrix-Hermitian and skew Hermitian matrices- Multiplication of matrices (Problems only).	9		
III	Matrices: *Various types of Matrices* - Rank of a Matrix - Eigen values and Eigen Vectors- Verification of Cayley-Hamilton theorem.	9		
IV	Trigonometry: Expansions of $cosn\theta$ and $sinn\theta$ – Powers of sines and cosines of θ in Terms of functions of multiple of θ .	9		
V	Hyperbolic functions – Simple Problems	9		

..... Self Study

Text Book(s):

 S.Narayanan, R.Hanumantha Rao and T.K. Manicachagom Pillay, P. Kandaswamy, Ancillary Mathematics, Volume I, S. Viswanathan Publishers Pvt. Ltd. Revised Edition (2007).
 T.K. Manicavachagom Pillay, T. Natarajan and K.S. Ganapathy, Algebra Volume-II, Ananda Book Depot, Chennai (2019).

UNIT I	Chapter 2	Sections 2.1–2.4	TB-1
UNIT II	Chapter 2	Sections 1-7	TB-2
UNIT III	Chapter 3	Sections 3.1, 3.2, 3.4.	TB-1
UNIT IV	Chapter 5	Sections 5.1, 5.2	TB-1
UNIT V	Chapter 5	Section 5.4.	TB-1

Reference Book(s):

1. A. Abdul Rashid, Allied Mathematics, Vijay Nicole Publishing Company (2008).

2. S. Arumugam and A. Thangapandi Isaac, Ancillary Mathematics, New Gamma Publishing house (2002).

Web Resource(s):

1. https://nptel.ac.in/courses/111107119

2. https://www.digimat.in/nptel/courses/video/111107119/L01.html

	Course Outcomes					
Upon suc	cessful completion of this course, the student will be able to:					
CO No.	CO Statement	Cognitive Level (K-Level)				
CO1	Understand of common algebra and how they are used to obtain solutions of matrices then mathematical problems.	K1				
CO2	Derive the Trigonometry Expansions of $\cos \theta$ and $\sin \theta$ – Powers of sines and cosines.	K2				
CO3	Apply algebra and Trigonometry to obtain solutions to mathematical problems.	K3				
CO4	Analyse mathematical problems to determine the suitable functions.	K4				
CO5	Evaluate various Trigonometry functions and roots of algebraic equation, hyperbolic functions.	K5				

Course Programme Outcomes (POs)						Programme Specific Outcomes (PSOs)					Mean Score of
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	COs
CO1	3	3	3	2	1	3	3	3	2	3	2.6
CO2	2	3	3	3	1	3	3	3	1	3	2.5
CO3	3	1	3	3	1	3	1	3	3	3	2.4
CO4	3	2	3	2	1	1	2	3	3	3	2.3
CO5	2	3	1	3	1	3	3	3	3	3	2.5
								Me	an Overa	all Score	2.46
									Cor	relation	Medium

Mean Overall Score	Correlation
< 1.5	Low
\geq 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:

- 1. Dr. V. Krishnan
- 2. Mr. T. Rabeeh Ahamed

Semester		Course Code	Course	Hours /	Credits	Marks	for Ev	valuation	
ben			Category	Week	Cicuits	CIA	ESE	Total	
0		23UBO3AC5	Allied – V	4	4	25	75	100	
Course little Applied Botany – I									
Unit	nit Contents								
IAlgae: General characteristics and outline classification of algae (F. E. Fritsch, 1935). Thallus organization, food reserve and habitats of algae. A detailed study of structure, reproduction, life cycle (excluding development stages) and economic uses of the following genera – *Oscillatoria*, Chlorella, Sargassum and Gracilaria. Cultivation methods of fresh water (Spirulina), and marine (Kappaphycus) algae.							12		
п	Fungi and Lichens: General characteristics and outline classification of fungi (Alexopoulos and Mims, 1979). Detailed study of occurrence, morphology, reproduction and life cycle of the following genera – <i>Albugo</i> , Brief account on cultivation of edible mushroom (<i>Pleurotus</i>). Introduction to medicinal mushrooms (<i>Ganoderma</i>) and antibiotic producing fungi (<i>Penicillium</i>). Brief account on production of citric acid and acetic acid from fruit peel waste.							12	
III	 Bryophytes: General characteristics and outline classification of Bryophytes (Watson, 1971). Structural description (excluding development stages) of the following genera – <i>Marchantia</i> and <i>Polytrichum</i>. A brief mention of use of bryophytes for antibiotics, anti-cancer, food, ornamental, non-absorbant bandage and pesticides. Environmental importance of mosses in pedogenesis and *neat hog* 						12		
IV	Pteridophytes : General characteristics and outline classification of Pteridophytes (Sporne, 1975). Structural description (excluding developmental stages) of the following genera – <i>Lycopodium</i> and <i>Adiantum</i> . and *Economic importance of Pteridophytes*. Cultivation of <i>Azolla</i> .						12		
V	importance of Pteridophytes*. Cultivation of Azolla.Gymnosperms: General characters and outline classification of gymnosperms(Sporne, 1967). Morphology, anatomy, reproduction, life cycle (excluding developmental stages) and economic uses of Cycas. Importance of gymnosperms as wood and resins (Pinus), anti-cancer drug (Taxus and Ephedra). A brief study of types and application of fossil plants in paleoclimatology and *climate models*.							12	

Text Book(s):

- 1. Vasishta PC, Sinha AK and Kumar A, Botany for Degree Students (Volumes), 2nd Edition, Chand & Company Pvt Ltd, New Delhi, India, 2010.
- 2. Hait G, Bhattacharya K and Ghosh AK, A Text Book of Botany, 5th Edition, New Central Book Agency Pvt Ltd, Kolkata, India, 2011.
- 3. Sharma OP, Plants and Human Welfare, Prakathi Prakashan Publications Pvt Ltd, Meerut, India, 2015.

Reference Book(s):

- 1. Alexopoulos CJ, Mims CW and Blackwell M, Introductory Mycology, 4th Edition, Wiley Publishers, New Delhi, India, 2007.
- 2. Sharma OP, A Text Book of Algae, 1st Edition, Tata McGrew Hill Education Pvt Ltd, New Delhi, India, 2011.

	Course Outcomes						
Course C	Outcomes: Upon successful completion of this course, the student will be able to	:					
CO No.	CO Statement	Cognitive Level (K-level)					
CO1	Outline the diversity of cryptogams and seed plants.	K1					
CO2	Identify the economic uses of natural wealth from cryptogams and seed plants.	K2					
CO3	Perceive the alternative uses of and applications of cryptogams and seed plants.	K3					
CO4	Appraise the values of natural wealth from cryptogams and seed plants.	K4					
CO5	Recommend alternative bio resources for human welfare.	K5					

Relationship Matrix:

Course Outcomes	Prog	ramm	e Outc	omes (I	POs)	Pro	Mean Score				
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	of COs
CO1	3	3	2	2	1	1	3	1	1	3	2
CO2	2	2	2	2	1	3	1	1	3	2	1.9
CO3	1	1	3	3	2	1	1	2	2	1	1.7
CO4	2	2	2	3	1	1	1	1	1	1	1.5
CO5	2	2	2	3	1	1	1	1	1	1	1.5
Mean Overall Score								1.7			
Correlation									Medium		

Mean Overall	Correlation			
Score				
< 1.5	Low			
\geq 1.5 and < 2.5	Medium			
≥ 2.5	High			

Course Coordinator: Dr. A. Aslam

Somostor	Course Code	Course	Hours / Credits		Marks for Evaluation				
Semester	Course Coue	Category	Week	Creans	CIA	ESE	Total		
III	23UBO3AC6P	Allied - VI	3	2	20	80	100		
Course Title	Laboratory Course for Applied Botany - I – Practical								

	Syllabus	
	Contents	Hours
1.	Generic level identification of algal specimens in a mixture.	
	a. Oscillatoria	
	b. Chlorella	
	c. Spirulina	
	d. Sargassum	
	e. Gracilaria	
2.	Identification of following fungi in both host as well as permanent slides	
	a. Albugo	
	b. Saccharomyces	15
3.	Observation of external and internal structure of	45
	a. Marchantia	
	b. Polytrichum	
	c. Lycopodium	
	d. Adiantum	
	e. Cycas	
	f. Pinus	
4.	Identification of spotters related to economic uses of species mentioned in	
	theory	

Text Book(s):

- 1. Santra SC, Chatterjee TP and Das AP, College Botany Practical (Volume II), 1st Edition (Reprinted), New Central Book Agency Pvt Ltd, Kolkata, India, 2001.
- 2. Pandey BP, Modern Practical Botany, 1st Edition (Reprinted), Chand & Company Pvt Ltd, New Delhi, India, 2011.
- 3. Sharma OP, Practical Botany, 7th Edition, Pragati Prakashan Educational Publishers Pvt Ltd, Meerut, India, 2014.

	Course Outcomes						
Course O	utcomes: Upon successful completion of this course, the student will be able	to:					
CO No.	CO Statement	Cognitive					
		Level					
		(K-level)					
CO1	Experience laboratory skills of handling botanical specimens.	K1					
CO2	Describe diversity of plants.	K2					
CO3	Demonstrate preparation and curation of botanical specimens.	K3					
CO4	Identify commercial potential of cryptogams.	K4					
CO5	Appraise the traits and key characters of cryptogams.	K5					

Course Outcomes	Programme Outcomes (POs)					Pro	Mean Score				
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	of COs
CO1	1	3	1	3	1	3	3	2	1	1	1.9
CO2	1	3	1	1	2	3	3	2	1	1	1.8
CO3	2	1	1	3	1	1	3	2	1	1	1.6
CO4	1	3	2	1	1	1	3	2	1	1	1.6
CO5	1	3	1	3	1	1	3	2	1	1	1.7
Mean Overall Score									1.7		
									Corr	elation	Medium

Mean Overall	Correlation
Score	
< 1.5	Low
\geq 1.5 and < 2.5	Medium
> 2.5	High

Course Coordinator: Dr. A. Aslam
Semester	Course Code	Course Cotogony	Hours/	Credita	Marks for Evaluation			
	Course Coue	Course Category	Week	Creans	CIA	ESE	Total	
III	23UCH3GE1	Generic Elective-I	2	2	-	100	100	
			-	•				

Course Title | Food and Nutrition

	SYLLABUS	
Unit	Contents	Hours
I	 FOOD AND ITS CONSTITUENTS 1.1. Food: Definition - Classification based on nutritional values, nutritive values of cereals and nuts - oil seeds. 1.2. Minimum Nutritional Requirement and RDA - Child, Adult, Pregnant Women and lactating women. 	6
II	 MINERALS AND VITAMINS 2.1. Minerals & Trace Elements, Physiological Role & requirements, sources, deficiency & excess (Calcium, Sodium, Potassium Phosphorus, Iron, Fluoride, Zinc, Selenium, Iodine, Chromium). 2.2. Vitamins – classification, sources, deficiency & excess of vitamin A, B₆, B₁₂, C, D, E and K. 	6
III	 MEAL PLANNING 3.1 Importance of meal planning-importance of mother's milk, Milk and milk products - Composition, Classification, Processing, Storage and uses in different preparations. 3.2.Diet during fever, dysentery, anemia, blood pressure, corona virus *obesity and diabetes* IV – Aavin Milk Tiruchirappalli Corporation 	6
IV	 FOOD SPOILAGE AND PRESERVATION 4.1: Food spoilage due to contamination and microorganisms – vegetables, fruits, fish, meat, eggs and milk. 4.2 Food Preservation: definition, objectives and principles of food preservation. *Different methods of food preservation*. 	6
V	 FOOD ADULTERATION 5.1. Food adulteration - Definition, classification - common adulterants in food- detection and ill Effects, packing hazards and food additives. 5.2. Practical rules for good sanitation of food - Food laws and standards - Food Standards : ISI, *Agmark*, FPO, MPO, PFA, FSSAI. IV - Bunge India PVT, Trichy 	6

Text Book(s):

1.Dr. M. Swaminathan, Handbook of foodand Nutrition, Printing andPublishing Co Ltd,Bangalore, 5th Edition, 2007.

2.B. Srilaksmi, Food Science, New Age International(P) Ltd, New Delhi, 3rd edition, 2005.

3. M. Raheena Begum, A Text Book ofFoods, Nutrition andDietetics, StrlingPublishers,New Delhi, 3rd edition, 2010.

Reference Book(s):

1. JayashreeGhose,Fundamental Conceptsof Applied Chemistry, S. Chand andCompany (P) Ltd, New Delhi, 1st Edition, 2006.

2.Morris B. Jacobs, The Chemical Analysisof Foods and FoodProducts, CBS Publishers and Distributors, New Delhi, 3rd Edition, 1993.

3.H.K. Chopra and P.S. Panesar, Food Chemistry, Narosa Publisher, NewDelhi, 3rd Edition, 2010.

Web Resource(s):

1. https://onlinecourses.swayam2.ac.in/cec19_ag02/preview

2.https://www.careers360.com/courses-certifications/food-nutrition-courses-brpg

3.http://www.pjc.ac.in/pdf/syllabus/UG-Food-Nutrition-Syllabus-09042019.pdf

Course Outcomes

Upon successful completion of this course, the student will be able to:						
CO No.	CO Statement	Cognitive Level (K-Level)				
CO1	Understand the major components of foods in the environment	K 1				
CO2	Explain the causes of food spoilage and principles of different techniques used in preservation of foods	К 2				
CO3	Examine the importance of meal planning and diet	K 3				
CO4	Analyze the biological functions of minerals and vitamins	K 4				
CO5	Compare the adulterants added to foods	K 5				

Relationship Matrix:

Course	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean
Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Score of COs
CO1	3	3	3	2	2	3	3	2	3	2	2.4
CO2	3	3	3	3	2	3	3	3	2	2	2.7
CO3	3	3	3	3	2	3	3	3	2	2	2.7
CO4	3	3	3	3	2	2	3	3	2	2	2.6
CO5	3	3	2	3	2	3	3	2	2	2	2.5
Mean Overall Score										2.58	
Correlation										High	

Mean Overall Score	Correlation
< 1.5	Low
\geq 1.5 and < 2.5	Medium
≥2.5	High

Course Coordinator 1. Dr. K Loganathan

2. Dr. S. S. Syed Abuthahir

Semester	Course Code	Course Cotogomy	Hours/	Cradita	Marks for Evaluation			
	Course Coue	Course Category	Week	Creans	CIA	ESE	Total	
IV	23UCH4CC7	Core - VII	5	5	25	75	100	

Course Title | INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY - IV

	SYLLABUS						
Unit	Contents	Hours					
Ι	 BINARY COMPOUNDS AND METALLURGY 1.1. Binary compounds: Borides, Hydrides, Carbides, Nitrides – Classification, structure-bonding and uses. 1.2. Metallurgy: Occurrence of metals in India – Extraction of V and Ti from their ores.Concentration of ores – Froth floatation, Magnetic separation, roasting, smelting. Purification of metals - Reduction, Electrolysis, Van Arkel process, *Zone refining, Alumino thermic process*. 1.3. Alloys: Classification - Preparation and properties – role of carbon in steel – important alloys – Bronze, Brass, Duralamine, gun metal, stainless steel, Nickel steel, Magnalium, Cast Iron, Nichrome, Solder - composition and uses. 	15					
п	 AROMATIC COMPOUNDS 2.1 Aromaticity: Resonance in benzene - delocalised cloud in benzene Huckel's rule and its application to aromaticity of benzenoid (benzene, naphthalene and phenanthrene) and non-benzenoid (cyclopropenium cation and cyclopentadienyl anion) compounds. 2.2 Aromatic Electrophilic substitution reactions: General mechanism of electrophilic reactions – Halogenation, nitration and sulphonation. Fridel-Craft's alkylation and acylation reactions. Orientation effects of various substituents – ortho/para ratio. Nuclear and side chain halogenations of toluene. 	15					
ш	 CARBONYL COMPOUNDS AND ETHERS 3.1. Carbonyl Compounds: General methods of preparation and properties of acetone and acetaldehyde. Benzaldehyde, Benzophenone and acetophenone preparation and properties. 3.2. Ethers: Nomenclature, isomerism, general methods of preparations, reactions involving cleavage of C-O linkages, alkyl group and ethereal oxygen. Zeisel's method of estimation of methoxy group. Preparation, properties and uses of Anisole 3.3. Thioethers - nomenclature, structure, preparation, properties and uses. 	15					
IV	CONCEPTS OF ACIDS AND BASES 4.1 Acids and bases – *Arrhenius, Bronsted- Lowry and Lewis concepts of acids and bases*– Ionic Equilibria - Buffer solution – Definition, buffer action mechanism and its uses –Buffer capacity - various measurement scales for the strength of acids and bases, pH, pOH, and pK _a - calculation of pH of a buffer by Henderson's equation - 4.2 Hydrolysis of salts – Definition, - salt of weak acid and strong base, salt of weak base -strong acid and salt of weak acid and weak base- hydrolysis constant (K _h), relation between K _h , K _a and K _w , Degree of hydrolysis - salt of weak acid - strong base, salt of weak base -strong acid and salt of weak acid - weak base.	15					
V	CHEMICAL KINETICS, CATALYSIS AND PHOTOCHEMISTRY 5.1 Chemical Kinetics: Rate and rate constant – factors affecting rate of reactions – Temperature effect on reaction rate - Arrhenius rate equation, energy of activation and its significance,. Theories of reaction rates – simple collision theory, Absolute Reaction Rate Theory (ARRT) to simple uni-molecular and bimolecular processes - Comparison of collision theory & ARRT (Solving problems using Arrhenius rate equation) 5.2 Catalysis: Catalyst, types of catalysts - *homogeneous and heterogeneous catalysis* –theories of catalysis- Intermediate compound formation theory and modern adsorption theory - synthetic and industrial importance of catalyst. 5.3 Photochemistry: Differences between thermal and photochemical reactions- Laws of photochemistry, Definition - quantum yield and chemical actinometry.	15					
VI	Current Trends (For CIA only)-Novel catalyst - NADPH, Ce-Zr, CLPN-Pd – application	ons.					

Text Book(s):

- 1. B.R. Puri, L.R. Sharma and K.C. Kalia, Principles of Inorganic Chemistry, Milestone Publishers and distributors, New Delhi, 1st Edition, 2012.
- 2. Bahl and Arun Bahl, Advanced Organic Chemistry, Sulthan and Chand Company, New Delhi, 19th Edition, 2005.
- 3. V. K. Ahluwalia, Text book of Organic Chemistry Vol-I &Vol-II, Ane's Student edition, New Delhi,

1st Edition, 2010.

4. R. L. Madan and G. D. Tuli, Simplified Course in Physical Chemistry, S. Chand & Co., New Delhi,

5th Revised and Enlarged Edition, 2009

Reference Book(s):

- 1. R. D. Madan, Modern Inorganic Chemistry, S. Chand & Co., New Delhi, 2nd Reprint, 1987
- 2. M. K. Jain, Organic Chemistry, Sulthan and Chand Company, New Delhi, 12th Edition, 2003
- 3. P.W. Atkins, Physical Chemistry, Oxford University Press, 7th Edition, 2009
- J. N. Gurtu and A.Gurtu, Advanced Physical Chemistry, Pragathi Prakashan, Meerut, 3rd Edition, 2016

Web Resource(s):

- 1. https://nptel.ac.in/courses/113/105/113105024/
- 2. https://www.khanacademy.org/science/organic-chemistry/aromatic-compounds
- 3. https://study.com/academy/topic/ethers-carbonyl-compounds.html

	Course Outcomes						
Upon suc	cessful completion of this course, the student will be able to:						
CO No.	CO Statement	Cognitive Level (K-Level)					
CO1	Describe the chemistry of binary compounds and alloys and metallurgy.	K1					
CO2	Understand the properties of carbonyl compounds and ethers.	K2					
CO3	Analyze the aromaticity of the organic compounds and their mechanism towards electrophilic substitution.	К3					
CO4	Infer the concepts of acids and bases.	K4					
CO5	Explain the kinetics of chemical reactions.	K5					

Relationship Matrix:

Course	Programme Outcomes (POs)					Progra	Mean				
Outcome	DO1	DOJ	DO3		DO5	DSO1	DSO2	DSO3	DSO4	DSO5	Score of
s (COs)	101	102	105	104	105	1501	1502	1505	1504	1505	COs
CO1	3	2	2	2	3	2	1	3	2	2	2.0
CO2	2	2	2	2	1	2	2	2	2	2	1.9
CO3	2	2	2	1	3	2	1	2	1	2	1.8
CO4	3	3	2	1	2	2	1	2	3	2	2.1
CO5	2	3	2	2	2	3	2	2	2	2	2.2
Mean Overall Score										2.0	
									Cor	relation	Medium

Mean Overall Score	Correlation
< 1.5	Low
\geq 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:

1. Dr. J. Sirajudeen

2. Dr. S. Mohamed Rabeek

Somester	C	www.c.ada	Course Cotogony	Hours/	Credita	Marks for Evaluation			
Semester	U	Jurse Code	Course Calegory	Week	Creatis	CIA	ESE	Total	
IV	231	UCH4CC8P	Core - VIII	3	3	20	80	100	
Course Title		SEMIMICR	O QUALITATIVE	ANALY	SIS OF	INOR	GANIC	SALT	
		MIXTURE	MIXTURE - PRACTICAL						

SYLLABUS					
Contents	Hours				
I. List of Practicals:					
Qualitative analysis of inorganic salts70 marksAnalysis of a mixture containing two cations and two anions of which one will be an interfering ion by Semimicro methods.70 marksCations to be analysed: Lead, copper, bismuth, cadmium, tin, iron, zinc, manganese, cobalt, nickel, barium, calcium, strontium, magnesium and ammonium.70 marksAnions to be analysed: Carbonate, sulphide, sulphate, nitrate, chloride, bromide, fluoride, borate, oxalate and phosphate.70 marks	45				
II. Record 10 marks					
Scheme of valuation					
Procedure Writing : 10 marks					
4 radicals correct with suitable tests : 60 marks					
3 radicals correct with suitable tests : 45 marks					
2 radicals correct with suitable tests : 30 marks					
1 radical correct with suitable tests : 15 marks					
Text Book(s):					
1.V.Venkateswaran, R.Veeraswamy and A.R. Kulandivelu, Basic Principles of Practical Chemistre	ry,				
Sultan Chand & Sons, New Delhi, second edition, 1997.					
Web Resource(s):					
1.https://www.vlab.co.in/broad-area-chemical-sciences					

	Course Outcomes	
Upon suc	cessful completion of this course, the student will be able to:	
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Acquire knowledge on the systematic analysis of Mixture of salts.	K 1
CO2	Infer the cations and anions in the unknown substance.	K2
CO3	Identify the cations and anions in the given substance by doing the suitable tests and to test the quality of the unknown substance.	К3
CO4	Deduct the role of common ion effect in the given substance	K4
CO5	Explain importance of the role of solubility product in qualitative analysis	K5

Course	Pro	gramm	e Outco	omes (P	Os)	Programme Specific Outcomes (PSOs)					Mean Score of
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	COs
CO1	2	2	2	2	2	2	2	3	2	3	2.2
CO2	3	3	3	2	2	2	3	3	3	2	2.6
CO3	2	2	2	2	2	2	3	2	2	2	2.1
CO4	2	2	2	2	2	2	3	3	3	3	2.4
CO5	2	2	3	2	3	2	2	2	2	2	2.2
Mean Overall Score									2.3		
Correlation									Medium		

Mean Overall Score	Correlation
< 1.5	Low
\geq 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:

1. Dr. M. Syed Ali Padusha 2. Dr. S. Farook Basha

Someston	Course Code	Course Category	Hours/	Credita	Marks for Evaluation		
Semester	Course Code		Week	Creans	CIA	ESE	Total
IV 2	23UMA4AC7:3	Allied – VII	4	3	25	75	100

Course Title

DIFFERENTIAL EQUATIONS (For Chemistry)

SYLLABUS				
Unit	Contents	Hours		
Ι	Linear equation – Bernoulli's equation – Exact differential equations.	12		
II	Equations of the first order but of higher degree - Equations solvable for dy/dx Equations solvable for y - *Equations solvable for x* – Clairaut's form – Equations that do not contain x explicitly - Equations that do not contain y explicitly - Homogeneous equations in x and y.	12		
III	Linear Equations with constant coefficients - The operator D - Complementary function of a linear equation with constant coefficients –Particular integrals.	12		
IV	Linear equations with variable coefficients – Equations reducible to the linear equations –Variation of parameters.	12		
V	Partial Differential Equations of the first order - Classification of integrals - Derivation of PDE by elimination of constants and functions - Lagrange's method of solving the linear equation -Special methods -Standard forms I, II, *III and IV (Clairant's form) *	12		

..... Self Study

Text Book(s):

S. Narayanan and T. K. Manicavachagom Pillay, Differential Equation and its Application, S. Viswanathan Publishers Pvt. Ltd., Ninth edition (2006).

UNIT I	Chapter II	Sections 4, 5, 6.1 –6.4
UNIT II	Chapter IV	Sections $1-4$
UNIT III	Chapter V	Sections $1-4$
UNIT IV	Chapter V	Sections 5 and 6
	Chapter VIII	Section 4
UNIT V	Chapter XII	Sections $1-5$

Reference Book(s):

1. M.D. Raisinghania, Ordinary and Partial Differential Equations, S. Chand & Co. (2010). 2. M.L. Khanna, Differential Equations, Jai Prakash Nath and Co. (2004).

Web Resource(s):

1. https://nptel.ac.in/courses/111/105/111105093/

2. https://nptel.ac.in/courses/111/107/111107111/

3. https://nptel.ac.in/courses/122/107/122107037/

Course Outcomes						
Upon suc	Upon successful completion of this course, the student will be able to:					
CO No.	No. CO Statement					
CO1	Recall the concept of differential equations.	K1				
CO2	Classify the different forms of differential equations	K2				
CO3	Solve the linear differential equations with constant coefficients and particular integrals	К3				
CO4	Simplify the differential equations with variable coefficients	K4				
CO5	Evaluate the partial differential equation by Lagrange's method	K5				

COs				Programme Specific Outcomes (PSOs)					Programme Outcomes (POs)					
	PSO5	PSO4	PSO3	PSO2	PSO1	PO5	PO4	PO3	PO2	PO1	(COs)			
2.5	2	2	3	3	3	2	2	2	3	3	CO1			
2.3	2	3	3	3	3	2	1	1	2	3	CO2			
2.5	2	2	3	3	3	2	2	2	3	3	CO3			
2.4	2	2	3	3	3	2	2	2	2	3	CO4			
2.4	2	2	2	3	3	2	2	2	3	3	CO5			
2.42	all Score	Mean Overall Score												
Medium	Correlation													
	2 2 2 all Score rrelation	2 2 2 an Overa Cor	3 3 2 Mea	3 3 3	3 3 3	2 2 2	2 2 2	2 2 2	3 2 3	3 3 3	CO3 CO4 CO5			

Mean Overall Score	Correlation
< 1.5	Low
\geq 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:

- 1. Dr. U. Abuthahir
- 2. Dr. C. Gurubaran

Semester	Course Code	Course Category	Hours/	Cradita	Marks for Evaluation		
	Course Coue		Week	Creans	CIA	ESE	Total
IV	23UMA4AC8:3	Allied – VIII	4	3	25	75	100

Course Title

STATISTICS AND VECTOR CALCULUS (For Chemistry)

SYLLABUS				
Unit	Contents	Hours		
Ι	Measures of central tendency- Arithmetic Mean - Properties of Arithmetic Mean - Weighted mean – Median- *Merits and Demerits of Mean, Median*.	12		
Π	Mode - Geometric mean - Harmonic mean. Graphical Location of the Partition values. *Merits and Demerits of Mode, Geometric Mean and Harmonic Mean*.	12		
III	Dispersion-characteristics for ideal measure of dispersion - Measures of Dispersion - Range - Q.D - M.D - S.D, coefficient of dispersion - *Coefficient of variation* - Simple problems.	12		
IV	Correlation – Bivariate distribution, correlation – scatter diagram – Karl- Pearson's coefficient of correlation – Rank correlation- Regression - Properties of correlation and regression coefficients. (Numerical Problems only)	12		
V	Vector Calculus: The vector differential operator – Gradient - Direction and Magnitude of gradient - Divergence and curl - Related problems.	12		
*	* Self Study			

Text Book(s):

1. S.C.Gupta & V.K.Kapoor, Elements of Mathematical Statistics, Sultan Chand and Sons, Third Edition, Reprint 2010.

2. S.Narayanan, R.Hanumantha Rao, T.K. Manicachagom Pillay and P. Kandasamy, Ancillary Mathematics, Volume II, S. Viswanathan Publishers Pvt. Ltd. Revised Edition (2008).

UNIT I	Chapter 2	Sections 2.3 - 2.6	TB-1
UNIT II	Chapter 2	Sections 2.7-2.9.1, 2.11.1	TB-1
UNIT III	Chapter 3	Sections 3.1-3.7, 3.7.3, 3.8	TB-1
UNIT IV	Chapter 10	Sections 10.1 to 10.3, 10.6, 10.7	TB-1
UNIT V	Chapter 8	Sections 16-20	TB-2

Reference Book(s):

1. Murray R. Speigel, John Jschiller, R. Alu Srinivasan, Probability and Statistics, Third Edition, Shaum's Outline Series (2010).

2. S. C. Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand and Sons Publication, Eleventh Edition (2013).

3. M.L, Khanna, Vector calculus, Jai Prakash Nath and Co., Eighth Edition (1986).

Web Resource(s):

1. https://nptel.ac.in/courses/111/106/111106112/

2. https://nptel.ac.in/courses/111105122

Course Outcomes									
Upon suc	Upon successful completion of this course, the student will be able to:								
CO No. CO Statement									
CO1	Relate and study of vector differential operator with examples	K1							
CO2	Acquire more knowledge on Measures of Central Tendency	K2							
CO3	Demonstrate and discuss the Measures of Dispersion	К3							
CO4	Apply domain knowledge for bivariate distributions with examples	K4							
CO5	Remember the integration and its applications	K5							

Course	Pro	gramm	e Outco	omes (P	Os)	Progra	Mean Score of				
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	COs
CO1	3	3	2	3	3	3	2	3	2	3	2.7
CO2	3	2	2	3	3	3	3	3	3	2	2.7
CO3	3	1	2	2	2	2	3	3	3	3	2.4
CO4	3	2	3	2	2	3	3	2	3	2	2.5
CO5	1	3	3	2	2	2	3	3	3	3	2.5
Mean Overall Score											
									Cor	relation	High

Mean Overall Score	Correlation
< 1.5	Low
\geq 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators: 1. Dr. H. Sheik Mujibur Rahman Dr. C. Gurubaran

Semester	Course Code	Course	Hours /	Credite	Marks for Evaluation			
	Course Coue	Category	Week	Creuits	CIA	ESE	Total	
IV	23UBO4AC7	Allied – VII	5	4	25	75	100	
Course Title	Applied Botany	7 - II						

	Syllabus	
Unit	Contents	Hours
Ι	Plant morphology: Parts of a plant – root, Stem and Leaf and their modifications with examples – Simple and compound leaves - Phyllotaxy - Inflorescence - Racemose, Cymose, Mixed and Special types - Terminology of floral parts, diagram and formula.	15
II	Systems of Classification: Artificial (Linnaeus system) - Natural (Outline of Bentham and Hooker's system; its merits and demerits). Plant Nomenclature - Brief account of ICN, Herbarium technique. Study of the general characteristics and economic importance of Annonaceae, Rutaceae, Caesalpiniaceae, Rubiaceae, Cucurbitaceae, Apocynaceae, Euphorbiaceae and Arecaceae.	15
III	Economic Importance of plants: Plant diet for cardio, renal, hypertention, aging, bone, detox and mental health. Non-alcoholic beverage plants – Coffee, Tea therapy (green tea) Tea extract capsules, Cocoa, Chocoloate, Gano-coffee, herbal 'teas' (<i>Psidium, Mangifera</i>). Prebiotic fibre plants (<i>Murayya, Cyamopsis</i>), Cereals, pseudo-cereals and *small grain cereal and their value addition as food supplements and snacks*.	15
IV	Oil yielding plants: Essential oils – applications – perfumes (rose, ylang-ylang, jasmine, lemon grass oil, rosemary and sandalwood oil). Food supplement oils – linseed, flax seed oils as source of omega-3-fatty acid. Vegetable oils – coconut, palm oil. Soapbark, soapwort, soap berries, soap pods. Preparation of organic herbal soap. *Importance of herbal cosmetics*.	15
V	Plant physiology Water relations in plants – osmosis, transpiration and hydrological cycle. Types and factors affecting transpiration. Water footprint of products and processes. Photosynthesis: apparatus, pigments – light (z-scheme) and dark reaction – outline of Calvin cycle. A brief mention of difference between C3, C4 and CAM pathway and their relevance to indoor gardening. Introduction to carbon sequestration and *carbon banking*. – Aerobic and anaerobic respiration (fermentation - and its importance). Plant growth regulators – types. *Commercial application of auxin in horticulture*.	15

Text Book(s):

- 1. Rao KN, Krishnamurthy KV and Rao GS, Ancillary Botany, 1st Edition, Viswanathan Pvt Ltd, New Delhi, India, 1983.
- 2. Shukla RS and Chandel PS, Ecology and utility of plants, 2nd Edition, Chand & Company Pvt Ltd, New Delhi, India, 2008
- 3. Sharma OP, Plants and Human Welfare, 2nd Edition, Prakathi Prakashan Publications Pvt Ltd, Meerut, India, 2015.

Reference Book(s):

- 1. Jeffrey C. An Introduction to Plant Taxonomy, 1st Edition, Cambridge University Press, United Kingdom, 1982.
- 2. Pandey BP. Taxonomy of Angiosperms, 2nd Edition, Chand & Company Pvt Ltd, New Delhi, India, 1999.

Course Outcomes										
Cou	Course Outcomes: Upon successful completion of this course, the student will be able to:									
CON	CO Statement	Level								
CU NO.		(K-level)								
CO1	Outline the diversity of cryptogams and seed plants.	K1								
CO2	Identify the economic uses of natural wealth from cryptogams and	K2								
	seed plants.									
CO3	Perceive the alternative uses of and applications of cryptogams and	K3								
	seed plants.									
CO4	Appraise the values of natural wealth from cryptogams and seed	K4								
	plants.									
CO5	Recommend alternative bio resources for human welfare.	K5								

Relationship Matrix:

Course Outcomes	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	of COs
CO1	3	2	2	1	1	1	2	1	1	2	1.6
CO2	3	2	2	1	1	2	1	1	3	2	1.8
CO3	1	1	2	1	1	1	1	3	3	1	1.5
CO4	3	2	2	1	1	1	1	1	3	2	1.7
CO5	3	2	2	1	1	1	1	1	3	2	1.7
Mean Overall Score											1.6
									Corr	elation	Medium

Mean Overall	Correlation				
Score					
< 1.5	Low				
\geq 1.5 and < 2.5	Medium				
≥ 2.5	High				

Course Coordinator: Dr. A. Aslam

Semester	Course Code	Course	Hours /	Credits	Marks for Evaluation						
		Category	Week		CIA	ESE	Total				
IV	23UBO4AC8P	Allied - VIII	3	2	20	80	100				
Course Title	Laboratory Co	Laboratory Course for Applied Botany - II – Practical									

	Syllabus	
	Contents	Hours
]	List of Practical	
A.	Angiosperm morphology and taxonomy (drawing and description of	
speci	mens only):	
1.	Parts of a dicot plant (Amaranthus)	
2.	Phyllotaxy (Annona, Psidium, Quisqualis, Nerium, Allamanda,	
Acaly	pha and Mollugo)	
3.	Compound leaves (Azadirachta, Butea, Albizzia, Moringa, Cleome)	
4.	Parts of a flower (Tribulus)	
5.	Racemose inflorescence (Crotalaria, Mangifera, Caesalpinia,	
Achy	ranthes, Cocos, Allium, Tridax)	
6.	Cymose inflorescence (Jasmine, Clerodendron, Hamelia,	
Helio	otropium, Mollugo)	
7.	Mixed and special (Ficus, Leucas, Euphorbia cyathophora, Ocimum,	
Zizyp	hus)	
8.	Description and identification features for the families	45
(Ann	onaceae, Rutaceae, Caesalpiniaceae, Rubiaceae, Apocynaceae,	45
Cucu	rbitaceae, Euphorbiaceae, and Arecaceae).	
B. 7	Γ.S of stem and root in dicots (<i>Tridax</i>) and monocots (<i>Zea mays</i>)	
C. 1	Nutritional quality analysis of plants (Minor experiments):	
1.	Analysis of nutritional quality of plants using chart	
2.	Estimation of ascorbic acid (vitamin-C)	
3.	Determination of moisture content in plant samples.	
4.	Observation of oxidative darkening of vegetables and fruits.	
5.	Observation of glutan formation in natural foods.	
D. 1	Physiology experimental set up	
1.	Ganong's photometer	
2.	Light screen experiment	
3.	Demo of paper chromatography	
4.	Bell jar experiment for oxygen evolution	
5.	Observation of Kranz anatomy of leaves	
6.	Observation of transpiration in leaves.	

Text Book(s)

1. Mehta AS and Verma AP, Experiments in Plant Physiology, 1st Edition, Chand &Company Pvt Ltd, New Delhi, India, 1987.

2. Pandey BP, Modern Practical Botany, 1st Edition (Reprinted), Chand & Company PvtLtd, New Delhi, India, 2011.

3. Sharma OP, Plants and Human Welfare, 2nd Edition, Prakathi Prakashan Publications PvtLtd, Meerut, India, 2015.

	Course Outcomes									
Course Outcomes: Upon successful completion of this course, the student will be able to:										
CO No.	O No. CO Statement									
CO1	Illustrate the external characters of flowering plants.	K1								
CO2	Classify the flowering plants based on their external characters.	K2								
CO3	Appraise the plants as useful resources for human use and welfare.	K3								
CO4	Recommend unique food supplements and herbal value-added products.	K4								
CO5	Solve the problems related with human environment applying physiology principles.	К5								

Course Outcomes	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	of COs
CO1	3	1	1	2	3	1	3	1	2	1	1.8
CO2	3	1	1	2	3	1	3	1	2	1	1.8
CO3	3	2	1	2	3	1	3	1	2	1	1.9
CO4	3	2	1	2	3	1	3	1	2	1	1.9
CO5	3	1	1	2	3	1	3	1	2	1	1.8
Mean Overall Score											
									Corr	elation	Medium

Mean Overall Score	Correlation
< 1.5	Low
\geq 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. A. Aslam

Somostor	Course Code	Course Cotogory	Hours/	Cradita	Marks for Evaluation			
Semester	Course Coue	Course Category	Week	Creans	CIA	ESE	Total	
IV	23UCH4GE2	Generic Elective - II	2	2	-	100	100	
Course Titl	e Chemistry	in Everyday Life						

	Syllabus	
Unit	Content	Hours
I	 Essential oils and Perfumes: 1.1. Essential oils: Definition, occurrences, isolation of essential oil - *steam distillation* and expression method. 1.2. Perfumes: Definition, Requirements of a good perfume, composition of perfumes - vehicle, fixative, odoriferous substance, classification of perfumery materials-animals-synthetic-formulations. 	6
Π	 Cosmetics: 2.1. Face cream, vanishing cream, sun screen lotion, shaving cream, talcum powder – composition – formulation – preparation, uses and their hazards. 2.2. Body Spray, hand lotion, nail lacquers, nail bleaches, bath oil *hair oil, hair dyes *- composition- formulation – preparation, uses and their hazards. 	6
III	 Soaps and Detergents 3.1 Soaps: Manufacture of soap, General consideration of soap making. Toilet soap transparent soap and Metal soaps – Manufacture method and uses. Cleaning action of soaps. 3.2 Detergents - Definition – classification of face active agents – anionic detergents - cationic detergents – * properties of detergents – Health hazards*. 	6
IV	 Fertilizers: 4.1 Fertilizers: Types, need for fertilizer, essential requirements, fertility of the soil. 4.2 Source of fertilizer, Classification – Natural organic fertilizers, natural inorganic fertilizers, Artificial fertilizers. Urea- Action of urea as fertilizer. NPK fertilizer, pollution caused by fertilizer and effect of fertilizers. 	6
V	 Fuels and Fire Extinguishers: 5.1 Fuel: Definition, classification - solid, liquid and gaseous fuels, requirements of a good fuel-composition and uses of *LPG*, gobar gas, bio gas and water gas. 5.2 Fire Protection: Causes of fire accidents in homes, fire fighting in homes – methods of extinguishing fire, chemical fire extinguishers - merits and demerits. Importance of safety requirements, Automatic fire detection cum control, causes and fire fighting. 	6

*.....*Self Study

Tex	Text Books:						
1	Thangammal Jacob A Textbook of Applied Chemistry 5th Edition McMillan Company Ind. Ltd, 1979,						
2	P. L. Soni and H. M. Chawla, Text Book of Organic Chemistry, 28th Edition, Sulthan and Chand						
	company, New Delhi, 1999						
Boo	oks for Reference:						
1	B. K.Sharma Industrial Chemistry, 21st Edition, Goel Publishing House, Meerut, 2018						
2	Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, 1st Edition, S.Chand Company Ltd –						
	New Delhi, 2006						
Web Reference:							
http	s://www.nationwide.com/lc/resources/home/articles/fire-extinguisher-safety						

	Course Outcomes									
	Upon successful completion of this course, the student will be able to:									
CO No:	CO statement	Cognitive level (K-Level)								
CO1	Understand the nature of essential oils and perfumes	K1								
CO2	Formulate the cosmetic products	K2								
CO3	Explain the chemistry of soap and highlight their importance	K3								
CO4	Appreciate the importance of fertilizers	K4								
CO5	Compare the properties of fuels and fire protectors.	K5								

Course	Pro	gramm	e Outco	mes (PO	Os)	Progra	Mean				
Outcomes	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	score of
(Cos)	101	102	105	104	105	1501	1502	1505	1504	1505	Cos
CO1	2	3	3	2	3	1	3	2	3	3	2.5
CO2	2	3	2	3	2	2	2	2	3	2	2.3
CO3	2	2	2	3	3	2	3	3	2	2	2.4
CO4	2	1	2	2	2	3	2	2	2	2	2.0
CO5	3	2	3	2	3	3	2	1	2	2	2.3
Mean Overall Score											2.3
	Correlation										Medium

Mean Overall Score	Correlation
< 1.5	Low
> 1.5 and < 2.5	Medium
> 2.5	High

Course Coordinator: 1. Dr. A. Jafar Ahamed 2. Dr. M. Yaseen Mowlana

G	Course Code	Correct Corte corre	II		Marks for Evaluation			
Semester	Course Code	Course Category	Hours/ week	Creatts	CIA	ESE	Total	
V	23UCH5CC9	Core-IX	6	6	25	75	100	

Course Title p - BLOCK ELEMENTS AND NUCLEAR CHEMISTRY

SYLLABUS								
Unit	Contents	Hours						
	NITROGEN FAMILY							
	nitrogen and its family. Ovides of nitrogen nitrous ovide nitris ovide dinitrogen							
	trioxide - preparation properties structure and uses Oxyacids of nitrogen - nitrous acid							
	trioxide - preparation, properties, structure and uses. Oxyacids of nitrogen - nitrous acid, nitric acid - preparation, properties, structure and uses							
	1.2. Hydrides of nitrogen: Ammonia hydrazine and hydrazoic acid - preparation properties							
Т	Structure and uses.	18						
•	1.3. Phosphorous and its compounds: *Allotropes of phosphorous* - White Phosphorous,							
	red phosphorous – properties and differences, oxides of phosphorous - P_2O_3 , P_2O_5 , P_4O_6							
	and P_4O_{10} - structure and uses; Oxyacids of phosphorous – hypo phosphorous acid, ortho							
	phosphorous acid, hypo phosphoric acid, ortho phosphoric acid and pyro phosphoric acid							
	structure and uses.							
	INTERHALOGENS, CARBORANES AND INTERCALATION COMPOUNDS							
	2.1. Interhalogen compounds: General properties, ClF, BrF ₃ , IF ₅ and IF ₇ - preparation,							
	properties and structures; Polyhalides – ICl_2^- , ICl_4^- and IF_4^+ - preparation, properties and							
	structure.							
Π	2.2. Carboranes – Wade's Rules – structures of Closo carboranes - C2B10H12, C2B3H5, nido							
	carboranes - $C_2B_9H_{13}$, $C_2B_4H_8$ and arachno carboranes - $C_2B_6H_{12}$, $C_2B_7H_{13}$.							
	2.3. Intercalation compounds -Intercalation compounds of graphite – with alkali metals,							
	oxoacids, *metal halides and halogens*.							
	SILICON, SILICATES, SILICONES & INORGANIC POLYMERS							
	3.1. Silicon: *Occurrence, types* - preparation, properties and uses, compounds of silicon -							
	SiO ₂ , SiH ₄ , SiCl ₄ , SiC – structure, properties and uses.							
	3.2. Silicates and Silicones: Silicates - Definition, Classification - ortho, pyro, chain							
ш	structures, cyclic silicates, sheet silicates, three dimensional silicates – feldspars, zeolites	10						
	and ultramarines; Silicones – types, preparation, properties and uses.	18						
	 3.3. Inorganic polymers: General properties – classification of inorganic polymers based on element in the backbone - boron based polymers – borazine polymers, silicon based polymers – polydimethyl siloxane and polymethyl hydrosiloxane, sulphur based polymer – polysulfide and polymeric sulphur nitride, phosphorous based polymer – polyphosphazines and polyphophonitrilic chloride, *industrial applications of inorganic polymers* 							

	NUCLEAR CHEMISTRY						
IV	4.1. Structure of nucleus - Composition of nucleus, nuclear forces, nuclear stability-mass defect, binding energy, BE / nucleon, n/p ratio, and magic numbers. whole number rule and packing fraction: * isotopes, isobars, isotones and isomers*						
	4.2. Nuclear Models : Nuclear shell model and liquid drop model. Nuclear Forces – Meson						
	4.3 Nuclear reactions: Nuclear Elector Atom homb and nuclear reactor. Nuclear Eucion						
	4.3. Nuclear reactions: Nuclear Fission–Atom bond and nuclear reactor. Nuclear Fusion – Hydrogen bomb and stellar energy.						
	RADIOACTIVITY						
	5.1. Radioactivity - Definition, types of radioactivity, *Properties of α , β and γ rays*:						
	Detection and measurement – Wilson cloud chamber and G.M. Counter, Modes of decay, decay constant, half-life period and average life period, group displacement law and radioactive series.	10					
v	5.2. Artificial radioactivity - definition, proton, deuteron, neutron and particle induced transmutations.	18					
	5.3. Applications of radio isotopes – Determination of reaction mechanism - ester hydrolysis and photosynthesis; medicinal field - ²⁴ Na, ⁴² K, ¹⁴ C, ³² P, ⁵¹ Cr, ⁶⁴ Cu, ⁶⁰ Co, ⁵⁹ Fe, ¹⁸⁶ Rh, rock dating and carbon dating.						
VI	Current Trends (For CIA only)						
• -	Nano Silica, Radioisotopes in environment						
	* * Solf Study						

..... Self Study

Text books:

- 1. Wahid Malik, G.D. Tuli and R.D.Madan, Selected Topics in Inorganic Chemistry, Revised Edition, S. Chand & Co, New Delhi, 2019.
- Satya Prakash, G.D. Tuli, S.K. Basu, R.D. Madan, Advanced Inorganic Chemistry, Vol-I, Revised Edition, S. Chand & Co Ltd, New Delhi, 2018.
- 3. P.L. Soni, Mohan Katyal, Text book of Inorganic Chemistry, Sulthan Chand &Sons, New Delhi, 2013.
- 4. R.D. Madan, Modern Inorganic Chemistry, 4thEdition, S. Chand & Company Ltd, New Delhi, 2014.
- 5. Mandeep Dalal, Text book of inorganic chemistry-I, Dalal Institute, 1st Edition, Haryana, 2017
- 6. Sandhya Pimplapure, Inorganic Polymer Chemistry 2nd Edition, Pragati Prakashan Meerut 2023

Reference Books:

- 1. B.R. Puri, L.R.Sharma and K.C.Kalia, Principles of Inorganic chemistry, 33rd Edition, Vishal Publishing Co, New Delhi, 2024.
- 2. J.D. Lee Concise Inorganic Chemistry, 5th Edition, Black well Science Ltd., France, 2022
- 3. Gurdeep Raj, Advanced Inorganic Chemistry-Vol.-I, Revised Edition, Krishna Prakashan Media (P) Ltd, 2014.
- 4. Gurdeep Raj, Advanced Inorganic Chemistry-Vol.-II, Revised Edition, Krishna Prakashan Media (P) Ltd, 2014.
- 5. H. J. Arnikar, Essentials of Nuclear Chemistry, 5th Edition, New Age International Private Limited, 2022.

Web Resources:

- 1. https://unacademy.com/course/course-on-group-15-nitrogen-family-for-jee-mains-advanced/7QZG1XK5
- 2. <u>https://www.stxaviersthumba.ac.in/content/reports/powerpoints/interhalogen.pdf</u>
- 3. <u>https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/chemistry/inorganic_chemistry-</u> <u>iii/23.structure_and_bonding_of_carboranes/et/4838_et_et.pdf</u>
- 4. https://www.slideserve.com/tybalt/graphite-intercalation-compounds
- 5. https://iscnagpur.ac.in/study_material/dept_chemistry/2.4_GMP_Inculsion_comp(GMP).pdf
- 6. https://byjus.com/jee/silicones/
- 7. <u>https://onlinecourses.nptel.ac.in/noc23_cy21/preview</u>
- 8. https://nptel.ac.in/courses/112/103/112103243/

Course Outcomes									
Upon succ	Upon successful completion of this course, the student will be able to								
CO No.	CO Statement	Cognitive Level (K-Level)							
CO1	Recall the chemistry of p- block elements	K1							
CO2	Explain the structures of interhalogen compounds and silicates	K2							
CO3	Apply the Wade's Rule to construct the structure of carboranes	K3							
CO4	Compare the stability of nucleus	K4							
CO5	Explain the nuclear reactions	K5							

Course Outcomes	Prog	gramn	ne Outco	ome (PC	Os)	Progra	Mean Score of				
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	COs
CO1	3	3	3	3	2	3	3	3	3	1	2.7
CO2	3	3	3	1	3	3	3	3	3	2	2.7
CO3	3	3	2	3	1	3	2	3	3	2	2.5
CO4	3	2	3	1	2	3	3	3	3	3	2.6
CO5	3	3	3	2	2	3	3	3	3	3	2.8
Mean Overall Score										2.66	
Correlation										High	

Mean Overall Score	Correlation
< 1.5	Low
\geq 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators: 1. Dr. K. Loganathan 2. Dr. S.K. Periyasamy

Semester	Course Code	Course Cotogory	Hours/	Credite	Marks for Evaluation			
	Course Coue	Course Category	Week	Creuits	CIA	ESE	Total	
V	23UCH5CC10	Core-X	6	6	25	75	100	

Course Title

OXYGEN, NITROGEN AND SULPHUR CONTAINING ORGANIC COMPOUNDS AND NAME REACTIONS

	SYLLABUS	
Unit	Contents	Hours
Ι	 HETEROCYCLIC AND POLYNUCLEAR HYDROCARBONS 1.1. Heterocyclics: Classification, pyrrole, furan, thiophene and pyridine - preparation, properties and uses, comparison of basicity of pyrrole, pyridine and piperidine. 1.2. Fused heterocycles: Indole, Quinoline and Isoquinoline - Fischer-indole, Skraup and Bischler - Napieralski synthesis, properties and uses. 1.3 Polynuclear hydrocarbons: Naphthalene, anthracene and phenanthrene - isolation, constitution, resonance structures, Haworth synthesis, properties and uses. 	18
II	 CARBOXYLIC ACIDS AND THEIR DERIVATIVES 2.1 Monocarboxylicacids: Formic acid, acetic acid and benzoic acid- preparation, properties and uses. Ionization of carboxylic acids: acidity constant –comparison of acid strengths of formic acid, acetic acid and benzoic acids. Arndt - Eistert synthesis. 2.2 Dicarboxylic acids: Oxalic, malonic, succinic, adipic and phthalic acids-preparation, properties and uses. 2.3 Acid derivatives: Acetyl chloride –preparation and properties. Esters - malonic and acetoacetic esters - preparation, properties and synthetic applications.*keto - enol tautomerism of acetoacetic ester*. 	18
III	 PHENOLS 3.1. Monohydric phenol - Phenol - preparation, physical properties, acidity, effect of substitutents on acidity. Reactions of – OH group, Reactions of benzene ring -Halogenation, Nitration, Sulphonation, Nitrosation, Friedel - Crafts alkylation and acylation, coupling reaction, Pechmann condensation, Liebermann, Phthalein, Reimer-Tiemann, Kolbe and Gatterman reaction. Cresol, α- and β- napthol - preparation, chemical properties,* uses of phenols and naphthols *. 3.2. Dihydric Phenols: Catechol, resorcinol and quinol - preparation, properties and uses. 3.3. Trihydric Phenols: Pyrogallol and hydroxyquinol - preparation, properties and uses. 	18

	AROMATIC NITRO COMPOUNDS AND AMINES	
	4.1 Nitro compounds: Nitrobenzene - Preparation, Reactions of benzene ring –	
IV	electrophilic and nucleophilic substitution, Reactions of nitro group - reduction of	
	nitrobenzene in neutral, acidic and alkaline medium, uses. TNB & TNT -	
	Preparation and uses.	
	4.2 Amines: methyl amine, dimethyl amine and triethyl amine - preparation, physical	
	properties – basicity of amines, relative basicity of aliphatic and aromatic amines.	18
	Separation of mixture of amines - Hinsburg and Hofmann methods. Aniline –	
	Structure. Preparation. Reactions involving NH ₂ group and phenyl group.	
	Diphenyl amine phenylene diamine $(o_1 - m_2 - and n_2)$ - preparation chemical	
	properties of amines *Benzene diazonium chloride and its synthetic applications*	
	4.3 Sulphonicscids: Preparation and uses of sulphanilic acid sulphanilamide	
	4.5 Supromeacids. Treparation and uses of surphannic acid, surphannamide,	
	saccharin, choiorainine - 1 and dichiorainine - 1.	
	REAGENTS AND NAMING REACTIONS	
	5.1 Reagents: Synthetic applications of Lithium aluminium hydride, Sodium	
	boronydride, Raney nickel, Wilkinson's catalyst, KMnO ₄ , chromyl chloride, Ulo $Pk(OA_2)$ and SoO with machanism	
V	HIO4, PO(OAC)4 and SeO ₂ with mechanism.	18
	Perkin reaction Michael addition Reformatsky Claisen Claisen-Schmidt MPV	
	Clemmensen and Wolff-Kishner reduction with mechanism	
	Current Trends (For CIA only)	
VI	Therapeutic applications of phenolic acids and microbial applications of nature	ral phenolic
	compounds.	
*	** Self Study	

Text Book(s):

- 1. Raj K Bansal, A Text Book of Organic Chemistry, Revised 4th Edition, New Age international Publishers, New Delhi, 2005.
- 2. Bahl and Arun Bahl, Advanced Organic Chemistry, 19th Edition, Sulthan and Chand company, New Delhi, 2005.
- 3. M.K. Jain and S.C. Sharma Organic chemistry, B.Sc. students of Indian universities, 1st Edition, Vishal publication,2008
- 4. V.K. Ahluwalia, Text Book of Organic Chemistry, Vol- I &Vol-II, 1st Edition, Ane^s student edition, New Delhi, 2010.
- 5. O.P Agarwal, Reaction and Reagents in Organic Chemistry, 5th Edition, Goel Publishing House, Meerut, 2005.

Reference Book(s):

- 1. Morrison, Boyd and Bhattacharjee, Organic Chemistry, 7th Edition, Pearson Education, India, 2010.
- 2. I. L. Finar, Organic Chemistry The Fundamental Principles, Vol-1 and Vol-2, 6th Edition, Langman Green and Co Ltd, London. 1973.
- 3. P.L. Soni and H.M. Chawla, Text Book of Organic Chemistry, 29th Edition, Sulthan and Chand company, New Delhi, 2012.
- 4. M.K. Jain, Organic Chemistry, 12th Edition, Sulthan and Chand company, New Delhi, 2003.
- 5. Dr. Jagadamba Singh, Undergraduate Organic Chemistry, UGC Curriculum Vol- I &Vol-II, 1st Edition, Pragati Prakashan Meerut, 2007.

Web Resource(s):

- 1. https://www.youtube.com/watch?v=Ir9ld8dak9M
- $2. \ \underline{https://youtu.be/uFWy5RPd2Ow?si=ILH4TWebUnZZ9a}$
- 3. <u>https://youtu.be/PMmxlnDA20Q?si=D4V405UA9f0C3Ude</u>
- 4. <u>https://youtu.be/7FvzeD_35gE?si=ATDr_9QxrzAu6puU</u>
- 5. <u>https://youtu.be/IO4ecYiPCog?si=-yqjVujuoiSJVclF</u>

Course Outcomes									
Upon s	Upon successful completion of this course, the student will be able to:								
		Cognitive							
CO No.	CO Statement	Level							
		(K-Level)							
CO1	Recall the chemistry of heterocyclic and polynuclear hydrocarbons.	K1							
CO2	Compare the acidity and reactivity of acids and esters	K2							
CO3	Organize a set of reactions of phenols.	K3							
CO4	Examine the relative basicity and reactivities of aliphatic and aromatic amines.	K4							
CO5	Interpret a plausible mechanistic pathway of a chemical reaction.	K5							

Course Outcomes	Prog	gramn	ne Outco	ome (PC	Ds)	Progra	Mean Score of				
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	COs
CO1	3	2	3	3	3	3	3	3	2	3	2.8
CO2	3	3	2	2	3	2	3	3	3	3	2.7
CO3	3	3	3	2	3	3	3	2	3	3	2.8
CO4	3	2	3	2	3	3	2	3	3	2	2.6
CO5	2	3	3	2	3	3	3	2	3	3	2.7
Mean Overall Score											2.72
	Correlation										

Mean Overall Score	Correlation
< 1.5	Low
\geq 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: 1. Dr. J. Sirajudeen

2. Dr. M. Purushothaman

Semester	Course Code	Course Cotogowy	Hours /	Credita	Marks for Evaluation			
	Course Code	Course Category	Week	Credits	CIA	ESE	Total	
V	23UCH5CC11	Core-XI	6	6	25	75	100	
	•					•		

Course Title

THERMODYNAMICS AND SOLUTIONS

SYLLABUS

Unit	Contents	Hours
Ι	 FIRST LAW OF THERMODYNAMICS AND THERMO CHEMISTRY 1.1 Terms used in thermodynamics: Definitions, importance, basic terminologies, different types of systems – open, closed and isolated, homogeneous and heterogeneous. Thermodynamic equilibrium-thermal, mechanical and chemical. Thermodynamic processes-cyclic, isothermal, isochoric, isobaric, adiabatic, reversible and irreversible. Intensive and extensive properties, state function and path functions, exact and inexact differentials, internal energy, enthalpy, work and heat, first law of thermodynamics- statement and derivation of its mathematical equation, heat capacity – definition, variation of heat capacity at constant volume and constant pressure, relationship between C_p and C_v. Joule-Thomson effect- statement and applications, Joule Thomson co-efficient and inversion temperature, Zeroth law of thermodynamics-Statement and Applications (Problems from Joule-Thomson effect). 1.2 Applications of First law: Calculation of q, W, ΔE and ΔH for isothermal and adiabatic reversible & irreversible expansion of an ideal gas. (Problems) 1.3 Thermo Chemistry: Definition, differences between exo and endo thermic reactions, Change of internal energy and change of enthalpy in a chemical reaction, Enthalpy of reaction at constant volume and at constant pressure, *Enthalpy of combustion, formation, neutralization, dissociation, hydration, and precipitation*. Kirchhoff equation, Hess's law of heat of summation and its 	18
II	 SECOND LAW OF THERMODYNAMICS AND ITS APPLICATIONS 2.1. Second law: Limitations of first law-Need for second law, spontaneous process and non-spontaneous process, different statements of second law of thermodynamics- Kelvin-Planck, Clausius, Carnot's and entropy statements, heat engine- Superiority of Carnot's heat engine, Carnot's cycle and its efficiency, Carnot's theorem, thermodynamic scale of temperature. 2.2. Entropy: Definition, entropy as a state function, physical significance of entropy, entropy change in isothermal expansion of ideal gas, entropy change in reversible and irreversible processes, *Entropy changes accompanying change of phases*, entropy of mixture of ideal gases, Change of entropy as a criteria for spontaneity and equilibrium. (Problems from entropy calculation). 2.3. Free energy: Free energy, work functions, variation of G with T and P, Gibb's-Helmholtz equations and their applications, thermodynamic equations of state, Maxwell's relations, ΔA and ΔG as criteria for spontaneity and equilibrium. (problems related to free energy) 	18

 3.1. Third law: Need for Third law of thermodynamics, Nernst heat theorem, statement of third law of thermodynamics, Applications of third law-determination of absolute entropies of solids, liquids and gases, exception of third law, concept of residual entropy. 3.2. Phase Diagrams: Definition of the terms – Phase, components, degrees of freedom, derivation of Gibbs`s phase rule, one component systems – H₂O, CO₂ 18 and sulphur systems. 3.3 Two component systems: Reduced phase rule, simple eutectic systems – thermal analysis: cooling curves, Bi-Cd, Pb-Ag, desilverisation of lead, freezing mixtures- acetone-dry ice, compound formation with congruent
 statement of third law of thermodynamics, Applications of third law-determination of absolute entropies of solids, liquids and gases, exception of third law, concept of residual entropy. 3.2. Phase Diagrams: Definition of the terms – Phase, components, degrees of freedom, derivation of Gibbs`s phase rule, one component systems – H₂O, CO₂ 18 and sulphur systems. 3.3 Two component systems: Reduced phase rule, simple eutectic systems – thermal analysis: cooling curves, Bi-Cd, Pb-Ag, desilverisation of lead, freezing mixtures- acetone-dry ice, compound formation with congruent
 determination of absolute entropies of solids, liquids and gases, exception of third law, concept of residual entropy. 3.2. Phase Diagrams: Definition of the terms – Phase, components, degrees of freedom, derivation of Gibbs`s phase rule, one component systems – H₂O, CO₂ 18 and sulphur systems. 3.3 Two component systems: Reduced phase rule, simple eutectic systems – thermal analysis: cooling curves, Bi-Cd, Pb-Ag, desilverisation of lead, freezing mixtures- acetone-dry ice, compound formation with congruent
 third law, concept of residual entropy. 3.2. Phase Diagrams: Definition of the terms – Phase, components, degrees of freedom, derivation of Gibbs's phase rule, one component systems – H₂O, CO₂ 18 and sulphur systems. 3.3 Two component systems: Reduced phase rule, simple eutectic systems – thermal analysis: cooling curves, Bi-Cd, Pb-Ag, desilverisation of lead, freezing mixtures- acetone-dry ice, compound formation with congruent
 3.2. Phase Diagrams: Definition of the terms – Phase, components, degrees of freedom, derivation of Gibbs`s phase rule, one component systems – H₂O, CO₂ and sulphur systems. 3.3 Two component systems: Reduced phase rule, simple eutectic systems – thermal analysis: cooling curves, Bi-Cd, Pb-Ag, desilverisation of lead, freezing mixtures- acetone-dry ice, compound formation with congruent
 III freedom, derivation of Gibbs`s phase rule, one component systems – H₂O, CO₂ 18 and sulphur systems. 3.3 Two component systems: Reduced phase rule, simple eutectic systems - thermal analysis: cooling curves, Bi-Cd, Pb-Ag, desilverisation of lead, freezing mixtures- acetone-dry ice, compound formation with congruent
 and sulphur systems. 3.3 Two component systems: Reduced phase rule, simple eutectic systems - thermal analysis: cooling curves, Bi-Cd, Pb-Ag, desilverisation of lead, freezing mixtures- acetone-dry ice, compound formation with congruent
3.3 Two component systems : Reduced phase rule, simple eutectic systems - thermal analysis: cooling curves, Bi-Cd, Pb-Ag, desilverisation of lead, freezing mixtures- acetone-dry ice, compound formation with congruent
thermal analysis: cooling curves, Bi-Cd, Pb-Ag, desilverisation of lead, freezing mixtures- acetone-dry ice, compound formation with congruent
freezing mixtures- acetone-dry ice, compound formation with congruent
(X,Y) (Y,Y) $(Y,Y$
melting points FeCla-HaO system compound formation with incongruent
melting points Na2SO4 HaO system
NON ELECTROLVTIC SOLUTIONS
4.1. Solution of liquids in liquids: Ideal and non-ideal solutions Reputies law vanour
4.1. Solution of ideal solution activity and activity coefficients components in
pressure of ideal solution, activity and activity coefficients components in
Solutions, chemical potential of ideal and non-ideal solution – Globs - Dunem -
Margules equation, temperature - dependance of vapour pressure of a solution.
4.2. vapour pressure of non-ideal solution: Deviations from Raoult's law vapour
pressure composition and boiling point - composition curves of completely
IV miscible binary solutions, azeotropic mixtures (HCl $-$ H ₂ O and C ₂ H ₅ OH $-$ H ₂ O 18
system).
4.3. Solubility of partially miscible liquids pairs: system with upper CST – Phenol –
Water, *aniline – hexane*, system with lower CST – Triethyl amine-water and
system with upper and lower CSTs - Nicotine-water, effects of impurities on CST,
completely immiscible liquid pairs – Nernst distribution law and its application to
solvent extraction. Solutions of gases in liquids - factors influencing the solubility
of a gas, Henry's law.
COLLIGATIVE PROPERTIES OF DILUTE SOLUTIONS
5.1. Lowering of vapour rressure and Osmotic rressure: Lowering of vapour pressure - definitions measurement of
lowering of vapour pressure, determination of molecular weight from lowering of
vapour pressure. Osmosis and osmotic pressure – definitions, expression for
calculating osmotic pressure, determination of molecular weight from osmotic
pressure, experimental determination of osmotic pressure, relation between
osmotic pressure and lowering of vapour pressure.
V 5.2. Elevation of boiling point and Depression of freezing point: Elevation of boiling 18
point - definition, derivation of ebullioscopic constant, determination of elevation
Depression of freezing point – definition derivation of cryoscopic constant
determination of molecular weight from depression of freezing point, experimental
determination of depression of freezing point.
5.3. Abnormal colligative properties: causes- association and dissociation, van't Hoff
factor, *degree of association and degree of dissociation* (Problems from 5.1 and
5.2).
VI Current Trends (For CIA only) Depent developments in thermoelectric devices
Kecent developments in thermoelectric devices * * Self Study

Text Books:

- 1. B. R. Puri, L. R. Sharma and M.S. Pathania, Principles of Physical Chemistry, 48th Edition, Vishal Publications, Jalandhar, 2023.
- 2. K. Kuriacose and J. C. Rajaram, Thermodynamics for Students of Chemistry, Revised Edition, S. Chand & Co., New Delhi, 20013.
- 3. R.L. Madan and G.D. Tuli, Simplified Course in Physical Chemistry, 5th Revised and Enlarged Edition, S. Chand & Co., New Delhi, 2022.
- 4. B. S. Bahl, G. D. Tuli and Arun Bahl, Essentials of Physical Chemistry, 28th Edition, S. Chand & Co., New Delhi, 2020.

Reference Books:

- 1. Samuel Glasstone, Thermodynamics for Chemists, 2nd Edition-Reprint, East-West Edition, New Delhi, 2018.
- 2. Peter Atkins and Julio de Paula, Elements of Physical Chemistry, 7th Edition, Oxford Press, New Delhi, 2017.
- 3. J. N. Gurtu and A. Gurtu, Advanced Physical Chemistry, Revised 4th Edition, Pragathi Prakashan, Meerut, 2009.

4. N. Kundu and S. K. Jain, Physical Chemistry, Revised Edition, S. Chand & Co., New Delhi, 2000.

Web Resource(s):

- 1. <u>https://onlinecourses.nptel.ac.in/noc19_cy32/preview</u>
- 2. https://archive.nptel.ac.in/courses/113/104/113104068/
- 3. <u>https://www.youtube.com/watch?v=_D6wlk7dL0Y</u>

Course Outcomes								
Upon succ	Upon successful completion of this course, the student will be able to:							
CO No.	Cognitive Level (K-Level)							
CO1	Remember the terminologies used in thermodynamics	K1						
CO2	Understand the concepts of entropy and free energy.	K2						
CO3	Apply the phase rule to study the behavior of one and two component systems.	К3						
CO4	Distinguish between ideal and non-ideal solutions	K4						
CO5	Evaluate the molecular mass of the non - volatile solutes by colligative properties.	К5						

Relationship Matrix:

Course	P	rogrami	ne Outc	omes (P	Os)	Programme Specific Outcomes (PSOs)					Mean
Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Score of COs
CO1	3	3	2	3	1	3	2	2	3	3	2.5
CO2	3	3	3	2	3	3	2	3	2	2	2.6
CO3	3	3	2	3	2	3	3	2	2	3	2.6
CO4	3	3	3	2	2	3	3	2	3	2	2.6
CO5	3	3	2	3	3	3	3	2	3	2	2.7
Mean Overall Score											
					Correla	ation					High

Mean Overall Score	Correlation
< 1.5	Low
\geq 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators: 1.Dr. A. Jafar Ahamed 2. Dr. M. Anwar Sathiq

Semester	Course Code	Course Cotogory	Hours/	Cradita	Marks for Evaluation			
	Course Coue	Course Category	Week	Creats	CIA	ESE	Total	
V	23UCH5CC12P	Core-XII	3	3	20	80	100	

Course Title

PHYSICAL CHEMISTRY ELECTRICAL - PRACTICAL

	SYLL	ABUS				
Contents						
List of Practicals:						
Conductometry 1. Determination of strength of strong acid 2. Determination of strength of a weak ba 3. Determination of conductance of the wa (i) Deionized water (ii) Tap water (iii) (i) 4. Determination of cell constant and eximinite dilution. (KCl) 5. Determination of conductance of the char (i) CuSO4 (ii) K ₂ Cr ₂ O ₇ (ii) K ₄ [F Potentiometry 6. Determination of strength of a strong a 7. Determination of strength of weak acid 8. Determination of strength of Fe(II) ior Scheme of valuation Record Procedure with formula Experiment 1-2% 2-3% 3-4% >4%	d by co se by c ater san On add quivale emical emical d by po acid by po on by p on by po - - - - - -	enductometry. (HCl Vs NaOH) onductometry. (CH ₃ COONH ₄) aples. ition of electrolyte nt conductance of a strong electrolyte at compounds:] potentiometry. (HCl Vs NaOH) betentiometry. (CH ₃ COOH) obtentiometry. (CH ₃ COOH + CH ₃ COONa) tentiometry. (FeSO ₄ Vs K ₂ Cr ₂ O ₇) 10 marks 10 marks 60 marks 60 marks 50 marks 40 marks 25 marks	45			

Text Book(s):

1. Venkateswaran V. Veerasamy R. Kulandaivelu A.R, Basic Principles of Practical Chemistry, 2nd Edition, S. Chand & Co Pvt. Ltd, New Delhi, 1997.

Reference Book(s):

 Daniels, Experimental Physical Chemistry, 7th edition, New York, McGraw Hill, 1970.
 Halpern, A. M. & Mc Bane, G.C., Experimental Physical Chemistry, 3rd edition, W.H. Freeman & Co., New York, 4, (2003).

Web Resource(s):

https://vlab.amrita.edu/index.php?sub=2&brch=190&sim=361&cnt=1

	Course Outcomes							
Upon suc	Upon successful completion of this course, the student will be able to:							
CO No.	CO Statement	Cognitive Level (K-Level)						
CO1	Apply the principle of conductometric titrations.	K1						
CO2	Understand the concept of potentiometry.	K2						
CO3	Analyze the different types of chemical reaction.	K3						
CO4	Evaluate electrode potential of the single electrode.	K4						
CO5	Determine electro motive force (EMF) of a chemical reaction.	K5						

Course	Pro	gramm	e Outco	omes (P	Os)	Programme Specific Outcomes (PSOs)					Mean Score of
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	COs
CO1	3	3	3	3	2	3	3	3	1	3	2.7
CO2	3	2	3	3	3	3	2	3	3	3	2.8
CO3	3	3	3	3	2	3	3	3	3	2	2.8
CO4	3	3	2	2	3	3	3	3	2	3	2.7
CO5	3	3	3	3	2	3	3	3	2	3	2.8
Mean Overall Score										2.76	
Correlation									High		

Mean Overall Score	Correlation
<1.5	Low
≥1.5and<2.5	Medium
≥2.5	High

Course Coordinators: 1. Dr. M. Syed Ali Padusha 2. Dr. B. Arifa Farzana

Semester	Course Code	Course Category	Hours/	Credita	Marks for Evaluation			
	Course Coue		Week	Creans	CIA	ESE	Total	
V	23UCH5DE1AP	Discipline Specific Elective - I	5	4	20	80	100	

Course Title GRAVIMETRIC ESTIMATION AND SPECTROPHOTOMETRIC STUDY OF METAL COMPLEXES - PRACTICAL

Contents	Hours
(i) Gravimetric Estimation:	
Using sintered glass crucible	
1. Ni as nickel dimethyl glyoxime	
2. Pb as lead chromate	
3. Ba as barium chromate	
4. Ca as calcium oxalate monohydrate	
5. Zn as zinc oxinate	
Using silica crucible	
1. Ba as barium sulphate	
2. Ca as calcium sulphate	
3. Pb as lead sulphate	
(ii) Spectrophotometric determination of mole fraction of metal and ligand in	
complexes (Job's method)	
1. Copper – EDTA complex	75
2. Zinc – EDTA complex	
3. Cobalt – Hydrazinate complex	
4. Chlorocuprate complex	
Scheme of valuation	
Record - 10 marks	
Procedure - 10 marks	
I. Gravimetric estimation - 30 Marks	
<1% - 30 marks	
1-2% - 25 marks	
2-3% - 20 marks	
>4 % - 10 marks	
II. Spectrometric study of metal complexes - 30 Marks	
<1% - 30 marks	
1-2% - 25 marks	
2-3% - 20marks	
>4 % - 10 marks	
Text Books:	
1. Venkateswaran V. Veerasamy R. Kulandaivelu A.R, Basic Principles of Practical Chemis	stry, S.
Chand & Co Pvt. Ltd, New Delhi, 2019, 2 nd Edition.	
Reference Books:	
1. Bidhan Chandra Ray and Satyanarayan Das, A text book on Chemistry Practical, New cen	tral book
agency Pvt ltd, Kolkata, 2014, 2 nd Edition.	
Web Resources:	
https://vlab.amrita.edu/index.php?sub=2&brch=193∼=350&cnt=1	

	Course Outcomes						
Upon suc	Upon successful completion of this course, the student will be able to:						
CO No.	CO Statement	Cognitive					
		Level					
		(K-Level)					
CO1	Synthesize inorganic complexes	K1					
CO2	Familiarize on the precipitating agents	K2					
CO3	Assess the stoichiometry of the complex	K3					
CO4	Understand the principle of photo colorimeter	K4					
CO5	Examine the optical density of a solution with variation in concentration	K5					

Course	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean
Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Score of COs
CO1	3	2	2	2	2	3	2	2	2	3	2.3
CO2	2	2	2	3	3	2	3	1	3	3	2.4
CO3	3	2	3	1	2	3	2	2	3	2	2.3
CO4	2	3	2	2	3	2	3	3	2	1	2.3
CO5	2	3	2	3	2	3	2	2	2	2	2.3
Mean Overall Score										2.32	
Correlation										Medium	

Mean Overall Score	Correlation
< 1.5	Low
\geq 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: 1. Dr. K. Riaz Ahamed 2. Dr. R. Abdul Vahith

Somestor Course Co		C. J.	Comme Code comme	Hours/	Care d'Ar	Mark	s for Eval	Evaluation	
Semester	Semester Course Co		Course Category	Week	Creatts	CIA	ESE	Total	
V	23 U	23UCH5DE1BPDiscipline Specific Elective - I542080				80	100		
Course Title QUANTITATIVE ANALYSIS OF METAL IONS BY PHOTOMETRIC ME PRACTICAL									
			Contents					Hours	
Contents QUANTITATIVE ANALYSIS OF METAL IONS BY PHOTOMETRIC METHOD 1.Ni as nickel dimethyl glyoxime 2.Zn as zinc oxinate 3.Pb as lead chromate 3.Pb as lead chromate 4.Ba as barium chromate 5.Copper – EDTA Complex 6.Cobalt – Hydrazinate complex 7.Zinc – EDTA Complex 8.Chloro Cuprate complex 8.Chloro Cuprate complex Scheme of valuation Procedure writing -10 marks Record - 10 marks Experiment - 60 Marks <5% - 60 marks								75	

Text Books:

1. Bidhan Chandra Ray and Satyanarayan Das, A text book on Chemistry Practical, New central book agency Pvt ltd, Kolkata, 2014, 2nd Edition.

Reference Books:

1. Venkateswaran V. Veerasamy R. Kulandaivelu A.R, Basic Principles of Practical Chemistry, S. Chand & Co Pvt. Ltd, New Delhi, 2019, 2nd Edition.

Web Resources:

https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000005CH/P000658/M026165/ET/1515586346CHE_P3_M15_etext.pdf

	Course Outcomes									
Upon successful completion of this course, the student will be able to:										
CO No.	CO No. CO Statement									
CO1	Apply the concept of photometry to metal complex	K1								
CO2	Correlate the intensity of colour of a solution with variation in concentration	K2								
CO3	Analyse optical density of a solution by varying concentration	K3								
CO4	Assess the metal ligand ratio of complex by Job's Method	K4								
CO5	Interpret the quantification of the complex	K5								

Relat	Relationship Matrix:											
Course	Pro	gramm	e Outc	omes (F	POs)	Progra	Programme Specific Outcomes (PSOs)					
Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Score of COs	
CO1	3	2	2	2	2	3	2	2	2	3	2.3	
CO2	2	2	1	3	3	2	3	1	3	3	2.3	
CO3	3	2	3	1	2	3	2	1	3	2	2.2	
CO4	2	3	2	2	3	2	3	3	2	1	2.3	
CO5	2	3	2	3	2	3	2	1	2	2	2.2	
Mean Overall Score												
									Co	rrelation	Medium	

Mean Overall Score	Correlation
< 1.5	Low
\geq 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: 1. Dr. K. Riaz Ahamed

2. Dr. S. S. Syed Abuthahir

Semester	Course Code	Course Category	Hours /	Credits	Marks for Evaluation			
	Course Coue	Course Category	week	Cicuits	CIA	ESE	Total	
V	23UCH5SE1	SEC-I	2	1	-	100	100	
Cou	ırse Title	ANALYTICAL CHEMIST	'RY					

Unit	Syllabus	Hours
I	 LABORATORY HYGIENE AND SAFETY 1.1 Storage and handling of chemicals - Carcinogenic chemicals, Ethers, Toxic and poisonous chemicals, General precautions for avoiding accidents 1.2 First aid techniques - acid and alkali on eye, acid and alkali burns, bromine burns, cut by glasses, heat burns, Inhalation of toxic vapours. Poisoning - Treatment for specific poisons – acids, alkalis, acetone, arsenic, copper compounds, cyanides, lead, silver and tin compounds - antidote – definition - universal antidotes. 	6
II	 DATA ANALYSIS 2.1. Mean, median, standard deviation – simple problems - precision, accuracy - Difference between precision and accuracy - confidence limits. 2.2 Errors – types - Determinate errors – instrumental, operative and methodic errors, Indeterminate errors - Rejection of data – Reporting of data. 	6
III	 THERMAL ANALYSIS 3.1. Thermo gravimetric Analysis (TGA)–Principle –Techniques - Factors affecting TGA –TGA curves of AgNO₃ and CuSO₄.5H₂O- Applications of TGA. 3.2. Differential Thermal Analysis (DTA)- Principle – Techniques – Factors affecting DTA - DTA curve of Calcium oxalate, applications. Differential Scanning Colorimetry (DSC) - Principle – Techniques - applications. 	6
IV	 CHROMATOGRAPHY TECHNIQUES 4.1. Chromatography – Classification - Paper chromatography – Principle, types, techniques and applications. TLC - Principle, techniques and applications. 4.2 Column chromatography - Principle, instrumentation - techniques and applications-HPLC – Principle - Instrumentation – Techniques and applications. 	6
V	 GAS CHROMATOGRAPHY AND SEM ANALYSIS 5.1 Gas Chromatography – Principle – instrumentation - techniques and applications. 5.2. Scanning Electron Microscopy (SEM) – Principle, techniques and applications. 	6

Text Books

- 1.Vogel, Arthur I: A Text book of Quantitative Inorganic Analysis (Rev. by G.H. Jeffery and others) 5th Edition, The English Language Book Society of Longman.,
- 2.R. Gopalan, P. S. Subramanian and K. Rengarajan, Elements of Analytical Chemistry, Sultan Chand, New Delhi, 2007
- 3.Skoog, Holler and Crouch, Principles of Instrumental Analysis, Cengage Learning, 6th Indian Reprint, 2017.

4.R. Speyer, Thermal Analysis of Materials, CRC Press, 1993.

5.R.A. Day and A.L. Underwood, Quantitative Analysis, 6th Edition, Prentice Hall of India Private Ltd., New Delhi,1993

Reference Books

- 1. D. A. Skoog, D.M. West and F. J. Holler, Analytical Chemistry: An Introduction, 5th Edition, Saunders college publishing, Philadelphia, 1998.
- 2. Dash UN, Analytical Chemistry; Theory and Practice, Sultan Chand and sons Educational Publishers, New Delhi, 2011.
- 3. Christian, Gary D; Analytical Chemistry, 6th Edition, John Wiley & Sons, New York, 2004.
- 4. Mikes, O and Chalmes, R.A. Laboratory Hand book of Chromatographic & Allied Methods, Elles Harwood Ltd. London.
- 5. G.H.Jeffery, J.Bassett, J.Mendham and R.C. Denney, Vogel's Text book of Quantitative Chemical Analysis, 6th edition, Pearson Education, 2000.

Web resources

- 1. http://www.epa.gov/rpdweb00/docs/marlap/402-b-04-001b-14-final.pdf
- 2. http://eric.ed.gov/?id=EJ386287
- 3. http://www.sjsu.edu/faculty/watkins/diamag.html
- 4. http://www.britannica.com/EBchecked/topic/108875/separation- and-purification.
- 5. http://www.chemistry.co.nz/stoichiometry.htm

	Course Outcomes									
Upon successful completion of this course, the student will be able to:										
CO No.	CO No. CO Statement									
CO1	Demonstrate the procedures of first-aid techniques	K1								
CO2	Discuss instrumentation, theory and applications of thermal and electrochemical techniques	K2								
CO3	Apply error analysis in the calibration and use of analytical instruments	К3								
CO4	Explaintheuseofchromatographictechniquesintheseparationandidentification of mixtures.	K4								
CO5	Analyze the features and impact of IPR and innovation	K5								

Relationship Matrix

Course	Programme Outcomes (POs)						Programme Specific Outcomes (PSOs)				
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	COs
CO1	2	3	3	2	3	2	3	2	3	3	2.6
CO2	3	3	2	3	2	3	2	2	2	2	2.4
CO3	2	2	2	3	3	2	2	2	3	3	2.4
CO4	3	3	2	2	2	3	2	2	3	3	2.5
CO5	3	2	3	2	3	3	2	3	3	3	2.7
Mean Overall score											
				Corr	elation						High

Mean Overall Score	Correlation
< 1.5	Low
>1.5 and > 2.5	Medium
>.= 2.5	High

Course Coordinators: 1.Dr. A. Zahir Hussain

2. Dr. G. Hema Sindhuja

Semester	Courser	Course	Hours/	Credits	Marks for Evaluation			
	Code	Category	week		CIA	ESE	Total	
V	23UCH5SE2	SEC - II	2	1	-	100	100	
		•		•				

Course Title CLINICAL CHEMISTRY

	SYLLABUS								
Unit	Content	Hours							
	DRUGS AND USES OF MEDICINAL PLANTS								
	1.1. Drugs and Common diseases –Definition - source of drugs - important terminologies								
	- pharmacy - chemotherapy - Pharmacology - pharmacodynamics - pharmacophore -								
-	pharmacognosy – pharmacopoeia – metabolites – antimetabolites. Diseases –								
I	Tuberculosis – asthma - jaundice, leprosy and typhoid - causes, symptoms, prevention	6							
	and treatment.								
	1.2. Indian Medicinal Plants - Neem, Tulsi, Adathoda, keezhanelli, Thuthuvalai,								
	Sembaruthi - bioactive constituents and medicinal uses.								
	ANTIBIOTICS								
	2.1.Antibiotics – Definition - penicillin and streptomycin. Chloramphenicol and								
п	Tetracycline – structure and uses.	6							
	2.2.Sulphadrugs –Definition - sulphadiazine, sulphapyridine, sulphathiazole and	v							
	sulphafurazole – preparation and uses.								
	ANESTHETICS AND ANALGESICS								
	3.1. Anesthetics –Definition – classification-general volatile anaesthetics - ethers								
	nitrousoxide chloroform halothane - advantages and disadvantages Intravenous								
ттт	anaesthetics – thiopental sodium methohexitone - local anaesthetics-cocaine procaine	6							
111	henzocaine - advantages-disadvantages	U							
	3.2 Analgesics Definition - classification parcotics analgesics and non-parcotics								
	3.2. Analgesies Deminion - classification-narcones analgesies and non-narcones								
	DIARTES AND ANAEMIA								
l	DIADETES AND ANAEMIA								
IV	4.1. Diabetes – Definition, Types – Causes- Hypoglycemic drugs – chloropropamide,	6							
	glibenclamide, phenoformin, metformin – structure and uses.	_							
	4.2 Anaemia – Symptoms and Causes , antianaemic drugs.								
	BLOOD AND BLOOD ANALYSIS								
\mathbf{V}	5.1 Blood – Definition – composition – Rh factor–Blood Pressure – coagulants –vitamin K	6							
•	and protamin sulphate – anticoagulants – coumarine, heparin.								
	5.2 Estimation of glucose – Folin and Wu's method – o -Toluidine method – Estimation of								
	urea, protein in blood.								

Text books:

Mathew George and Lincy joseph, Text book of pharmaceutical chemistry, Revised Edition, Viva book private Ltd, New Delhi, 2009
 Lakshmi.S, Pharmaceutical Chemistry, 3rd Edition, S. Chand &Co., New Delhi, 2004

3. D. Sriram and P. Yogeshwari, Medicinal Chemistry, 2nd Edition, Sharma Printers, Delhi, 2011

V.K.Ahluwalia and Madhi Chopra, Medicinal Chemistry, 2nd Edition, Ane Books Pvt. Ltd., Delhi, 2012
 Jayashree Ghose, Text book of Pharmaceutical chemistry, 2nd Edition, S.Chand & Co., New Delhi, 2003

Reference Books:

- 1. Ashutoshkar, Medicinal Chemistry, Revised Edition, International Publishers, 2010
- 2. V.N. Rajasekaran, PharmaceuticalChemistry, 4th Edition, Sun publications Chennai, 2003
- 3. S. Vasudevan and Sreekumari, Essentials of Medical Biochemistry, 5th Edition, Jaypee Brothers Medical Publishers (P) Ltd. New Delhi, 2020

Web resources

1. https://www.worldcat.org

2. https://www.accessdata.fda.gov

	Course Outcomes										
Upon succ	Upon successful completion of this course, the student will be able to:										
CO No.	CO No. CO Statement										
CO1	Understand the basic knowledge on drugs and medicinal uses of plants	K1									
CO2	Analyze the structure of Antibiotics and its uses	K2									
CO3	Categorize the Anesthetics and Analgesics	K3									
CO4	Probed into the causes and remedy of Diabetes and Anaemia	K4									
CO5	Predict the blood composition, mechanism and coagulants	K5									

Relationship Matrix

Course	P	rogram	me Ou	itcomes	(POs)	Pro	ogramme	Specific (Outcomes	s (PSOs)	Mean	
Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	score of COS	
CO1	2	2	3	2	2	3	2	2	2	3	2.30	
CO2	2	2	2	3	2	2	3	2	3	2	2.30	
CO3	3	3	2	3	2	3	2	3	3	3	2.70	
CO4	3	2	3	3	2	3	3	3	3	3	2.80	
CO5	2	3	3	2	3	3	3	3	3	2	2.70	
Mean overall score												
									Corre	elation	High	

Mean overall score	Correlation
< 1.5	Low
\geq 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator:

Dr. A. Zahir Hussain
 Dr. A. Samsathbegum

			Hours		Marks for Evaluation		
Semester	Course Code	Course Category	/Week	Credits	CIA	ESE	Total
VI	23UCH6CC13	Core-XIII	6	6	25	75	100

Course Title	COORDINATION COMPLEXES AND CHEMISTRY OF LANTHANIDES AND
	ACTINIDES

SYLLABUS						
Unit	t Contents		Hours			
I	 Transition Elements and their Properties 1.1 Transition Elements: Position of d-block electronic configuration, variable oxid tendency to form complexes, standard eleproperties and catalytic properties; Positie metals in the periodic table and Similaritie 1.2 Preparation, properties and uses of TiO₂, Ti.3 Platinum Triads - ruthenium, rhodium, platinum-properties and uses. 	elements, General characteristics – lation states, metallic character, ectrode potential, colour, magnetic on of Ferrous metals and *coinage es*. V ₂ O ₅ , Cr ₂ O ₃ , MnO ₂ , CoO and NiO. , palladium, osmium, iridium and	18			
II	 Inner-transition elements and Indian knowledg 2.1 Lanthanides: Properties of lanthanides, estates, ionic radii, lanthanide contraction, extraction from monazite sand, separation method, ion-exchange method. 2.2 Actinides: Properties, Electronic configuration uranium elements, oxidation states, colou comparison with lanthanides. 2.3 Indian Knowledge in Metallurgy – Intrand Silver. 	ge in Metallurgy electronic configurations, oxidation colour, magnetic properties, uses, of lanthanides –change in oxidation ration, Actinide contraction, Trans- ar of ions, formation of complexes, oduction, Copper, Iron, Zinc, Gold	18			
ш	 Coordination Chemistry 3.1 Coordination compounds: Definition, terra - based on charge and denticity. Hapticity. I 3.2 Theories of coordination compounds: Pauling's theory, limitations of Pauling splitting of d-orbitals in O_h, T_d and square and strong fields, Colour of transition m spectrum of [Ti (H₂O)₆]³⁺. 3.3 Organometallic compounds- alkene comp [Co₂(CO)₆(RC=CR)], metallocene - ferror structure. 	minology, Ligands – classification (UPAC nomenclature *Werner's theory*, Sidgwick and 's theory. Crystal field theory – e planar complexes, CFSE of weak tetal complexes, visible absorption blex Zeise's salt, alkyne complex- cene - preparation, properties and	18			
	Isomerism and Stability of Complexes					
----	---	----	--	--	--	--
	4.1. Isomerism in coordination compounds: Structural isomerism - ionisation,					
	hydrate, ligand, linkage, coordination and coordination position isomerisms,					
	Stereoisomerism -Geometrical and optical isomerism in 4 and 6 coordination					
	compounds – *Distinction between cis and trans-isomers*.					
IV	4.2. Stability of complexes in aqueous solution: Thermodynamic stability-stable	18				
	and unstable complexes, kinetic stability – labile and inert complexes. Stepwise					
	and overall stability constants.					
	4.3. Substitution reaction - SN^{4} and SN^{2} Reactions in O_{h} complexes. Square planar					
	complexes - Irans effect - definition and its applications.					
	4.4. Chelates – Characteristics – classification – factors influencing the stability of					
	metal chelates.					
	Carbonyls and Nitrosyls					
	5.1 Metal carbonyis: Preparation, properties and structures of mono and binuclear					
	carbonyls of Cr, Mn, Fe, Co and Ni - Applications of 18 e and EAN rules on metal carbonyls					
	5 2 Nitrosyls: Classification Sodium nitronrusside Preparation Properties and					
v	uses.					
	5.3 Analytical application of coordination complexes–Detection of K ⁺ ions –					
	Separation of Cu^{2+} and Cd^{2+} ions, Estimation of Ni ²⁺ using DMG and Al ³⁺ using					
	oxine. Structure of EDTA and its complexes-applications.	18				
	5.4 Biologically important coordination compounds - Chlorophyll	20				
	Haemoglobin, *Vitamin B ₁₂ - structure and function*.					
	Current Trends (For CIA only)					
VI	Newly discovered elements - Nihonium, Moscovium, Tennessine and Oganesson-Ato					
	number, atomic weight and discoverer.					

..... Self Study

Text Books:

- 1. P.L. Soni, Mohan Katyal, Textbook of Inorganic Chemistry, Revised Edition, Sulthan Chand & Sons, New Delhi, 2013.
- Wahid Malik, G.D. Tuli and R.D. Madan, Selected Topics in Inorganic Chemistry, Revised Edition, S. Chand & Co, New Delhi, 2010.
- 3. Satya Prakash, G.D. Tuli, S.K. Basu, R.D. Madan, Advanced Inorganic Chemistry, Vol-II, 19th Edition, S Chand & Co Ltd, New Delhi, 2011.
- 4. R. Gopalan, V. Ramalingam, Concise Coordination Chemistry, 1st Edition, Vikas Publishing House Pvt. Ltd, 2001.
- 5. Ajai Kumar, Mukesh Chand, Sudershan Kumar, Advanced Inorganic Chemistry, 1st Edition, Aaryush Education, UP, 2018.

Reference Books:

- 1. R.D. Madan, Modern Inorganic Chemistry, S. Chand & Co., NewDelhi, 2nd Reprint, 1987.
- 2. Gurdeep Raj, Advanced Inorganic Chemistry-Vol.-I Revised Edition Krishna Prakashan Media (P) Ltd, 2014.
- 3. Gurdeep Raj, Advanced Inorganic Chemistry-Vol.-II Revised Edition Krishna Prakashan Media (P) Ltd, 2014.
- 4. J.D. Lee, Concise Inorganic Chemistry, 5th Edition Blackwell Science Ltd., France, 2014.
- 5. James E Huheey, E.A. Keiter, R.L. Keiter, Inorganic Chemistry: Principles of Structure and Reactivity, 4th Edition, Pearson Education, 2014.
- 6. Knowledge Traditions and Practices of India, Book code 11151, Chemistry and Metallurgy in India, NCERT Publication.
- 7. Jyoti Pathak, Chemistry in Ancient India, International Research Journal of Management Science & Technology, Vol. 7, Issue 3, 2016, ISSN 2250-1959 (online) 2348 -9367 (Print)

WebResources:

- 1. <u>https://onlinecourses.nptel.ac.in/noc23_cy25/preview</u>
- 2. <u>https://nptel.ac.in/content/syllabus_pdf/104101121.pdf</u>
- 3. <u>https://www.vedantu.com/chemistry/qualitative-chemical-analysis</u>
- 4. https://en.wikipedia.org/wiki/IUPAC_nomenclature_of_organic_chemistry
- 5. <u>https://mjcollege.kces.in/pdf/download_documents/study_material_iks_sem_2/unit_1_c_Vedic_Metallurgy_Notes_English.pdf</u>

	Course Outcomes					
Upon suc	cessful completion of this course, the student will be able to:					
CONo.	CO Statement	Cognitive Level				
		(K-Level)				
CO1	Recall the position of transition elements in the periodic table.	K 1				
CO2	Explain the properties of inner transition elements.	K2				
CO3	Apply CFSE calculation to explain the stability of coordination compounds.	K3				
CO4	Classify isomerism of complexes.	K4				
CO5	Estimate metal ions by gravimetry.	K5				

Relationship Matrix:

Course	Pro	gramm	e Outco	omes (P	Os)	Programme Specific Outcomes (PSOs)					Mean Score of
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Cos
CO1	3	3	3	2	3	3	2	3	2	2	2.6
CO2	3	3	3	3	2	3	3	3	3	3	2.9
CO3	3	3	2	2	3	3	2	2	3	3	2.6
CO4	3	3	3	2	3	3	3	2	2	2	2.6
CO5	3	3	3	3	3	3	3	2	3	3	2.9
Mean Overall Score									2.72		
Correlation								Medium			

Mean Overall Score	Correlation
<1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators: 1. Dr. K. Loganathan 2. Dr. R. Arulnangai

Som	ostor	Course Code	Course Category	Hours/	Crodite	Marks for Evaluati			on
		Course Coue	Course Category	Week	Creans	CIA	ESE	Τα	otal
V	I	23UCH6CC14	Core - XIV	6	6	25	75	1	00
Cour	se Titl	e ELECTRO THEORY	CHEMISTRY, MO	LECULA	R SPECT	ROSC	OPY AND	GROUP	
			SYI	LLABUS					
Unit			Co	ontents					Hours
 Properties of Electrolytes 1.1. Conductance in metals and electrolytic solutions: specific conductance, molar conductance, equivalent conductance, Variation of conductance with temperature and concentration, Kohlrausch's law and its applications. *Arrhenius theory of electrolytic dissociation and its limitations –Weak and strong electrolytes according to Arrhenius theory* Ostwald's dilution law - derivation, uses and limitations, Elementary treatment of Debye-Huckel - Onsager theory of strong electrolytes – Activity coefficient of electrolytes. I.2. Ionic Mobility: Definition, experimental proof for migration of ions, Transport number – definition, Hittorf's rule, Determination of transport number by Hittorf's method and moving boundary method, effect of concentration on transport number. I.3. Conductometric titrations: Principle, advantages and applications - Types of conductometric titrations: HCl vs NaOH, CH₃COOH vs NaOH, HCl vs NH₄OH, CH₃COOH vs NH₄OH and AgNO₃ vs KCl. (Problems from1.1 and 1.2) 							18		
п	Equil 2.1. (irreve electro electro electro 2.2. E and c Relati series 2.3. (cells, e.m.f. (Prob	ibrium Electroch Galvanic Cells : rsible cell*, type odes, gas electro ode, single electro ode, standard elec .M.F. of Galvani ell reaction, Ner on between E.M. standard cell. Concentration Ce Electrolyte conc , concentration of lems from 2.2 and	hemistry Definition, *chemicals s of reversible electric des, metal-insoluble ode potential. Reference trode potential and it ic cell and Cell react nst equation for cell I.F. and ΔG , ΔH , Δ ells : Electrode concent entration cells – Co cells with transferent 1 2.3)	l cell, co rodes – N metal sal ce electrod s determin ions: Cell e.m.f., T S, equilib tration cel ncentration	ncentratio Ietal-meta It electrod les – prima nation. e.m.f., sig Thermodyn orium con lls – Amal n cells wa ts e.m.f.,	n cell, l ion el le and c ary and s n conve amics o stant (F gam an- ithout the liquid	reversible c lectrodes, ar oxidation-re secondary re entions of cel of galvanic X), electroch d gas concer ransference junction po	ell and nalgam duction ference ll e.m.f. cells – nemical ntration and its otential.	18
III	 (Problems from 2.2 and 2.3) Molecular Spectroscopy 3.1. Electromagnetic Radiations: Definition, regions of electromagnetic radiations, wavelength, wavenumber and frequency - Interaction of electro-magnetic radiations with molecules, quantization of energies in molecules - Translational, rotational, vibration, and electronic energies, molecular spectra - origin of molecular spectra. 3.2. Microwave Spectroscopy: Theory, selection rule, effect of isotopic substitution and calculation of moment of inertia and bond length of diatomic molecules. 3.3. Infrared Spectroscopy: Theory, Hook's law, selection rule - (Harmonic and anhormonic oscillators), Expression for vibrational frequency, types of molecular vibrations –vibrations of HCl, CO₂ and H₂O molecules, Calculation of force constant- Applications of IR spectra – (Functional group region, finger print region and Hydrogen bonding only). 3.4. Raman spectroscopy – *Raman Effect, Rayleigh and Raman scattering* – Stokes and anti - stokes lines, Modes of vibrations and change in polarizability of H₂O and CO₂, mutual exclusion principle, comparison of Raman and IR spectroscopy 							18	

	NMR, ESR and Mass Spectroscopy	
	4.1. NMR spectroscopy: Principle, Conditions for nuclei to be a NMR active, Magnetic	
	and non-magnetic nuclei, Chemical shift - Definition, reference standard – Tetramethyl	
	silane (TMS), Chemical shift value for TMS, Factors affecting the value of chemical shifts	
	- Inductive effect (+L and -D) and hydrogen bonding - Number of signals for ethanol.	
	ethylamine propagal urea acetone 14-dichlorobenzene 2-chloropropene - Spin-spin	
137	coupling coupling constant NMR spectra of pure ethanol and acidified ethanol	10
1 V	4.2 ESD Supering constant, twick spectra of pure entation and actimized entation.	18
	4.2. ESK Spectroscopy: Theory, hyperfine splitting, factors affecting the g value - ESK	
	spectra of hydrogen, deuterium, methyl radical, benzene anion, naphthalene anion,	
	anthracene anion and benzoquinone anion radicals – comparison of NMR and ESR.	
	4.3. Mass Spectroscopy: Basic principle, molecular ion peak, base peak, isotopic peaks,	
	meta stable peaks [*] , ring rule and nitrogen rule - mass spectra of ethylchloride, aniline,	
	toluene.	
	Electronic Spectroscopy and Group Theory	
	5.1. UV-Visible spectroscopy: Theory, types of electronic transitions, chromophore,	
	auxochrome, Franck-Condon principle, dissociation and pre-dissociation spectra, factors	
	affecting absorption maxima, application to geometrical isomerism (maleic and fumaric	
	acids, cis and trans stilbenes).	
V	5.2. Group Theory: symmetry elements symmetry operations- Identity operation Centre	18
	of symmetry Plane of symmetry n-fold proper axis of symmetry andn-fold improper axis	
	of symmetry. Group, postulates, types evalue group, sub-group, shalion and non shalion	
	or symmetry. Group - postulates, types-cyclic group, sub group, abenan and non-abenan	
	group. Point group - definition, symmetry elements and their operations of the following	
	molecules - H_2O and NH_3 .	
VI	Current Trends (CIA only)	
VI	Current Trends (CIA only) Two-dimensional infrared spectroscopy – Introduction, Principle and applications	
VI	Current Trends (CIA only) Two-dimensional infrared spectroscopy – Introduction, Principle and applications ** Self Study	
	Current Trends (CIA only) Two-dimensional infrared spectroscopy – Introduction, Principle and applications ** Self Study xt Books: P. P. Duri, L. P. Sharma, M. S. Dathania, Drinciples of Physical Chemistry, 48th Edition	Vichol
VI Te 1.	Current Trends (CIA only) Two-dimensional infrared spectroscopy – Introduction, Principle and applications ** Self Study xt Books: B. R. Puri, L.R. Sharma, M. S. Pathania, Principles of Physical Chemistry, 48 th Edition, Publications, Jalandhar, 2023	Vishal
VI Te 1. 2	Current Trends (CIA only) Two-dimensional infrared spectroscopy – Introduction, Principle and applications ** Self Study xt Books: B. R. Puri, L.R. Sharma, M. S. Pathania, Principles of Physical Chemistry, 48 th Edition, Publications, Jalandhar, 2023. C.N. Banwell and E.M. Mc cash. Fundamentals of Molecular Spectroscopy 30 th Reprin	Vishal t Tata
VI Te 1. 2.	Current Trends (CIA only) Two-dimensional infrared spectroscopy – Introduction, Principle and applications ** Self Study xt Books: B. R. Puri, L.R. Sharma, M. S. Pathania, Principles of Physical Chemistry, 48 th Edition, Publications, Jalandhar, 2023. C.N. Banwell and E.M. Mc cash, Fundamentals of Molecular Spectroscopy, 30 th Reprin McGraw-Hill Publishing Company Limited, New Delhi, 2008.	Vishal t, Tata
VI Te 1. 2. 3.	Current Trends (CIA only) Two-dimensional infrared spectroscopy – Introduction, Principle and applications ** Self Study xt Books: B. R. Puri, L.R. Sharma, M. S. Pathania, Principles of Physical Chemistry, 48 th Edition, Publications, Jalandhar, 2023. C.N. Banwell and E.M. Mc cash, Fundamentals of Molecular Spectroscopy, 30 th Reprin McGraw-Hill Publishing Company Limited, New Delhi, 2008. R.L. Madan, G.D. Tuli, Simplified Course in Physical Chemistry, 5 th Revised and Enlarged I	Vishal t, Tata Edition
VI Te 1. 2. 3.	Current Trends (CIA only) Two-dimensional infrared spectroscopy – Introduction, Principle and applications ** Self Study xt Books: B. R. Puri, L.R. Sharma, M. S. Pathania, Principles of Physical Chemistry, 48 th Edition, Publications, Jalandhar, 2023. C.N. Banwell and E.M. Mc cash, Fundamentals of Molecular Spectroscopy, 30 th Reprin McGraw-Hill Publishing Company Limited, New Delhi, 2008. R.L. Madan, G.D. Tuli, Simplified Course in Physical Chemistry, 5 th Revised and Enlarged I S. Chand& Co., New Delhi, 2009.	Vishal t, Tata Edition
VI Te 1. 2. 3. 4.	Current Trends (CIA only) Two-dimensional infrared spectroscopy – Introduction, Principle and applications ** Self Study xt Books: B. R. Puri, L.R. Sharma, M. S. Pathania, Principles of Physical Chemistry, 48 th Edition, Publications, Jalandhar, 2023. C.N. Banwell and E.M. Mc cash, Fundamentals of Molecular Spectroscopy, 30 th Reprin McGraw-Hill Publishing Company Limited, New Delhi, 2008. R.L. Madan, G.D. Tuli, Simplified Course in Physical Chemistry, 5 th Revised and Enlarged I S. Chand& Co., New Delhi, 2009. N.N. Das, Symmetry and Group Theory for Chemists, Low Price Edition, Asian Books Pv	Vishal t, Tata Edition t. Ltd.,
VI Te 1. 2. 3. 4.	Current Trends (CIA only) Two-dimensional infrared spectroscopy – Introduction, Principle and applications ** Self Study xt Books: B. R. Puri, L.R. Sharma, M. S. Pathania, Principles of Physical Chemistry, 48 th Edition, Publications, Jalandhar, 2023. C.N. Banwell and E.M. Mc cash, Fundamentals of Molecular Spectroscopy, 30 th Reprin McGraw-Hill Publishing Company Limited, New Delhi, 2008. R.L. Madan, G.D. Tuli, Simplified Course in Physical Chemistry, 5 th Revised and Enlarged I S. Chand& Co., New Delhi, 2009. N.N. Das, Symmetry and Group Theory for Chemists, Low Price Edition, Asian Books Pv 2016.	Vishal t, Tata Edition t. Ltd.,
VI Te 1. 2. 3. 4. Re	Current Trends (CIA only) Two-dimensional infrared spectroscopy – Introduction, Principle and applications **Self Study xt Books: B. R. Puri, L.R. Sharma, M. S. Pathania, Principles of Physical Chemistry, 48 th Edition, Publications, Jalandhar, 2023. C.N. Banwell and E.M. Mc cash, Fundamentals of Molecular Spectroscopy, 30 th Reprin McGraw-Hill Publishing Company Limited, New Delhi, 2008. R.L. Madan, G.D. Tuli, Simplified Course in Physical Chemistry, 5 th Revised and Enlarged I S. Chand& Co., New Delhi, 2009. N.N. Das, Symmetry and Group Theory for Chemists, Low Price Edition, Asian Books Pv 2016. ference Books:	Vishal t, Tata Edition t. Ltd.,
VI Te 1. 2. 3. 4. Re 1.	Current Trends (CIA only) Two-dimensional infrared spectroscopy – Introduction, Principle and applications ** Self Study xt Books: B. R. Puri, L.R. Sharma, M. S. Pathania, Principles of Physical Chemistry, 48 th Edition, Publications, Jalandhar, 2023. C.N. Banwell and E.M. Mc cash, Fundamentals of Molecular Spectroscopy, 30 th Reprin McGraw-Hill Publishing Company Limited, New Delhi, 2008. R.L. Madan, G.D. Tuli, Simplified Course in Physical Chemistry, 5 th Revised and Enlarged I S. Chand& Co., New Delhi, 2009. N.N. Das, Symmetry and Group Theory for Chemists, Low Price Edition, Asian Books Pv 2016. ference Books: Samuel Glasstone, An Introduction to Electrochemistry, 2 nd Edition Indian Reprint, Eas	Vishal t, Tata Edition t. Ltd., t-West
VI Te 1. 2. 3. 4. Re 1. 2.	Current Trends (CIA only) Two-dimensional infrared spectroscopy – Introduction, Principle and applications ** Self Study xt Books: B. R. Puri, L.R. Sharma, M. S. Pathania, Principles of Physical Chemistry, 48 th Edition, Publications, Jalandhar, 2023. C.N. Banwell and E.M. Mc cash, Fundamentals of Molecular Spectroscopy, 30 th Reprin McGraw-Hill Publishing Company Limited, New Delhi, 2008. R.L. Madan, G.D. Tuli, Simplified Course in Physical Chemistry, 5 th Revised and Enlarged I S. Chand& Co., New Delhi, 2009. N.N. Das, Symmetry and Group Theory for Chemists, Low Price Edition, Asian Books Pv 2016. ference Books: Samuel Glasstone, An Introduction to Electrochemistry, 2 nd Edition Indian Reprint, Eas Edition, New Delhi, 2016. C.M. Barrenty Later devices to Malagement Superstruggery.	Vishal t, Tata Edition t. Ltd., t-West
VI Tee 1. 2. 3. 4. Ree 1. 2. 3. 4. 2. 3. 4. 2. 3. 4. 2. 3. 4. 3. 4. 3. 4. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5	Current Trends (CIA only) Two-dimensional infrared spectroscopy – Introduction, Principle and applications ** Self Study xt Books: B. R. Puri, L.R. Sharma, M. S. Pathania, Principles of Physical Chemistry, 48 th Edition, Publications, Jalandhar, 2023. C.N. Banwell and E.M. Mc cash, Fundamentals of Molecular Spectroscopy, 30 th Reprin McGraw-Hill Publishing Company Limited, New Delhi, 2008. R.L. Madan, G.D. Tuli, Simplified Course in Physical Chemistry, 5 th Revised and Enlarged I S. Chand& Co., New Delhi, 2009. N.N. Das, Symmetry and Group Theory for Chemists, Low Price Edition, Asian Books Pv 2016. ference Books: Samuel Glasstone, An Introduction to Electrochemistry, 2 nd Edition Indian Reprint, Eas Edition, New Delhi, 2016. G.M. Barrow, Introduction to Molecular Spectroscopy, Tata-Mc Graw Hill Edition, 1993. R.S. Pach, C.D. Tuli and Arun, Pach, Eccentical of Physical Chemistry, 28 th Edition S.	Vishal t, Tata Edition t. Ltd., t-West
VI Te 1. 2. 3. 4. Re 1. 2. 3. 3. 4. Re 1. 2. 3. 4.	Current Trends (CIA only) Two-dimensional infrared spectroscopy – Introduction, Principle and applications ** Self Study xt Books: B. R. Puri, L.R. Sharma, M. S. Pathania, Principles of Physical Chemistry, 48 th Edition, Publications, Jalandhar, 2023. C.N. Banwell and E.M. Mc cash, Fundamentals of Molecular Spectroscopy, 30 th Reprin McGraw-Hill Publishing Company Limited, New Delhi, 2008. R.L. Madan, G.D. Tuli, Simplified Course in Physical Chemistry, 5 th Revised and Enlarged I S. Chand& Co., New Delhi, 2009. N.N. Das, Symmetry and Group Theory for Chemists, Low Price Edition, Asian Books Pv 2016. ference Books: Samuel Glasstone, An Introduction to Electrochemistry, 2 nd Edition Indian Reprint, Eas Edition, New Delhi, 2016. G.M. Barrow, Introduction to Molecular Spectroscopy, Tata-Mc Graw Hill Edition, 1993. B.S.Bahl, G.D. Tuli and Arun Bahl, Essentials of Physical Chemistry, 28 th Edition, S. Company, New Delhi, 2020	Vishal t, Tata Edition t. Ltd., t-West Chand
VI Tee 1. 2. 3. 4. Ree 1. 2. 3. 4. A	Current Trends (CIA only) Two-dimensional infrared spectroscopy – Introduction, Principle and applications ** Self Study xt Books: B. R. Puri, L.R. Sharma, M. S. Pathania, Principles of Physical Chemistry, 48 th Edition, Publications, Jalandhar, 2023. C.N. Banwell and E.M. Mc cash, Fundamentals of Molecular Spectroscopy, 30 th Reprin McGraw-Hill Publishing Company Limited, New Delhi, 2008. R.L. Madan, G.D. Tuli, Simplified Course in Physical Chemistry, 5 th Revised and Enlarged I S. Chand& Co., New Delhi, 2009. N.N. Das, Symmetry and Group Theory for Chemists, Low Price Edition, Asian Books Pv 2016. ference Books: Samuel Glasstone, An Introduction to Electrochemistry, 2 nd Edition Indian Reprint, Eas Edition, New Delhi, 2016. G.M. Barrow, Introduction to Molecular Spectroscopy, Tata-Mc Graw Hill Edition, 1993. B.S.Bahl, G.D. Tuli and Arun Bahl, Essentials of Physical Chemistry, 28 th Edition, S. Company, New Delhi, 2020. N. Kundu and S. K. Jain Physical Chemistry Revised Edition S. Chand & Co. New Delhi	Vishal t, Tata Edition t. Ltd., t-West Chand
VI Te 1. 2. 3. 4. Re 1. 2. 3. 4. 4. 5.	Current Trends (CIA only) Two-dimensional infrared spectroscopy – Introduction, Principle and applications ** Self Study xt Books: B. R. Puri, L.R. Sharma, M. S. Pathania, Principles of Physical Chemistry, 48 th Edition, Publications, Jalandhar, 2023. C.N. Banwell and E.M. Mc cash, Fundamentals of Molecular Spectroscopy, 30 th Reprin McGraw-Hill Publishing Company Limited, New Delhi, 2008. R.L. Madan, G.D. Tuli, Simplified Course in Physical Chemistry, 5 th Revised and Enlarged I S. Chand& Co., New Delhi, 2009. N.N. Das, Symmetry and Group Theory for Chemists, Low Price Edition, Asian Books Pv 2016. ference Books: Samuel Glasstone, An Introduction to Electrochemistry, 2 nd Edition Indian Reprint, Eas Edition, New Delhi, 2016. G.M. Barrow, Introduction to Molecular Spectroscopy, Tata-Mc Graw Hill Edition, 1993. B.S.Bahl, G.D. Tuli and Arun Bahl, Essentials of Physical Chemistry, 28 th Edition, S. Company, New Delhi, 2020. N. Kundu and S.K. Jain, Physical Chemistry, Revised Edition, S. Chand & Co., New Delhi, ZA, Guuta and M. Kumar, Group Theory and Spectroscopy.	Vishal t, Tata Edition t. Ltd., t-West Chand 2000. an.
VI Te 1. 2. 3. 4. Re 1. 2. 3. 4. 4. 5.	Current Trends (CIA only) Two-dimensional infrared spectroscopy – Introduction, Principle and applications ** Self Study xt Books: B. R. Puri, L.R. Sharma, M. S. Pathania, Principles of Physical Chemistry, 48 th Edition, Publications, Jalandhar, 2023. C.N. Banwell and E.M. Mc cash, Fundamentals of Molecular Spectroscopy, 30 th Reprint McGraw-Hill Publishing Company Limited, New Delhi, 2008. R.L. Madan, G.D. Tuli, Simplified Course in Physical Chemistry, 5 th Revised and Enlarged I S. Chand& Co., New Delhi, 2009. N.N. Das, Symmetry and Group Theory for Chemists, Low Price Edition, Asian Books Pv 2016. ference Books: Samuel Glasstone, An Introduction to Electrochemistry, 2 nd Edition Indian Reprint, Eas Edition, New Delhi, 2016. G.M. Barrow, Introduction to Molecular Spectroscopy, Tata-Mc Graw Hill Edition, 1993. B.S.Bahl, G.D. Tuli and Arun Bahl, Essentials of Physical Chemistry, 28 th Edition, S. Company, New Delhi, 2020. N. Kundu and S.K. Jain, Physical Chemistry, Revised Edition, S. Chand & Co., New Delhi, 2020. N. Kundu and M. Kumar, Group Theory and Spectroscopy, 1 st Edition, Pragathi Prakash: Meerut, 2018.	Vishal t, Tata Edition t. Ltd., t-West Chand 2000. an,
VI Te: 1. 2. 3. 4. Re 1. 2. 3. 4. 5. W	 Current Trends (CIA only) Two-dimensional infrared spectroscopy – Introduction, Principle and applications ** Self Study xt Books: B. R. Puri, L.R. Sharma, M. S. Pathania, Principles of Physical Chemistry, 48th Edition, Publications, Jalandhar, 2023. C.N. Banwell and E.M. Mc cash, Fundamentals of Molecular Spectroscopy, 30th Reprin McGraw-Hill Publishing Company Limited, New Delhi, 2008. R.L. Madan, G.D. Tuli, Simplified Course in Physical Chemistry, 5th Revised and Enlarged I S. Chand& Co., New Delhi, 2009. N.N. Das, Symmetry and Group Theory for Chemists, Low Price Edition, Asian Books Pv 2016. ference Books: Samuel Glasstone, An Introduction to Electrochemistry, 2nd Edition Indian Reprint, Eas Edition, New Delhi, 2016. G.M. Barrow, Introduction to Molecular Spectroscopy, Tata-Mc Graw Hill Edition, 1993. B.S.Bahl, G.D. Tuli and Arun Bahl, Essentials of Physical Chemistry, 28th Edition, S. Company, New Delhi, 2020. N. Kundu and S.K. Jain, Physical Chemistry, Revised Edition, S. Chand & Co., New Delhi, 2020. N. Kundu and M. Kumar, Group Theory and Spectroscopy, 1st Edition, Pragathi Prakash Meerut, 2018. eb Resource(s): 	Vishal t, Tata Edition t. Ltd., t-West Chand 2000. an,
VI Te 1. 2. 3. 4. Re 1. 2. 3. 4. W 1. 5. W	Current Trends (CIA only) Two-dimensional infrared spectroscopy – Introduction, Principle and applications ** Self Study xt Books: B. R. Puri, L.R. Sharma, M. S. Pathania, Principles of Physical Chemistry, 48 th Edition, Publications, Jalandhar, 2023. C.N. Banwell and E.M. Mc cash, Fundamentals of Molecular Spectroscopy, 30 th Reprin McGraw-Hill Publishing Company Limited, New Delhi, 2008. R.L. Madan, G.D. Tuli, Simplified Course in Physical Chemistry, 5 th Revised and Enlarged I S. Chand& Co., New Delhi, 2009. N.N. Das, Symmetry and Group Theory for Chemists, Low Price Edition, Asian Books Pv 2016. ference Books: Samuel Glasstone, An Introduction to Electrochemistry, 2 nd Edition Indian Reprint, Eas Edition, New Delhi, 2016. G.M. Barrow, Introduction to Molecular Spectroscopy, Tata-Mc Graw Hill Edition, 1993. B.S.Bahl, G.D. Tuli and Arun Bahl, Essentials of Physical Chemistry, 28 th Edition, S. C Company, New Delhi, 2020. N. Kundu and S.K. Jain, Physical Chemistry, Revised Edition, S. Chand & Co., New Delhi, 2 A. Gupta and M. Kumar, Group Theory and Spectroscopy, 1 st Edition, Pragathi Prakash: Meerut, 2018. eb Resource(s): https://onlinecourses.nptel.ac.in/noc23	Vishal t, Tata Edition t. Ltd., t-West Chand 2000. an,
VI Te 1. 2. 3. 4. Re 1. 2. 3. 4. 5. W 1. 2. 3. 4. 5. W 1. 2. 3. 4. 5. W	Current Trends (CIA only) Two-dimensional infrared spectroscopy – Introduction, Principle and applications ** Self Study xt Books: B. R. Puri, L.R. Sharma, M. S. Pathania, Principles of Physical Chemistry, 48 th Edition, Publications, Jalandhar, 2023. C.N. Banwell and E.M. Mc cash, Fundamentals of Molecular Spectroscopy, 30 th Reprin McGraw-Hill Publishing Company Limited, New Delhi, 2008. R.L. Madan, G.D. Tuli, Simplified Course in Physical Chemistry, 5 th Revised and Enlarged I S. Chand& Co., New Delhi, 2009. N.N. Das, Symmetry and Group Theory for Chemists, Low Price Edition, Asian Books Pv 2016. ference Books: Samuel Glasstone, An Introduction to Electrochemistry, 2 nd Edition Indian Reprint, Eas Edition, New Delhi, 2016. G.M. Barrow, Introduction to Molecular Spectroscopy, Tata-Mc Graw Hill Edition, 1993. B.S.Bahl, G.D. Tuli and Arun Bahl, Essentials of Physical Chemistry, 28 th Edition, S. C Company, New Delhi, 2020. N. Kundu and S.K. Jain, Physical Chemistry, Revised Edition, S. Chand & Co., New Delhi, 7 A. Gupta and M. Kumar, Group Theory and Spectroscopy, 1 st Edition, Pragathi Prakash: Meerut, 2018. eb Resource(s): https://onlinecourses.nptel.ac.in/noc23_cy19/preview https://onlinecourses.nptel.ac.in/noc23_cy09/preview	Vishal t, Tata Edition t. Ltd., t-West Chand 2000. an,
VI Te 1. 2. 3. 4. Re 1. 2. 3. 4. VI W 1. 2. 3. 4. VI VI VI VI VI VI VI VI VI VI	Current Trends (CIA only) Two-dimensional infrared spectroscopy – Introduction, Principle and applications ** Self Study xt Books: B. R. Puri, L.R. Sharma, M. S. Pathania, Principles of Physical Chemistry, 48 th Edition, Publications, Jalandhar, 2023. C.N. Banwell and E.M. Mc cash, Fundamentals of Molecular Spectroscopy, 30 th Reprin McGraw-Hill Publishing Company Limited, New Delhi, 2008. R.L. Madan, G.D. Tuli, Simplified Course in Physical Chemistry, 5 th Revised and Enlarged I S. Chand& Co., New Delhi, 2009. N.N. Das, Symmetry and Group Theory for Chemists, Low Price Edition, Asian Books Pv 2016. ference Books: Samuel Glasstone, An Introduction to Electrochemistry, 2 nd Edition Indian Reprint, Eas Edition, New Delhi, 2016. G.M. Barrow, Introduction to Molecular Spectroscopy, Tata-Mc Graw Hill Edition, 1993. B.S.Bahl, G.D. Tuli and Arun Bahl, Essentials of Physical Chemistry, 28 th Edition, S. Company, New Delhi, 2020. N. Kundu and S.K. Jain, Physical Chemistry, Revised Edition, S. Chand & Co., New Delhi, 7 A. Gupta and M. Kumar, Group Theory and Spectroscopy, 1 st Edition, Pragathi Prakash: Meerut, 2018. eb Resource(s): https://onlinecourses.nptel.ac.in/noc23_cy19/preview https://onlinecourses.nptel.ac.in/noc24_cy14/preview	Vishal t, Tata Edition t. Ltd., t-West Chand 2000. an,

	Course Outcomes					
Upon suc	Upon successful completion of this course, the student will be able to:					
CO No.	CO Statement	CognitiveLevel (K-Level)				
CO1	Describe the basic concepts of electrochemistry and its applications	K1				
CO2	Compare the efficiency of various types of electrochemical cells	K2				
CO3	Articulate the concepts of molecular spectroscopy	K3				
CO4	Interpret the structure of the chemical compounds using various spectral techniques	K4				
CO5	Predict the point group of a molecule	K5				

Course Programme Outcomes (POs)						Progr	Mean Score of				
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	COs
CO1	3	3	3	3	2	3	3	3	3	3	2.9
CO2	3	3	2	2	1	3	1	2	2	1	2.0
CO3	3	2	2	3	2	3	3	3	1	2	2.4
CO4	3	3	3	3	2	3	3	3	3	2	2.8
CO5	3	3	1	2	2	3	3	2	1	1	2.1
Mean Overall Score									2.44		
									Cor	relation	Medium

Mean Overall Score	Correlation
<1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator(s): 1. Dr. A. Jafar Ahamed 2. Dr. N. Mujafarkani

Somoston	Course Code	Course Category	Hours/	Credita	Marks for Evaluation			
Semester	Course Code		Week	Creans	CIA	ESE	Total	
VI	23UCH6CC15P	Core-XV	5	5	20	80	100	

Course Title ORGANIC ANALYSIS AND INSILICO STUDIES - PRACTICAL

SYLLABUS						
Contents			Hours			
 (i) Preparation of organic compounds involving the conversions Oxidation (Benzoic acid from benzaldehyde Hydrolysis (Benzoic acid from benzamide, Nitration (m-Dinitrobenzene from nitrobenz Bromination (p-Bromoacetanilide from acet Diazotization (Methylorange from aniline) 	e following ch e) <mark>Benzoic acid t</mark> ene) canilide, Tri-b	nemical From ethyl benzoate) romoaniline from aniline)				
 (ii) Analysis of Organic Compounds: (a) Characterization- Aliphatic/ Aromatic, Saturat Sulphur, Halogens) and functional groups (b) Confirmation by the preparation of solid derives 	 (ii) Analysis of Organic Compounds: (a) Characterization- Aliphatic/ Aromatic, Saturated / Unsaturated, Elements (Nitrogen, Sulphur, Halogens) and functional groups (b) Confirmation by the preparation of solid derivatives / characteristic colour reactions. 					
(Salicylic acid) compounds, students are required groups.	to report any	one of the functional	75			
(iii) Insilico Spectral Data Analysis of organic comj	pounds using	ChemDraw 20. x:				
Draw the chemical structure and determination and molecular mass	of ¹ H, ¹³ C c	hemical shift values				
Scheme of va	aluation					
Record	-	10 marks				
Procedure writing	-	10 marks				
(i) Organic Preparation	-	15 marks				
(ii) Organic analysis	-	35 mark				
Special elements present / absent	_	05 marks				
Aromatic/ aliphatic	-	05 marks				
Saturated/ unsaturated	_	05 marks				
Functional group present	-	15 marks				
Derivative	-	05 marks				
(iii) <i>Insilico</i> analysis	-	10 marks				
Structure and molecular mass	-	04 marks				
Chemical shift values	-	06 marks				

Text Books:

1. Venkateswaran V. Veerasamy R., Kulandaivelu, A.R Basic principles of Practical Chemistry, 2nd Edition, S. Chand & Co Pvt. Ltd, New Delhi- 1997.

Reference Books:

1. Furniss, B.S.; Hannaford, A.J.; Smith, P.W.G.; Tatchell, A.R., Practical Organic Chemistry, 5th Edition, Pearson PVT .Ltd, 2012.

Web Resources:

https://vlab.amrita.edu/index.php?sub=2&brch=191

	Course Outcomes					
Upon succ	Upon successful completion of this course, the student will be able to:					
CO No.	CO Statement	Cognitive Level (K-Level)				
CO1	Understand the selected organic compounds independently.	K1				
CO2	Analyze the nature and special elements present in an organic compound.	K2				
CO3	Differentiate the aliphatic and aromatic nature of the organic compounds.	K3				
CO4	Identify the functional group through systematic chemical analysis.	K4				
CO5	Summarize their result of analysis of organic compound in a scientific way.	K5				

Relationship Matrix:

Course	Programme Outcomes (POs)					Prog	Mean				
Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Score of COs
CO1	3	3	3	3	2	3	3	3	2	2	2.7
CO2	3	2	3	3	3	3	3	2	3	1	2.6
CO3	3	2	3	3	2	3	3	3	2	2	2.4
CO4	3	2	1	3	3	3	3	3	3	2	2.6
CO5	3	2	3	1	2	3	3	2	3	1	2.3
Mean Overall Score											2.52
Correlation											High
CO3 3 2 1 3 3 3 3 3 2 3 1 2 3 3 2 3 1 1 2 3 3 2 3 1 1 2 3 3 2 3 1 1 2 3 3 2 3 1 1 2 3 3 2 3 1 1 2 3 3 2 3 1 1 2 3 3 2 3 1 1 2 3 3 2 3 1 1 2 3 3 2 3 1 1 2 3 3 2 3 1 1 2 3 3 2 3 1 1 2 3 3 2 3 1 1 2 3 3 2 3 1 2 3 3 3 2										2 2. H	

Mean Overall Score	Correlation
< 1.5	Low
\geq 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: 1. Dr. J. Sirajudeen

2. Dr. K. Mahmoodah Parveen

Semester	Course Code	Course Cotogory	Hours/	Cuedita	Marks for Evaluation					
	Course Code	Course Category	Week	Creatis	CIA	ESE	Total			
VI	23UCH6DE2A	JCH6DE2A DSE-II		4	25	75	100			
Course Title STEREOCHEMISTRY, MOLECULAR REARRANGEMENTS AND NATURAL										

IIIIC	
	PRODUCTS

	SYLLABUS	
Unit	Contents	Hours
I	 STEREOCHEMISTRY – I 1.1. Isomerism – Definition, classification, Optical isomerism, optical activity, conditions for optical activity, asymmetric centre. Definition of Chirality and prochirality. 1.2. Optical activity of lactic acid and tartaric acid - enantiomers and diastreromers, racemic mixture – resolution – chemical and biochemical resolutions. Racemization, asymmetric synthesis and Walden inversion. 1.3 Optical activity of compounds containing no asymmetric carbons – Biphenyls, allenes and spiranes. 	15
Π	 STEREOCHEMISTRY - II 2.1. D, L-Configuration, R,S-Notations – Cahn, Ingold and Prelog rule, Erythro and Threo representations. Fischer, Sawhorse and Newmann projection formulae of compounds containing two asymmetric carbon atoms. 2.2. Geometrical Isomerism: Cis - trans, syn – anti and E – Z notations, Geometrical isomerisms of maleic and fumaric acids and unsymmetrical ketoximes, methods of determination of the configuration of geometrical isomers. 2.3. Conformational analysis – Definition, conformations and stability of ethane and n-butane. Conformations of cyclohexane and energy profile diagram. 	15
ш	 MOLECULAR REARRANGEMENTS 3.1. Carbocation rearrangements: Pinacole - Pinacolone, Dienone - phenol and Wolff. 3.2. Rearrangements to electron - deficient nitrogen: Beckmann, Hofmann and Curtius. 3.3. Rearrangements to electron - deficient oxygen: Bayer-Villiger, Benzilic acid and Favorskii. 3.4. Aromatic rearrangements: Benzidine, Fries and Claisen rearrangements. 	15
IV	 ORGANIC PHOTOCHEMISTRY AND DYES 4.1. Organic Photochemistry: Jablonski diagram – Photochemical reactions – Norrish type I & II reactions, Paterno Buchi reaction, Fluorescence, phosphorescence, chemiluminescence and photosensitisation – photosynthesis (definition with examples). Chemistry of Vision – 11 cis retinal – vitamin A as a precursor - colour perception of vision. 4.2. Dyes: Colour and Chemical constitution – Theories- Witt's Chromophore-auxochrome theory, Resonance theory, Valance –bond theory, Modern orbital theory, Requirements of a coloured compound to act as a dye, classification based on applications, Preparation and uses of Malachite green, Crystal violet, Rosaniline, aniline yellow, methyl orange, Bismarck brown, Congo red, Eosin and Indigo. 	15
V	 NATURAL PRODUCTS 5.1. Alkaloids: Classification – General methods of isolation, Hofmann exhaustive methylation, Structural elucidation of coniine, nicotine and piperine. 5.2. Terpenoids: Classification, Isoprene rule, special isoprene rule, gem - dialkyl rule, Structural elucidation and uses of citral, α-terpineol, menthol, Geraniol and Camphor. Identification of longifolene terpene in Indian Knowledge system. 5.3. Pigments: Structure and uses of Anthrocynin and Flavonens. Pigment in Indian Knowledge system-A stunning new shade of the colour Blue(YInMn Blue) 	15
VI	Current Trends (CIA only) Applications of stereo isomers in medicine (cetirizine and Levocetirizine).	

Text Books:

- 1. D. Nasipuri, Stereochemistry of Organic Compounds Vol-I & Vol-II, 3rd Edition, New Age International (P) Ltd, Publishers, New Delhi, 2010.
- 2. H.M. Chawla and P.L. Soni Text Book of Organic Chemistry,29th Edition, Sulthan and Chand company, New Delhi, 2012.
- 3. M. K. Jain, and S.C. Sharma, Modern Organic Chemistry,12th Edition, Vishal Publishing & Co, Jalndher, 2023.
- 4. K.S. Mukherjiee, Mechanism of Organic Reactions Revised 2nd Edition Arunabha Sen, Books & Allied (P) Ltd, Kolkata, 2015.
- 5. Gurdeep Chatwal, Organic chemistry of natural products Vol –I & II revised 5th Edition Himalaya publishing house, 2005.

Reference Books:

- 1. I. L. Finar, Stereochemistry and the Chemistry of Natural Products Vol. II, 5th Edition Dorling Kindersley (India) Pvt. Ltd, 1998.
- M. K. Jain, and S.C. Sharma, Modern Organic Chemistry, 12th Edition, Vishal Publishing & Co, Jalndher 2023.
- Dr.L. Jagadamba Singh and Dr. D.S Yadav, Organic Synthesis4th Edition, Pragati Prakashan, Meerut. 2009.
- 4. Sharma and Rakesh Kumar VinayPrabha, Pericyclic Reactions and Organic Photochemistry, 2nd Edition Pragati Prakashan, Meerut. 2011.
- 5. V.K. Ahluwalia, Chemistry of Natural Products, 2nd Edition, Vishal Publishing Co., Jalandhar, Delhi. 2014.

Web Reference

- 1.https://nptel.ac.in/courses/104/105/104105086/
- 2.https://nptel.ac.in/content/storage2/courses/104103071/pdf/mod8.pdf

3.https://www.slideserve.com/marvin-kirby/chapter-12-molecular-rearrangements

- 4. https://nptel.ac.in/courses/104/105/104105038/
- 5.https://www.uou.ac.in/lecturenotes/science/MSCCH17/Chemistry%20LN%208%20natural %20products-converted.pdf

	Course Outcomes								
Upon suc	Upon successful completion of this course, the student will be able to:								
CO No.	CO No. CO Statement								
CO1	Acquire the comprehensive knowledge on stereochemistry	K 1							
CO2	Understand the concepts of isomerism and conformational analysis	K2							
CO3	Apply the mechanism for various molecular rearrangements	K3							
CO4	Know the importance of organic photochemistry and pericyclic reactions	K4							
CO5	Elucidate the structure of terpenes and alkaloids	K5							

Course	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	COs
CO1	3	3	3	3	2	3	3	3	3	3	2.9
CO2	3	3	1	2	1	3	2	2	2	2	2.2
CO3	3	2	2	3	2	3	3	3	2	2	2.4
CO4	3	3	3	3	2	3	3	3	2	3	2.7
CO5	3	1	2	1	2	3	2	2	3	3	2.6
Mean Overall Score											
	Correlation										

Mean Overall Score	Correlation
< 1.5	Low
\geq 1.5 and < 2.5	Medium
\geq 2.5	High

Course Coordinator: 1. Dr. J. Sirajudeen 2. Dr. J. Muneer Ahamath

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation CIA ESE Total			
VI	23UCH6DE2B	DSE-II	5	4	25	75	100	
	·							
Course Title	ESSENTIALS OF BIOI	NORGANIC CH	EMISTR	Y				

	SYLLABUS	
Unit	Contents	Hours
I	 METAL IONS IN BIOLOGICAL SYSTEM 1.1. Essential and trace metals-classification, functions of elements based on their biological system. 1.2. Metal storage and transport, oxygen binding metallo-biomolecules, electron carriers, non protein metal transport. 	15
II	 ROLE OF METAL IONS IN BIOLOGICAL PROCESS 2.1. Biochemistry of sodium, potassium, calcium, magnesium, zinc, nickel, manganese, iron, cobalt, copper, molybdenum, vanadium and chromium. 2.2. Chemistry from the medical schools of ancient India – Origin of alchemy, benefits of rasayana, material and process, gold bhasma, silver bhasma, copper bhasma and lead bhasma. 	15
III	 BIOENERGETICS AND ATP CYCLE 3.1. Structure and functions of carbonic anhydrase, carboxy peptidase A and superoxide dismutase. 3.2. Biological energy, ATP cycle, DNA polymerization, Watson and Crick model, replication of DNA, prokaryotic DNA polymerase-DNA polymerase I, II & III- Proof reading and DNA repair - Glucose storage - glycogenesis, glycogenolysis, gluconeogenesis, catabolism . 	15
IV	 TRANSPORT AND STORAGE OF DIOXYGEN 4.1. Hemoglobin and Myoglobin - functions. Iron in hemoglobin and myoglobin, kinetics of haemoglobin and myoglobin. 4.2. Oxygenation, conformational changes, transport of carbon dioxide, Bohr effect. Hemoglobin modeling. 	15
V	 BIOCHEMISTRY OF NON METALS 5.1. Biological role of some Trace non metals: Boron, Silicone, Sulfur, Selenium, Arsenic, Fluorine, Chlorine, Bromine and Iodine 5.2.Biologial importance of Nitric Oxide: Relation of Smooth Muscle Tissue and NO – Transmission of signals in Brain Cells, Storage of Memories and NO- Enzymatic synthesis of NO. 	15

Text Books:

- Neerja Gupta & Monal Singh Essentials of Bioinorganic Chemistry, 5th Edition, Pragati Prakashan, Meerut, 2014.
- 2. K. Hussain Reddy, Bioinorganic Chemistry 1st Edition, New Age International Limited, New Delhi, 2005.
- 3. P.S.Kalsi & J.P.Kalsi, Bioorganic, Bioinorganic and Supramolecular Chemistry, 1st Edition, New Age International Limited, New Delhi, 2007.

Books for Reference:

- 1. Pabitra Krishna Bhattacharya & Prakash B. Samnani, Metal ions in bio chemistry, 2nd Edition, CRC Press, New Delhi, 2020.
- 2. Sathyaprakash, G.D. Tuli, S.K. Basu & R. D. Madhan, Advanced inorganic chemistry, 5th Edition,
- S. Chand & Company, New Delhi, 2007.
- 3. Asim K Das, Bioinorganic Chemistry, 6th Edition, Books & Allied Limited, Kolkatta, 2013.

Web Reference:

<u>1. https://nptel.ac.in/courses/104/105/104105031/</u> <u>2. https://nptel.ac.in/courses/104/104/104104109/</u>

	Course Outcomes								
Upon su	Upon successful completion of this course, the student will be able to:								
CO No.	CO Statement	Cognitive Level (K-Level)							
CO1	List the essential and trace metals in biological system	K1							
CO2	Explain the role of metals in biological processes.	K2							
CO3	Apply Watson and Crick model to explain DNA replication, repair.	K3							
CO4	Contrast Hemoglobin and Myoglobin functions.	K4							
CO5	Explain the biochemistry of non metals	K5							

Relationship Matrix:

Course	Course Programme Outcomes (POs)					Progr	Mean					
Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Score of COs	
CO1	3	2	1	2	2	3	2	1	2	3	2.1	
CO2	2	1	2	3	3	1	3	2	3	3	2.3	
CO3	3	3	2	1	2	2	3	1	2	3	2.2	
CO4	2	3	1	3	2	3	2	3	2	1	2.2	
CO5	2	3	3	2	1	3	2	1	2	2	2.1	
Mean Overall Score												
	Correlation											

Mean Overall Score	Correlation
< 1.5	Low
\geq 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: 1.Dr. K. Loganathan

2. Dr. M. Yaseen Mowlana

Semester	Course Code	Course Cotogory	Hours/	Cradita	MarksforEvaluation			
		Course Category	Week	Creans	CIA	ESE	Total	
VI	23UCH6DE3AP	DSE-III	4	4	20	80	100	

Course Title

PHYSICAL CHEMISTRY NON-ELECTRICAL - PRACTICAL

SYLLABUS						
	C	ontents		Hours		
List of Experimen	its:					
Colligati 1. Deta 2. Deta 3. Deta Phase R 4. Criti 5. Effe Wa 6. Deta 7. Phas Rea 8. Deta Scheme of valuatio R Pi E	ive Properties ermination of molecular we ermination of k_f by Rast's ermination of molecular we ule ical Solution Temperature act of impurity (NaCl) on the system. ermination of Transition T se diagram (Simple eutection ction Kinetics ermination of rate constant on ecord rocedure with formula xperiment 1-2% 2-3% 3-4% >4%	veight b macro r veight b e of Phe Critical Cempera ic system t of acid	y Rast's macro method. method. y Ostwald viscometer. nol –Water system. I Solution Temperature of Phenol - ature of a salt hydrate. m). d catalyst hydrolysis of an ester. 10 marks 10 marks 60 marks 60 marks 50 marks 50 marks 25 marks	60		

Text Book:

1. Venkateswaran V. Veerasamy R. Kulandaivelu A.R, Basic Principles of Practical Chemistry, 2nd Edition, S. Chand & Co Pvt. Ltd, New Delhi, 1997.

Reference Book (s):

1. Sindhu, P.S. Practicals in Physical Chemistry, Macmillan India: New Delhi, 2005.

2. Gupta, Renu, Practical Physical Chemistry, 1stEd. New Age International: New Delhi, 2017.

Web Resource(s):

https://labmonk.com/partition-co-efficient-of-iodine-in-distilled-water-and-carbon-tetrachloride

	Course Outcomes							
Upon suc	cessful completion of this course, the student will be able to:							
CO No.	CO No. CO Statement							
C01	Understanding Basic Principles of Physical Chemistry	K1						
CO2	Develop proficiency in Hands-on Skills in Non-Electrical Experiments	K2						
CO3	Gain experience in quantitative analysis of data	K3						
CO4	Solve experimental problems using a combination of theoretical knowledge and experimental data	K4						
CO5	Plan and perform the experiments along with their interpretation.	K5						

Course	Pro	gramm	e Outco	omes(P	Os)	Progr	Mean Score of				
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	COs
CO1	3	3	3	3	3	3	3	3	1	3	2.8
CO2	3	2	3	3	3	3	2	3	3	3	2.8
CO3	3	3	3	3	3	3	3	3	3	2	2.9
CO4	3	3	2	1	3	3	3	3	2	3	2.5
CO5	3	3	3	3	3	3	3	3	2	3	2.9
Mean Overall Score										2.78	
Correlation										High	

Mean Overall Score	Correlation
<1.5	Low
≥1.5and<2.5	Medium
≥2.5	High

Course Coordinators: 1. Dr. M. Syed Ali Padusha 2. Dr. A. Mushira Banu

Somester	ester Course Code Course Category Hours/ Credits Marks for Evalu								uation	
Semester		ourse Code	Course Caleg	ory	Week	Creans	CIA	ESE	Total	
VI	23	UCH6DE3BP	DSE-III		4	4	20	80	100	
Course Ti	tle	ADVANCED I	PHYSICAL CE	IEMIS	STRY - F	PRACTIC	AL			
			S	YLLA	BUS					
			Co	ntent					Hours	
1. Heat o	f ne	utralization of s	odium hydroxid	e and h	nydrochlo	ric acid by	calorime	etry.		
2. Detern	niniı	ng the order of S	Saponification of	f ethyl	acetate w	ith sodium	n hydroxio	de.		
3. Findin	g th	e order of reacti	ion and velocity	consta	ant for the	e inversion	of cane	sugar		
by acids.										
4. Detern	nina	tion of the equi	librium constant	t of the	e esterifica	ation react	ion betwe	een acetic		
acid and e	ethai	nol.								
5. Detern	nina	tion of equilibri	um constant of th	ne Keto	o – Enol ta	utomerisn	n of ethyl	acetoacetat	e.	
6. Experi	mer	tal verification	of Freundlich's	adsorp	tion isoth	erm.	·			
7. Experi	mer	tal verification	of Langmuir ads	sorptio	n isothern	n.			60	
8. Detern	nina	tion of the solub	oility of KCl at r	oom te	emperatur	e.			00	
Scheme o	f V	aluation			r					
Benefice	1 1	Record		-	10 mar	ks				
	Procedure with formula - 10 marks									
	Experiment - 60 marks									
	1-2% - 60 marks									
		2-3% - 50 marks								
		3-4%		-	40 mark	IS .				
		>4%		-	25 mark	TS				

Text Books:

- 1. Venkateswaran, V.Veerasamy, R. Kulandaivelu A.R, Basic principles of Practical Chemistry, 2nd Edition, S. Chand & Co Pvt. Ltd, New Delhi, 1997.
- 2. Gurtu and Gurtu, Advanced Physical Chemistry Experiments, 3rd Edition, Pragathi Prakashan Publications, Meerut, 2007.

Reference Books:

- 1. Dr. M. Gurtu, Advanced Physical Chemistry Experiments, Advanced and enlarged Edition, Pragathi Prakashan Publications, Meerut, 2008.
- 2. Datar-Doke, Bhadane Pande, Advanced Practicals in Physical Chemistry, 1st Edition, Manali Publication, Pune, 2014.

Web Resource(s):

- 1.https://www.ccri.edu/chemistry/courses/chem_1100/wirkkala/labs/Enthalpy_of_Neutralization.pdf 2. https://glaserr.missouri.edu/vitpub/teaching/8160f09/Enol_JCE_1988_p0629.pdf
- 3. https://www.iitk.ac.in/che/PG_research_lab/pdf/r esources/BET-TPX-Chemi-reading-material.pdf

	Course Outcomes							
Upon suc	Upon successful completion of this course the student will be able to:							
CO No.	CO No. CO Statement							
CO1	Determine the enthalpy change of a reaction between strong acids and strong bases	K1						
CO2	Find the order of saponification reaction	K2						
CO3	Investigate the velocity constant for inversion of cane sugar	K3						
CO4	Evaluate equilibrium constant using the law of mass action	K4						
CO5	Relate the quantity of gas adsorbed on a solid surface at constant pressure and temperature.	K5						

Course	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	COs
CO1	3	3	3	3	2	3	3	3	3	3	2.9
CO2	3	3	2	2	1	3	1	2	2	1	2.0
CO3	3	2	2	3	2	3	3	3	1	2	2.4
CO4	3	3	3	3	2	3	3	3	3	2	2.8
CO5	3	3	1	2	2	3	3	2	1	1	2.1
Mean Overall Score											2.44
Correlation										Medium	

Mean Overall Score	Correlation
<1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: 1. Dr. M. Syed Ali Padusha 2. Dr. F.M. Mashood Ahamed Allied Chemistry for B.Sc. Physics Allied Chemistry for B.Sc. Botany & B.Sc. Zoology

Allied Chemistry for B.Sc. Physics

Semester	Course Code	Course Cotogowy	Hours/	Cradita	Marks for Evaluation			
	Course Code	Course Category	Week	Creans	CIA	ESE	Total	
Ι	23UCH1AC1:1	Allied – I	5	4	25	75	100	

Course Title INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY – I

	SYLLABUS							
Unit	Contents	Hours						
I	 PERIODIC PROPERTIES, MOLECULAR ORBITAL THEORY AND INDUSTRIAL CHEMISTRY 1.1.Periodic properties: Ionization potential, electron affinity and electro negativity- Definition, factors affecting and variation in the periodic table. 1.2. Molecular Orbital Theory: LCAO, Bonding, anti-bonding orbital and bond order. MO diagrams of H₂, He₂, N₂, O₂ and F₂ molecules. 1.3. Industrial Chemistry: Fuel gases composition and preparation of Water gas, Producer gas, LPG, Gobar gas and Natural gas. Fertilizers – NPK and mixed fertilizers. *Soap and detergents – An elementary idea of soap and detergent*. SOLUTIONS 2.1. Solutions: Definition. Types of solutions – classification based on the solute and 							
П	 solvent, Ideal and non-ideal solutions, Liquid-Liquid type, Primary and secondary standards, preparation of standard solutions. 2.2. Concentration of Solutions: Molarity, Molality, Equivalent weight – acid, base and salt, Normality, Mole fraction, percentage (W/V, V/V) and Parts Per Million. 	15						
ш	 POLYMERS, HETEROCYLIC COMPOUNDS AND STEREOISOMERISM 3.1. Polymers – Definition, classifications of polymers – Natural and synthetic polymers, Thermoplastic and thermosetting polymer. Addition and condensation polymerization. Preparation, properties and uses of polyethylene, *PVC, Teflon*, polystyrene, nylon 6, 6, and Bakelite. 3.2. Heterocyclic compounds – Furan, thiophene and pyridine – Preparation, properties and uses. 3.3. Stereoisomerism: Optical isomerism – lactic and tartaric acid, Racemic mixture and resolution, Geometrical isomerism – cis – trans isomerism, maleic and fumaric 							
IV	 CHROMATOGRAPHY, PHOTOCHEMISTRY AND PHASE RULE 4.1 Chromatography – Definition, classification – principles, Technique and application of TLC. 4.2 Photochemistry: Differences between thermal and Photochemical reactions, photochemical laws – Lambert's law, Beer's law, Grothus - Draper's law, Einstein's law of photo chemical equivalence, *Quantum efficiency*. 4.3 Phase Rule: Phase, Component, Degree of freedom, Phase Rule – definition, one component system –Water system. 	15						
V	 CONDUCTANCE, CORROSION, pH AND BUFFER 5.1. Conductance: specific and equivalent conductance – Determination, Effect of dilution on conductivities, Ostwald's dilution law and Kohlrausch's law, conductometric titrations- Principle, applications (Strong acid vs Strong base and Weak acid and Weak base) and advantages. 5.2. Corrosion: Definition, types, wet and dry corrosion and prevention of corrosion. 5.3. pH and Buffer: *pH, buffer solution*, Henderson-Hasselbalch equation and its importance (no derivation)-Biological importance of pH and Buffer solutions in living system. 	15						

..... Self Study

Text Book(s):

- 1. P. L. Soni, Text book of Inorganic Chemistry, S. Chand & Co., New Delhi, Revised Edition, 2017.
- P. L. Soni and H.M. Chawla, Text Book of Organic Chemistry, S. Chand & Co., New Delhi, 28th Edition, 1999.
- B.R. Puri, L.R. Sharma and M.S. Pathania, Principles of Physical Chemistry, Vishal Publications, Jalandhar, 48th Edition, 2019.

Reference Book(s):

- Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, Shoban Lal, Nagin Chand & Co. New Delhi, 23rd, 1993.
- 2. Bahl and Arun Bahl, Advanced Organic Chemistry, S.Chand & Co., New Delhi, 19th Edition, 2005
- R. L. Madan, G.D. Tuli, Simplified Course in Physical Chemistry, S. Chand & Co., New Delhi, 5th Revised and Enlarged, 2009.

Web Resource(s):

- 1. <u>https://onlinecourses.nptel.ac.in/noc22_cy03/preview</u>
- 2. <u>https://www.toppr.com/</u>
- 3. https://byjus.com/chemistry/

	Course Outcomes									
Upon suc	Upon successful completion of this course, the student will be able to:									
CO No.	CO No. CO Statement									
CO1	Describe the periodic properties, polymers and conductance	K1								
CO2	Explain the terms involved in expressing concentrations of solutions	K2								
CO3	Apply chromatographic techniques and photochemical laws	K3								
CO4	Predict the stereoisomerism of organic compounds	K4								
CO5	Measure the pH and buffer solutions	K5								

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Progra	Mean Score of COs					
	PUI	PO2	PUS	PU4	P05	P501	P502	PSU3	P504	P505		
CO1	3	3	3	3	3	3	3	3	3	3	3	
CO2	2	2	2	2	2	2	2	2	2	2	2	
CO3	2	2	2	2	2	2	2	2	2	2	2	
CO4	2	2	2	2	2	2	2	2	2	2	2	
CO5	2	2	2	2	2	2	2	2	2	2	2	
Mean Overall Score											2.2	
	Correlation											

Mean Overall Score	Correlation
< 1.5	Low
\geq 1.5 and < 2.5	Medium
≥ 2.5	High

Semester	Co	Course Code Course Category Hours/ Week Credits Marks for Evant									
I	231	UCH1AC2P	Allied – II	3	2	20	80	100			
Course Title VOLUMETRIC ESTIMATIONS - PRACTICAL											
			List of Practicals	6				Hours			
 Volumetri 1. Estimati 2. Estimati 3. Estimati 4. Estimati 5. Estimati 6. Estimati 7. Estimati 8. Estimati 	ic Es on of ion o on of on of on of on of on of	Example 1 Formula Constraints Constr	racticalsoxide $(Na_2CO_3 \ Vs \ HCl \ Vs \ Na$ Acid $(H_2C_2O_4 \ Vs \ NaOH \ Vs \ Certain (FeSO_4 \ Vs \ KMnO_4 \ Vs \ H_2C_2$ ate $(H_2C_2O_4 \ Vs \ KMnO_4 \ Vs \ H_2C_2O_4 \ Vs \ KMnO_4 \ Vs \ Fonium \ Sulphate \ (H_2C_2O_4 \ Vs \ FAS \ Vs \ KMnO_4)$ $_2O_7 \ Vs \ FAS \ Vs \ KMnO_4$ $_4 \ (MgSO_4 \ Vs \ EDTA \ Vs \ ED$	OH) HCl) 2O ₄) 2eSO ₄) KMnO ₄ Vs (0 ₄) (s MgSO ₄)	(NH ₄) ₂ Fe(S	50 ₄) ₂ .6H	20	45			
		Record Procedur For Estin <u>For Estimati</u> >49	Scheme of val – 10 Mar re writing – 10 Mar nation – 60 Mar on Results: 1-2% - 60 r 2-3% - 50 r 3-4% - 40 r 6 - 30 marks - 30 marks	luation ks ks ks marks marks marks							

Text Books:

1. Peter McPherson, Volumetric Analysis, Royal Society of Chemistry, 1st Edition 2014.

2. K.B. Baliga et al., College Analytical Chemistry, Himalaya Publishing House, 19th Edition, 2011

3. Venkateswaran V. Veerasamy R. Kulandaivelu A.R, Basic Principles of Practical Chemistry, S. Chand & Co Pvt. Ltd, New Delhi, 2nd Edition1997.

Reference Books:

1. Handbook Of Inorganic Qualitative Analysis by Maharudra Chakraborty, Scifinity Publication; 1st Edition 2019.

2. Vogel, Text Book of Quantitative Chemical Analysis, Pearson Education, 6th edition ,2009.

3. Day R A., Underwood A l., Quantitative Analysis, New York: Pearson Emory University. Print. 6^{th} edition, 1991

Web Resources:

1. https://www.studiestoday.com/useful-resources-chemistry-class-12-chemistry-practicals-volumetric-analysis-estimation-oxalic-0

2. https://ncert.nic.in/pdf/publication/sciencelaboratorymanuals/class XI/chemistry/kelm 206.pdf

	Course Outcomes									
Upon su	Upon successful completion of this course, the student will be able to:									
CO No.	CO Statement	Cognitive Level (K-Level)								
CO1	Recall the principle of volumetric techniques and to classify the methods of preparation of solutions with different concentration.	K1								
CO2	Estimate the concentration of a various solution	K2								
CO3	Apply the principle of volumetric concept in the estimation	К3								
CO4	Analyze the quality of portability of water	K4								
CO5	Assess the quantity of chemical substance in a solution	K5								

Course	Pro	gramm	e Outco	omes (P	Os)	Progra	Mean Score of					
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	COs	
CO1	3	3	3	3	2	3	3	1	2	2	2.5	
CO2	3	3	3	3	1	3	3	2	2	2	2.5	
CO3	3	3	3	2	2	3	3	2	3	1	2.5	
CO4	2	1	2	3	3	3	3	3	3	3	2.6	
CO5	3	3	2	2	3	3	3	3	3	2	2.7	
Mean Overall Score												
	Correlation											

Mean Overall Score	Correlation
< 1.5	Low
\geq 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. S. K. Periyasamy

Semester	Course Code	Course Cotogory	Hours/	Cradita	Marks for Evaluation			
	Course Coue	Course Category	Week	Creats	CIA	ESE	Total	
II	23UCH2AC3:1	Allied - III	4	4	25	75	100	

Course Title Inorganic, Organic and Physical Chemistry – II

SYLLABUS									
Unit	Contents	Hours							
I	COORDINATION CHEMISTRY AND METALLIC BOND 1.1. Coordination Chemistry: Introduction to co-ordination compounds, Werner's theory; ligands, co-ordination number, denticity, chelation; IUPAC nomenclature of mononuclear coordination compounds, isomerism; Bonding-Valence bond approach and basic ideas of Crystal field theory, colour and magnetic properties; Importance of coordination compound 1.2. Metallic Bond: Properties - Electron gas and Band Theories. Semiconductors – Intrinsic and Extrinsic, n and *p- type*, super conductors.	12							
Π	 ELECTRON DISPLACEMENT EFFECTS, AROMATICITY AND SUBSTITUTION REACTIONS 2.1. Electron Displacement Effects- Electronic Displacements: Inductive, electromeric, resonance and mesomeric effects, hyperconjugation and their applications; Dipole moment; Organic acids and bases; their relative strength. 2.2. Aromaticity – Criteria's – Huckel's rule - aromaticity of benzene, furan, thiophene, pyrrole and pyridine. 2.3. Substitution reactions- mechanism of nitration, halogenation, sulphonation, *Friedel Crafts alkylation and acylation of benzene*. 	12							
III	 CHLORO COMPOUNDS, CHEMOTHERAPHY AND NAME REACTIONS 3.1. Chloro compounds: Preparation and uses of dichloromethane, chloroform, carbon tetrachloride, freons, DDT and BHC. 3.2. Chemotherapy: Sulpha drugs-structure, preparation and uses of sulphapyridine, sulphathiazole and sulphadiazine, Antibiotics –Structure and uses of penicillin–G and *Chloromycetin*. 3.3. Name reactions: Benzoin, Perkin, Cannizzaro, Reimer-Tiemann and Kolbe's reactions. (Mechanism not necessary) 	12							

	SOLID STATE AND COLLOIDS								
IV	4.1 Solid State: Nature of the solid state, law of constancy of interfacial angles, law								
	of rational indices, Miller indices, elementary ideas of symmetry, symmetry								
	elements and symmetry operations, seven crystal systems - X-ray diffraction,								
	Bragg's law. Defects in crystals (stoichiometric and non- stoichiometric).								
	4.2. Colloids: Definition, differences between true solution, colloidal solution and	12							
	suspension, principle, applications -Electrical properties – Electrophoresis and								
	Electro osmosis (definition and uses only) - protection of colloids – Gold								
	number- *medicinal applications of colloids*								
	4.3. Emulsion and Gels: definition, types, preparation, properties and applications.								
	CHEMICAL KINETICS, CHEMICAL EQUILIBRIUM AND CATALYSIS								
	5.1 Chemical Kinetics: Rate of a chemical reaction, factors affecting the rate of								
	reactions: concentration, temperature, pressure and catalyst; elementary and								
	complex reactions, order and molecularity of reactions, rate law, rate constant								
	and its units. Arrhenius theory.								
V	5.2 Chemical Equilibrium: Criteria of homogeneous and heterogeneous equilibria.	12							
	Decomposition of HI and PCl ₅								
	5.3 Catalysis: Catalysis - Importance of catalysis. Types of catalysis -								
	Homogeneous and heterogeneous catalysis, factors affecting catalysis. Definitions								
	of catalytic promoter, *catalytic inhibitor, catalytic poison*. Theory of catalysis -								
	Acid-base catalysis								
*	* Self Study								

Text Books:

1. P.L. Soni, Text book of Inorganic Chemistry, S. Chand & Co., New Delhi, 2017, Revised Edition, 2. P.L. Soni and H.M. Chawla, Text Book of Organic Chemistry, S. Chand & Co., New Delhi, 199728th Edition.

3. B.R. Puri, L.R. Sharma and M.S. Pathania, Principles of Physical Chemistry, Vishal Publications, Jalandhar, 2017, 48th Edition.

Reference Book(s):

1. B. R. Puri and L.R. Sharma, Principles of Inorganic Chemistry, Shoban Lal Nagin Chand and Co., New Delhi, 2020, 55th Edition.

2. A .K. Srivastava, Organic Chemistry, New Age International Publishers, New Delhi, 2002, 1st Edition.

3. R.L. Madan, G.D. Tuli, Simplified Course in Physical Chemistry, S. Chand & Co., New Delhi, 2009, 5th Revised and enlarged Edition.

Web Resource(s):

1. https://onlinecourses.nptel.ac.in/noc19_cy19/preview

- 2. https://www.youtube.com/watch?v=1zima5tIXbY
- 3. https://nptel.ac.in/courses/104101128

	Course Outcomes									
Upon suc	Upon successful completion of this course, the student will be able to:									
CO No. CO Statement										
CO1	Understand the bonding nature of inorganic compounds and to classify different types of conductors	K1								
CO2	Explain the concept of electron displacement effect and to apply Huckel's rule to identify the aromatic compounds	K2								
CO3	Illustrate the preparation and uses of pesticides and some common drugs	K3								
CO4	Differentiate types of solids and colloids	K4								
CO5	Appraise the rate and molecularity reaction and to explain the application of catalysts	K5								

Course	Pro	gramm	e Outco	omes (P	Os)	Progra	Mean Score of				
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	COs
CO1	3	3	3	2	2	3	3	2	2	1	2.4
CO2	3	3	3	2	2	3	3	2	1	1	2.3
CO3	3	3	3	2	1	3	2	2	2	1	2.3
CO4	3	3	3	2	2	3	2	2	2	1	2.3
CO5	3	3	3	2	1	3	2	2	2	1	2.2
Mean Overall Score											
Correlation											

Mean Overall Score	Correlation
< 1.5	Low
\geq 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. S. K. Periyasamy

Someston	Course Code	Course Cotogory	Hours/	Cradita	Marks for Evaluation			
Semester	Course Coue	Course Category	Week	Creats	CIA	ESE	Total	
II	23UCH2AC4P	Allied - IV	3	2	20	80	100	

List of Practicals						
Qualitative analysis of the following organic compounds:						
1. Carbohydrate						
2. Amide						
3. Aldehyde						
4. Ketone						
5. Monocarboxylicacid						
6. Dicarboxylic acid						
7. Amine	45					
Scheme of valuation						
Record – 10 Marks						
Procedure writing – 10 Marks						
For Organic Analysis – 60 Marks						
For Organic Analysis Results Marks Distribution:						
(i) Special Elements Present/ Absent - 20 marks						
(ii) Aromatic/ Aliphatic - 10 marks						
(iii) Saturated/Unsaturated - 10 marks						
(iv) Functional Group Present - 20 marks						

Text Books:

1. Ganapragasm N S and Ramamurthy G, Organic Chemistry Lab Manual, S. Vishwanathan Printers and Publishers (P) Ltd., Chennai, 2nd Edition, 2007.

2. Venkateswaran V. Veerasamy R. Kulandaivelu A.R, Basic Principles of Practical Chemistry, S. Chand & Co Pvt. Ltd, New Delhi, 2nd Edition, 1997.

3. Furniss B S, et al., Vogel's Textbook of Practical Organic Chemistry, ELBS Longman, London, 7th Edition, 1984.

Reference Books:

1. A. I. Vogel's, Text Book of Practical Organic Chemistry, Prentice Hall, 5th Edition, 1989.

Web Resources:

% 20% 20 Pharmaceutical% 20 Organic% 20 Chemistry.pdf

2.https://ncert.nic.in/pdf/publication/sciencelaboratorymanuals/classXII/chemistry/lelm108.pdf 3.https://faculty.chas.uni.edu/~manfredi/860-121/ORG%20LAB%20MAN%20S08.pdf

	Course Outcomes						
Upon suc	Upon successful completion of this course, the student will be able to:						
CO No.	CO Statement	Cognitive Level (K-Level)					
CO1	Recall the preliminary tests of organic qualitative analysis.	K1					
CO2	Differentiate the aliphatic and aromatic nature of the organic compounds	K2					
CO3	Examine the nature of the organic compound	K3					
CO4	Separate the functional groups through appropriate chemical reactions	K4					
CO5	Summarize their results of the organic analysis in a scientific way.	K5					

Course	e Programme Outcomes (POs) Programme Specific Outcomes (PSOs)						Mean				
Outcomes	P O1	PO1	PO3	PO 4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Score of
(COs)	101	102	105	104	105	105		1505	COs		
CO1	3	3	3	3	2	3	3	3	2	2	2.7
CO2	3	2	3	3	3	3	3	2	3	1	2.6
CO3	3	2	3	3	2	3	3	3	2	2	2.4
CO4	3	2	1	3	3	3	3	3	3	2	2.6
CO5	3	2	3	1	2	3	3	2	3	1	2.3
								Me	an Overa	all Score	2.52
									Cor	relation	High

Mean Overall Score	Correlation
< 1.5	Low
\geq 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. S. Syed Abuthahir

Allied Chemistry for B.Sc. Botany & B.Sc. Zoology

Somostor	Course Code	Course Cotogory	Hours/	Credite	Marks for Evaluation			
Semester	Course Coue	Course Category	Week	Creuits	CIA	ESE	Total	
Ι	23UCH1AC1:2	Allied – I	5	4	25	75	100	
							•	

Course Title

Inorganic, Organic and Physical Chemistry – I

	SYLLABUS	
Unit	Contents	Hours
I	 PERIODIC PROPERTIES, INDUSTRIAL GASES AND INSECTICIDES 1.1 Periodic properties: Ionization potential, *electron affinity* and electro negativity - Definition, factors affecting and variation in the periodic table. 1.2 Industrial Gases: Fuel gases composition and Preparation of Water gas, Producer gas, LPG, Gobar gas and Natural gas. 1.3 Insecticides: Introduction – Lists of various pesticides, methods of pest control, methods of using pest control chemicals. Insecticides – Arsenic compounds, Bordeaux mixture DDT and BHC. 	15
п	 BIOMOLECULES 2.1. Carbohydrates: Classification. Glucose and fructose – Preparation, properties and uses. Sucrose –Manufacture and properties. Starch and cellulose – uses. 2.2. Amino Acids and Proteins: Amino acids – Definition, classification – Essential and non essential, preparation and properties of glycine – Peptide bond – Proteins – Classification based on physical properties and biological functions. 2.3. Nucleic acids: DNA and RNA – Differences between DNA and RNA, functions - *Structure of DNA*. 	15
ш	 BLOOD AND POLYMERS 3.1. Blood and Haematological agents: Blood – Composition of blood, Blood grouping and matching, Clotting of blood. Haematological agents – Coagulants – Vitamin K and Protamine sulphate. Anticoagulants – Coumarine and Heparin. 3.2. Polymers: Definition, classifications of polymers – Natural and synthetic polymers, Thermoplastic and thermosetting polymer. Addition and condensation polymerization. Preparation, properties and uses of polyethylene, *PVC, Teflon*, polystyrene, nylon 6, 6, and Bakelite. 	15
IV	 SEPARATION AND PURIFICATION TECHNIQUES 4.1 Separation Techniques: Distillation-steam, *fractional* and azeotropic distillation, crystallization – principles, working techniques and applications. 4.2 Chromatography – Paper, thin layer chromatography, HPLC and GC-MS - principle, experimental techniques and applications. 	15
V	 ACIDS - BASES AND CATALYSIS 5.1. Acids-Bases: Arrhenius, Lowry-Bronsted and Lewis concepts of acids and bases, pH, buffer solution, Henderson-Hasselbalch equation and its importance (no derivation) - Biological importance of pH and buffer solutions in living system. 5.2 Catalysis: Catalysis – Importance of catalysis. Types of catalysis - Homogeneous and heterogeneous catalysis, factors affecting catalysis. Definitions of catalytic promoter, *catalytic inhibitor, catalytic poison*. Theory of enzyme catalysis. 	15

Text Book(s):

1. P. L. Soni, Text book of Inorganic Chemistry, S. Chand & Co., New Delhi, Revised Edition, 2017 2. Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, S. Chand & Co., New Delhi, First Edition, 2006

3. B.R. Puri, L.R. Sharma and M.S. Pathania, Principles of Physical Chemistry, Vishal Publications, Jalandhar, 48th Edition, 2019

Reference Book(s):

- 1. Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, Shoban Lal, Nagin Chand & Co. New Delhi, 23rd, 1993
- 2. Bahl and Arun Bahl, Advanced Organic Chemistry, S.Chand & Co., New Delhi, 19th Edition, 2005
- 3. R. L. Madan, G.D. Tuli, Simplified Course in Physical Chemistry, S. Chand & Co., New Delhi, 5th Revised and Enlarged, 2009

Web Resource(s):

- 1. <u>https://onlinecourses.nptel.ac.in/noc22_cy03/preview</u>
- 2. https://www.toppr.com/
- 3. <u>https://byjus.com/chemistry/</u>

Course Outcomes						
Upon suc	cessful completion of this course, the student will be able to:					
CO No.	CO Statement	Cognitive Level (K-Level)				
CO1	Describe the periodic properties, polymers and catalysis	K1				
CO2	Classify the carbohydrates, amino acids, proteins and appraise their applications.	K2				
CO3	Apply chromatographic techniques	K3				
CO4	Analyse the blood groups	K4				
CO5	Evaluate the value of pH of a solution	K5				

Relationship Matrix:

Course	Course Programme Outcomes (POs)						e Programme Outcomes (POs) Programme Specific Outcomes (PSOs)						Mean
Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Score of COs		
CO1	3	3	3	3	3	3	3	3	3	3	3		
CO2	2	2	2	2	2	2	2	2	2	2	2		
CO3	2	2	2	2	2	2	2	2	2	2	2		
CO4	2	2	2	2	2	2	2	2	2	2	2		
CO5	2	2	2	2	2	2	2	2	2	2	2		
								Mea	n Overa	ll Score	2.2		
									Cor	relation	Medium		

Mean Overall Score	Correlation
< 1.5	Low
\geq 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators: Mr. M. Varusai Mohamed

Semester	Course Code	Course Cotogory	Hours/ Credita		Marks for Evaluation			
	Course Coue	Course Category	Week	Credits	CIA	ESE	Total	
I	23UCH1AC2P	Allied – II	3	2	20	80	100	

Course	Title
--------	-------

VOLUMETRIC ESTIMATIONS - PRACTICAL

List of Practicals						
 Volumetric Estimation Practicals Estimation of Sodium Hydroxide (Na₂CO₃ Vs HCl Vs NaOH) Estimation of Hydrochloric Acid (H₂C₂O₄ Vs NaOH Vs HCl) Estimation of Oxalic Acid (FeSO₄ Vs KMnO₄ Vs H₂C₂O₄) Estimation of Ferrous Sulphate (H₂C₂O₄ Vs KMnO₄ Vs FeSO₄) Estimation of Ferrous Ammonium Sulphate (H₂C₂O₄Vs KMnO₄ Vs (NH₄)₂Fe(SO₄)₂·6H₂O Estimation of KMnO₄ (K₂Cr₂O₇ Vs FAS Vs KMnO₄) Estimation of Zinc by EDTA (MgSO₄ Vs EDTA Vs ZnSO₄) 	45					
Scheme of valuationRecord -10 MarksProcedure writing -10 MarksFor Estimation -60 MarksFor Estimation Results: $1-2\% - 60$ marks $2-3\% - 50$ marks $3-4\% - 40$ marks $>4\% - 30$ marks						

Text Books:

1. Peter McPherson, Volumetric Analysis, Royal Society of Chemistry, 1st Edition 2014.

2. K.B. Baliga et al., College Analytical Chemistry, Himalaya Publishing House, 19th Edition, 2011

3. Venkateswaran V. Veerasamy R. Kulandaivelu A.R, Basic Principles of Practical Chemistry, S. Chand & Co Pvt. Ltd, New Delhi, 2nd Edition1997.

Reference Books:

1. Handbook Of Inorganic Qualitative Analysis by Maharudra Chakraborty, Scifinity Publication; 1st Edition 2019.

2. Vogel, Text Book of Quantitative Chemical Analysis, Pearson Education, 6th edition ,2009.

3. Day R A., Underwood A l., Quantitative Analysis, New York: Pearson Emory University. Print. 6th edition, 1991

Web Resources:

1. https://www.studiestoday.com/useful-resources-chemistry-class-12-chemistry-practicals-volumetric-analysis-estimation-oxalic-0

2.https://ncert.nic.in/pdf/publication/sciencelaboratorymanuals/classXI/chemistry/kelm206.pdf

Course Outcomes							
Upon su	Upon successful completion of this course, the student will be able to:						
CO No.	CO Statement	Cognitive Level (K-Level)					
CO1	Recall the principle of volumetric techniques and to classify the methods of preparation of solutions with different concentration.	K1					
CO2	Estimate the concentration of a various solution	K2					
CO3	Apply the principle of volumetric concept in the estimation	К3					
CO4	Analyze the quality of portability of water	K4					
CO5	Assess the quantity of chemical substance in a solution	K5					

Course	Pro	gramm	e Outco	omes (P	Os)	Progra	Mean Score of				
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	COs
CO1	3	3	3	3	2	3	3	1	2	2	2.5
CO2	3	3	3	3	1	3	3	2	2	2	2.5
CO3	3	3	3	2	2	3	3	2	3	1	2.5
CO4	2	1	2	3	3	3	3	3	3	3	2.6
CO5	3	3	2	2	3	3	3	3	3	2	2.7
Mean Overall Score										2.56	
Correlation											High

Mean Overall Score	Correlation
< 1.5	Low
\geq 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. S. K. Periyasamy

Semester	Course Code	Course Cotogory	Hours/	Cradita	Marks for Evaluation			
	Course Coue	Course Category	Week	Creatis	CIA	ESE	Total	
II	23UCH2AC3:2	Allied – III	4	4	25	75	100	

Course Title | Inorganic, Organic and Physical Chemistry – II

SYLLABUS						
Unit	Contents	Hours				
I	 INDIAN MEDICINAL PLANTS AND BIOLOGICALLY IMPORTANT COMPOUNDS 1.1 Indian Medicinal Plants: Hibisous Rosa Sinesis - Adathoda Vasica - Azadirachta Indica – Solanum Trolobatum – Active Constituents and Medicinal uses. 1.2 Biologically important compounds: Haemoglobin and Chlorophyll- structure and biological role. 	12				
II	 NUCLEAR CHEMISTRY 2.1 Structure of nucleus - Composition of nucleus, nuclear forces, nuclear stability-mass defect, binding energy, n/p ratio and magic numbers, *Definition of isotopes, isobars, isotones and isomers* 2.2 Radioacitivity- Definition, types of radioactivity, Properties of α, β and γ rays: Detection and measurement – Wilson cloud chamber and G.M. Counter, nuclear fusion and fission reactions, applications of radio isotopes – in analytical chemistry, in medicine, rock dating and carbon dating 	12				
ш	 VITAMINS AND DRUGS 3.1 Vitamins – Definition, classification. Sources and deficiency diseases of vitamins A, D, E, K, B₆, B₁₂ and C. 3.2 Drugs: Sulpha drugs - Definition, structure and uses of sulphapyridine and sulphathiazole. Antibiotics – Definition, structure and uses of penicillin and Chloromycetin. Antipyretics - Definition, structure and uses of paracetamol and aspirin. Anti inflammatory - Definition, structure and uses of ibuprofen and Naproxen. 	12				
IV	 ENZYMES AND HORMONES 4.1 Enzymes- Classification of enzymes, chemical nature, factors affecting rate of enzyme action, specifity of enzyme action, mechanisms of enzyme action – lock and key, biological functions of enzymes, applications of enzymes- therapeutic, analytical, industrial uses. 4.2. Hormones- introduction, structure and physiological functions - Adrenaline, thyroxine, oxytocin and insulin. 	12				
v	 COLLOIDS 5.1. Colloids: Definition, colloidal solution and suspension, phases of colloidal solution-Electrical properties – *Electrophoresis and Electro osmosis (definition and uses only)* - protection of colloids – Gold number- medicinal applications of colloids. 5.2 Emulsion: definition, types, preparation, properties and applications. 5.3. Gels: definition, types, preparation, properties and applications. 	12				

Text Book(s):

1. Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, Shoban Lal, Nagin Chand & Co. New Delhi, 23rd, 1993

2. P. L. Soni and H.M. Chawla, Text Book of Organic Chemistry, S. Chand & Co., New Delhi, 28th Edition, 1999

3. Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, S. Chand & Co., New Delhi, First Edition, 2006

Reference Book(s):

- 1. R. D Madan, Modern Inorganic Chemistry, S. Chand & Co., New Delhi, 2nd reprint, 1987
- A.K. Srivastava, Organic Chemistry, New Age International Publishers, New Delhi, 1st Edition, 2002
- 3. R. L. Madan, G.D. Tuli, Simplified Course in Physical Chemistry, S. Chand & Co., New Delhi5th revised and enlarged Edition, 2009

Web Resource(s):

- 1. <u>https://onlinecourses.nptel.ac.in/noc22_cy20/preview</u>
- 2. <u>https://www.toppr.com/</u>
- 3. <u>https://byjus.com/chemistry/</u>

	Course Outcomes						
Upon suc	Upon successful completion of this course, the student will be able to:						
CO No.	CO No. CO Statement						
CO1	Describe the Indian medicinal plants, types of radioactivity and physiological functions of hormones	K1					
CO2	Discuss the properties of alpha, beta and comma rays	K2					
CO3	predict the sources and deficiency diseases of vitamins and illustrate the various drugs	K3					
CO4	Classify the enzymes and explain the mechanism of enzyme action	K4					
CO5	Compare the phases of colloidal solutions and predict the applications	K5					

Relationship Matrix:

Course	Pro	gramm	e Outco	omes (I	POs)	Programme Specific Outcomes (PSOs)					Mean
Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Score of COs
CO1	3	3	3	3	3	3	3	3	3	3	3
CO2	2	2	2	2	2	2	2	2	2	2	2
CO3	2	2	2	2	2	2	2	2	2	2	2
CO4	2	2	2	2	2	2	2	2	2	2	2
CO5	2	2	2	2	2	2	2	2	2	2	2
Mean Overall Score										2.2	
Correlation										Medium	

Mean Overall Score	Correlation
< 1.5	Low
\geq 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators: Dr. R. Abdul Vahith

Semester	Course Code	Course Cotogony	Hours/	Cradita	Marks for Evaluation			
	Course Coue	Course Category	Week	Creans	CIA	ESE	Total	
П	23UCH2AC4P	Allied - IV	3	2	20	80	100	

Course Title | Organic Analysis - Practical

List of Practicals				
Qualitative analysis of the following organic compounds:				
1. Carbohydrate				
2. Amide				
3. Aldehyde				
4. Ketone				
5. Monocarboxylicacid				
6. Dicarboxylic acid				
7. Amine				
Scheme of valuation				
Record – 10 Marks				
Procedure writing – 10 Marks				
For Organic Analysis – 60 Marks				
For Organic Analysis Results Marks Distribution:				
(i) Special Elements Present/ Absent - 20 marks				
(ii) Aromatic/ Aliphatic - 10 marks				
(iii) Saturated/ Unsaturated - 10 marks				
(iv) Functional Group Present - 20 marks				

Text Books:

1. Ganapragasm N S and Ramamurthy G, Organic Chemistry Lab Manual, S. Vishwanathan Printers and Publishers (P) Ltd., Chennai, 2nd Edition, 2007.

2. Venkateswaran V. Veerasamy R. Kulandaivelu A.R, Basic Principles of Practical Chemistry, S. Chand & Co Pvt. Ltd, New Delhi, 2nd Edition, 1997.

3. Furniss B S, et al., Vogel's Textbook of Practical Organic Chemistry, ELBS Longman, London, 7th Edition, 1984.

Reference Books:

1. A. I. Vogel's, Text Book of Practical Organic Chemistry, Prentice Hall, 5th Edition, 1989.

Web Resources:

1.https://jru.edu.in/studentcorner/lab-manual/bpharm/Lab%20Manual%20-

%20%20Pharmaceutical%20Organic%20Chemistry.pdf

2.https://ncert.nic.in/pdf/publication/sciencelaboratorymanuals/classXII/chemistry/lelm108.pdf 3.https://faculty.chas.uni.edu/~manfredi/860-121/ORG%20LAB%20MAN%20S08.pdf

Course Outcomes					
Upon successful completion of this course, the student will be able to:					
CO No.	CO Statement	Cognitive Level (K-Level)			
CO1	Recall the preliminary tests of organic qualitative analysis.	K1			
CO2	Differentiate the aliphatic and aromatic nature of the organic compounds	K2			
CO3	Examine the nature of the organic compound	K3			
CO4	Separate the functional groups through appropriate chemical reactions	K4			
CO5	Summarize their results of the organic analysis in a scientific way.	K5			

Rela	tionshi	p Matri	x:								
Course	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean
Outcomes	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Score of
(COs)	101	102	105	104	105	1501	1502	1505	1504	1505	COs
CO1	3	3	3	3	2	3	3	3	2	2	2.7
CO2	3	2	3	3	3	3	3	2	3	1	2.6
CO3	3	2	3	3	2	3	3	3	2	2	2.4
CO4	3	2	1	3	3	3	3	3	3	2	2.6
CO5	3	2	3	1	2	3	3	2	3	1	2.3
								Me	an Overa	all Score	2.52
Correlation							High				

Mean Overall Score	Correlation
< 1.5	Low
\geq 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. S. Syed Abuthahir