Annexure-13

E.M.G. YADAVA WOMENS COLLEGE, MADURAI -14.

(An Autonomous Institution – Affiliated to Madurai Kamaraj University)

(Re –accredited (3rd Cycle) with Grade A+ and CGPA 3.51 by NAAC)

TANSCHE-CBCS with OBE

DEPARTMENT OF CHEMISTRY–UG

COURSE STRUCTURE

(w.e.f. 2023 – 2024 Batch onwards)

Semester	Part	Course Code	Course Title	Teaching hrs (per week)	Duration of Exam (hrs.)	Marks Allotted			Credits
						CIA	SE	Total	
I	I	23OU1TA1/23OU1HIN1/23OU1FR1	Tamil/Hindi/French	6	3	25	75	100	3
	II	23OU2EN1	General English -I	6	3	25	75	100	3
	III	23OUCH11	**CC1**: General Chemistry-I	5	3	25	75	100	5
		23OUCH1P	**CCL1:** Quantitative Inorganic Estimation (titrimetry) and Inorganic Preparations	3	6	40	60	100	3
		23OUCHGEMA1	**GEC 1:** Allied Mathematics –I	6	3	25	75	100	5
	IV	23OUCHSECN1	**SEC 1 (NME) :** Food Chemistry	2	3	25	75	100	2
		23OUCHFC1	**FC** : Role of Chemistry in Daily Life	2	3	25	75	100	2
			Total	**30**					**23**
II	I	23OU1TA2/23OU1HIN2/23OU1FR2	Tamil/Hindi/French	6	3	25	75	100	3
	II	23OU2EN2	General English - II	6	3	25	75	100	3
	III	23OUCH21	**CC2**: General Chemistry-II	5	3	25	75	100	5
		23OUCH2P	**CC L 2**: Qualitative Organic Analysis and Preparation of Organic Compounds	3	6	40	60	100	3
		23OUCHGEMA2	**GEC 2:** Allied Mathematics –II	6	3	25	75	100	5
	IV	23OUCHSECN2	**SEC 2 (NME) :** Dairy Chemistry	2	3	25	75	100	2
		23OUCHSEC3	**SEC 3:** Cosmetics and personal grooming	2	3	25	75	100	2
			Total	**30**					**23**

III	I	23OU1TA3/23OU1HIN3/23OU1FR3	Tamil/Hindi/French	6	3	25	75	100	3
	II	23OU2EN3	General English -III	6	3	25	75	100	3
	III	23OUCH31	**CC 3**: General Chemistry-III	5	3	25	75	100	5
		23OUCH3P	**CCL3:** Qualitative Inorganic Analysis	3	3	40	60	100	3
		23OUCHGEPH3	**GEC 3:** Allied Physics –I	4	3	25	75	100	3
		23OUCHGEPH3P	**GEC Lab 1:** Allied Practicals –I	2	3	40	60	100	2
	IV	23OUCHSEC31	**SEC 4:** Entrepreneurial in Chemistry	1	3	25	75	100	1
		23OUCHSEC32	**SEC 5:** Pesticide Chemistry	2	3	25	75	100	2
			Environmental Studies	1	-	-	-	-	-
			Total	**30**					**22**
IV	I	23OU1TA4/23OU1HIN4/23OU1FR4	Tamil/Hindi/French	6	3	25	75	100	3
	II	23OU2EN4	General English - IV	6	3	25	75	100	3
	III	23OUCH41	**CC 4:** General Chemistry-IV	5	3	25	75	100	5
		23OUCH4P	**CCL4**: Physical Chemistry practical – I	3	3	40	60	100	3
		23OUCHGEPH4	**GEC 4:** Allied Physics – II	3	3	25	75	100	3
		23OUCHGEPH4P	**GEC Lab 2:** Allied Physics Practical –II	2	3	40	60	100	2
	IV	23OUCHSEC41	**SEC 6 :** Instrumental methods of chemical analysis	2	3	25	75	100	2
		23OUCHSEC42	**SEC 7 :** Forensic Science	2	3	25	75	100	2
		23OU4EV4	Environmental Studies	1	3	25	75	100	2
			Total	**30**					**25**
V	**III**	23OUCH51	**CC5:** Organic Chemistry -I	**5**	3	25	75	100	**4**
		23OUCH52	**CC6:**Inorganic Chemistry - I	**5**	3	25	75	100	**4**
		23OUCH53	**CC7:**Physical Chemistry-I	**5**	3	25	75	100	**4**
			DSEC I	**5**	3	25	75	100	**3**
			DSEC II	**4**	3	25	75	100	**3**
		23OUCHPR5	Project with viva-voce	**4**	--	20	80	100	**4**
	IV	23OU4VE5	Value Education	**2**	3	25	75	100	**2**

		23OUCHIN5	Internship / Industrial training (Summer vacation at the end of IV semester)	--	--	--	--	--	**2**
			Total	**30**					**26**
VI	**III**	23OUCH61	**CC 8:** Organic Chemistry -II	**5**	3	25	75	100	**3**
		23OUCH62	**CC 9:** Inorganic Chemistry – II	**5**	3	25	75	100	**3**
		23OUCH63	**CC10:** Physical Chemistry -II	**5**	3	25	75	100	**3**
		23OUCH6P	**CCL 5:** Physical Chemistry Practical- II	**4**	6	40	60	100	**3**
			DSEC III	**5**	3	25	75	100	**3**
			DSEC IV	**4**	3	25	75	100	**3**
	IV	23OUCHSEC6	**SEC 8:** Professional Competency Skill Training For Competitive examinations	**2**	3	25	75	100	**2**
	V	23OU5PE6/ 23OU5NS6	Extension Activity Physical Education / NSS	--	--	--	--	--	**1**
			Total	**30**					**21**
				Total credits					**140**

Semester V – DSEC- I (Choose any one)
Biochemistry – 23OUCHDSE5A
Polymer Science – 23OUCHDSE5B
DSEC- II (Choose any one)
Industrial Chemistry - 23OUCHDSE5C
Environmental Chemistry-23OUCHDSE5D

Semester VI- DSEC- III (Choose any one)
Nanoscience – 23OUCHDSE6A
Fundamentals of Spectroscopy – 23OUCHDSE6B
DSEC- IV (Choose any one)
Pharmaceutical Chemistry - 23OUCHDSE6C
Non- Conventional and Renewable Sources of Energy-23OUCHDSE6D

Note :
FC-Foundation Course
CC-Core Course
GEC : Generic Elective Course
CCL-Core Course Lab
SEC : Skill Enhancement Course
DSEC : Discipline Specific Elective Course

Annexure-13

Year	Semester	Nature of Course	Course Code	Title of the Course	Hours	Offered to students of
I	I	Add on Course	22CHAOC 22CHAOCP	Water Analysis Lab in Water Analysis	30	I B.Sc., Chemistry
II	III&IV	Certificate Course	23KC1 23KCP	Small Scale Industrial Chemicals Lab in Small Scale Industrial Chemicals	90	II year students of all other disciplines
III	V	Value Added Course	23CHVAC1 23CHVAC1P	Paints and Biofuels Lab in Paints and Biofuels	30	III B.Sc Chemistry

Department of Chemistry						Class: III B.Sc		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**SE**	**Total**
V	Core Course 5	23OUCH51	Organic Chemistry -I	4	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1. To understand the stereoisomerism in chiral and geometric isomerism in olefins, conformations of ethane and butane
2. To acquire knowledge on preparation and properties of aromatic and aliphatic nitro compounds and aliphatic amines
3. To prepare different dyes, food colour and additives
4. To study the preparation and properties of five membered heterocycles like pyrrole, furan and thiophene
5. To understand the preparation and properties of six membered heterocycles like pyridine, quinoline and isoquinoline

Course Content:

Unit I Stereochemistry: Fischer Projection, Newmann and Sawhorse Projection formulae and their interconversions; Geometrical isomerism: cis–trans, syn-anti isomerism, E/Z notations. **Optical Isomerism:** Optical activity, specific rotation, asymmetry, enantiomers, diastereoisomers, meso structures - molecules with one and two chiral centres, racemisation-methods of racemisation; resolution- methods of resolution. R and S notations for one and two chirality (stereogenic) centres. Molecules with no asymmetric carbon atoms – allenes and biphenyls.Conformational analysis of ethane and butane.

Unit II Chemistry of Nitrogen Compounds – I: Nitroalkanes- Nomenclature, isomerism, preparation from alkyl halides, halo acids, alkanes; physical properties; reactions – reduction, halogenations, Grignard reagent, Pseudo acid character. Nitro – acinitro tautomerism.

Aromatic nitro compounds: Nomenclature, preparation – nitration, from diazonium salts, physical properties; reactions - reduction of nitrobenzene in different medium, Electrophilic substitution reactions and TNT.

Amines: Aliphatic Amines-Nomenclature, isomerism, preparation –Hofmanns' degradation

reaction, Gabriel's phthalimide synthesis, Curtius Schmidt rearrangement Physical properties, reactions – alkylation, acylation, carbylamines reaction, Mannich reaction, oxidation and basicity of amines.

UNIT III Chemistry of Nitrogen Compounds – II: Aromatic amines - Nomenclature, preparation– from nitro compounds, Hofmann's method; Schmidt reaction, properties - Basic nature, ortho effect; reactions – alkylation, acylation, carbylamine reaction, reaction with nitrous acid, aldehydes, oxidation, Electrophilic substitution reactions, diazotization and coupling reactions; sulphanilic acid - zwitter ion formation. Distinction between primary, secondary and tertiary amines – aliphatic and aromatic Diazonium compounds, Diazomethane, Benzene diazonium chloride -preparations and synthetic applications. **Dyes-** Theory of colour and constitution; classification based on structure and application; preparation –Martius yellow, methyl orange, indigo and malachite green. Industry oriented content Dyes Industry, Food colour and additives.

UNIT IV Heterocyclic compounds: Nomenclature and classification. General characteristics – aromatic character and reactivity. Five-membered heterocyclic compounds- Pyrrole – preparation - from succinimide, Paal Knorr synthesis; reactions – reduction, basic character, acidic character, electrophilic substitution reactions, ring opening. Furan – preparation from mucic acid and pentosan; reactions –hydrogenation, reaction with oxygen, Diels Alder reactions- Electrophilic substitution reactions. Thiophene: synthesis from acetylene; reactions –reduction; oxidation; electrophilic substitution reactions.

UNIT V Six-membered heterocyclic compounds: Pyridine – synthesis - from acetylene, Physical properties; reactions - basic character, oxidation, reduction, electrophilic substitution reactions; nucleophilic substitution- Condensed ring systems-Quinoline– preparation - Skraup synthesis and Friedlander's synthesis; reactions – basic nature, reduction, oxidation; electrophilic substitutions; nucleophilic substitutions – Chichibabin reaction- Isoquinoline – preparation by the Bischler – Napieralski reaction- reduction, oxidation; electrophilic Substitution.

Books for Study:

1.Jain.M.K., Sharma.S.C (2009), "*Modern Organic Chemistry*," Vishal Publishing, fourth reprint. New Delhi

2.Mukherji. S.M., and Singh. S.P., (2009), "*Reaction Mechanism in OrganicChemistry*," Macmillan India Ltd., third edition, New Delhi

3.ArunBahl and Bahl. B.S., (2012), "*Advanced organic chemistry*," Multicolour edition. S.Chand & Company Pvt. Ltd., New Delhi.

4.Soni. P. L. and Chawla. H. M., (2007), "*Text Book of Organic Chemistry*," Twenty ninth edition, Sultan Chand &Sons, New Delhi.

5. Pillai. C.N., (2009), "*Text Book of Organic Chemistry*", Universities Press (India) Pvt Ltd, New Delhi

Books for Reference:

1. Morrison. R. T. and Boyd. R. N. (2012), "*Organic Chemistry"*, Sixth Edition, Pearson Education, Asia.

2. Graham Solomons. T.W. (2012), "*Organic Chemistry"*, eleventh edition, John Wiley &Sons, India.

3. Carey Francis. (2009), "*Organic Chemistry"*, Seventh Edition, Tata McGraw-Hill Education Pvt. Ltd., New Delhi.

4. Finar. L., (2006), "*Organic Chemistry"*, sixth Edition, Vol. (1& 2), England, Wesley Longman Ltd, India.

5. Joule. J. A., and Smith. G. F. (2010), "*Heterocyclic Chemistry"*, Fifth Edition, Wiley, UK.

Website resource/E Books:

1. www.epgpathshala.nic.in

2. www.nptel.ac.in

3. http:/swayam.gov.in

Pedagogy:

Chalk and Talk method, Power point Presentations, Seminar, Group Discussion, Quiz, You tube Links, Open book test and Virtual Labs.

Rationale for nature of Course:

Knowledge and Skill:

This course will enable the students to acquired knowledge about the stereo chemistry in cis and trans isomer, color and constitution of dyes, nitro alkanes, aromatic amines and structure of heterocyclic compounds.

Activities to be given:

1. To construct the fisher projection formula using atomic model set.
2. To prepare the power point presentation on structure and properties of pyridine and Quinoline.

COURSE LEARNING OUTCOMES (CLO's):

CLOs	Course Learning Outcomes Statements	Knowledge According to Bloom's Taxonomy (Upto K level)
CLO1	Assign RS notations to chirals and EZ notations to olefins and explain conformations ofethane and butane.	K1 to K3
CLO2	Explain the preparation and properties of aromatic and aliphatic nitro compounds and amines	K1 to K3
CLO3	Summarize the colour and constitution of dyes and food additives	K1 to K4
CLO4	Discuss the preparation and properties of five membered heterocycles like pyrrole, furan and Thiophene	K1 to K3
CLO5	Illustrate the preparation and properties of six membered heterocycles like pyridine,quinoline and isoquinoline	K1 to K4

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Mapping of Course Learning Outcomes (CLO's) with Programme Outcomes (PO's)

CLO's	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	2	2	2	3	2
CLO2	3	2	2	1	3	2
CLO3	3	2	2	1	3	2
CLO4	3	2	1	3	3	2
CLO5	3	2	1	2	2	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

LESSON PLAN: TOTAL HOURS (75 Hrs)

UNIT	DESCRIPTION	HOURS	MODE
I	**Stereochemistry:** Fischer Projection, Newmann and Sawhorse Projection formulae andtheir interconversions; Geometrical isomerism:cis–trans, syn-anti isomerism, E/Z notations. **Optical Isomerism:** Optical activity, specific rotation, asymmetry, enantiomers, diastereoisomers, meso structures - molecules with one and two chiral centres, racemisation-methods of racemisation; resolution- methods of resolution. R and S notations for one and two chirality (stereogenic) centres. Molecules with no asymmetric carbon atoms – allenes and biphenyls.Conformational analysis of ethane and butane	15	Chalk and Talk, PPT, and quiz
II	**Chemistry of Nitrogen Compounds – I: Nitroalkanes-** Nomenclature, isomerism, preparation from alkyl halides, halo acids, alkanes; physical properties; reactions –	15	Chalk and Talk, PPT, quiz and You tube Links

	reduction, halogenations, Grignard reagent, Pseudo acid character. Nitro - aci nitro tautomerism **Aromatic nitro compounds:** Nomenclature, preparation – nitration, from diazonium salts, physical properties; reactions - reduction of nitrobenzene in different medium,Electrophilic substitution reactions, TNT. **Amines: Aliphatic amines-**Nomenclature, isomerism, preparation – Hofmanns' degradation reaction, Gabriel's phthalimide synthesis, Curtius Schmidt rearrangement Physical properties, reactions – alkylation, acylation, carbylamines reaction, Mannich reaction, oxidation, basicity of amines.		
III	**Chemistry of Nitrogen Compounds – II: Aromatic amines -** Nomenclature, preparation– from nitro compounds, Hofmann's method; Schmidt reaction, properties - Basic nature, ortho effect; reactions – alkylation, acylation, carbylamine reaction, reaction with nitrous acid, aldehydes, oxidation, Electrophilic substitution reactions, diazotization and coupling reactions; sulphanilic acid - zwitter ion formation. Distinction between primary, secondary and tertiary amines–aliphatic and aromatic Diazonium compounds. Diazomethane, Benzene diazonium chloride –preparations and synthetic applications. **Dyes-** Theory of colour and constitution; classification based on structure and application; preparation –Martius yellow, methyl orange, indigo, malachite green. Industry oriented content Dyes Industry, Food colour and additives	**15**	Chalk and Talk, PPT, quiz and You tube Links
IV	**Heterocyclic compounds:** Nomenclature and classification. General characteristics – aromatic character and reactivity. Five-membered heterocyclic compounds- Pyrrole – preparation - from succinimide, Paal Knorr synthesis; reactions – reduction, basic character, acidic character, electrophilic substitution reactions, ring opening. Furan – preparation from mucic acid and pentosan; reactions – hydrogenation, reaction with oxygen, Diels Alder reactions, Electrophilic substitution reaction. Thiophene synthesis - from acetylene; reactions –reduction; oxidation; electrophilic substitution reactions.	**15**	Chalk and Talk, PPT, quiz and You tube Links
V	**Six-membered heterocyclic compounds:** Pyridine – synthesis - from acetylene, Physical properties; reactions - basic character, oxidation, reduction, electrophilic substitution reactions; nucleophilic substitution- Condensed ring systems-Quinoline – preparation - Skraup synthesis and Friedlander's synthesis; reactions – basic nature, reduction, oxidation; electrophilic substitutions; nucleophilic substitutions – Chichibabin reaction- Isoquinoline – preparation by the Bischler – Napieralski reaction, reduction, oxidation; electrophilic Substitution.	**15**	Chalk and Talk, PPT, quiz and You tube Links
	Total hours	**75**	

Course Designers: 1. Dr.Mrs.A.Ramya

2. Dr.Mrs. S.Manimekalai

Department of Chemistry						Class: III B.Sc		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**SE**	**Total**
V	Core Course 6	**23OUCH52**	Inorganic Chemistry -I	4	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1.To provide a knowledge on nomenclature, isomerism and theory of coordination compounds and chelate complexes.

2. To learn about crystal field theory, magnetic properties, stability of complexes .

3.To explain the preparation and properties of metal carbonyls.

4.To acquire knowledge on Lanthanides and actinides

5.To study the preparation and properties of inorganic polymers

Course Content:

Unit - I Co-ordination Chemistry – I IUPAC Nomenclature of coordination compounds, Isomerism in coordination compounds. Werner's Coordination theory – effective atomic number –interpretation of geometry and magnetic properties by Pauling's theory – geometry of co-ordination compounds with co-ordination number 4 & 6. Chelates – types of ligands forming chelates – stability of chelates, applications of chelates in qualitative and quantitative analysis– application of DMG and oxine in gravimetric analysis –estimation of Hardness of water using EDTA, metal ion indicators. Role of metal chelates in living systems – haemoglobin and chlorophyll

Unit- II Co-ordination Chemistry – II Crystal field theory –Crystal field splitting of energy levels in octahedral and tetrahedral complexes, Crystal field stabilization energy (CFSE), spectrochemical series - calculation of CFSE in octahedral and tetrahedral complexes - factors influencing the magnitude of crystal field splitting-interpretation of magnetic properties, spectra of $[Ti(H_2O)_6]^{3+}$. Stability of complexes in aqueous solution, stability constants- factors affecting the stability of a complex ion, thermodynamic and kinetic stability (elementary idea). Comparison of VBT and CFT.

Unit- III Organometallic compounds -Metal Carbonyls: Mono and poly nuclear carbonyls, General methods of preparation of carbonyls – general properties of Binary carbonyls –

bonding in carbonyls – structure and bonding in carbonyls of Ni, Fe, Cr, Co, Mn,Ru and Os. EAN rule as applied to metal carbonyls. Ferrocene-Methods of preparation, physical and chemical properties.

Unit -IV Inner transition elements (Lanthanoids and Actinoids) : General characteristics of f-block elements - Comparative account of lanthanoids and actinoids. Occurrence, Oxidation states, Magnetic properties, Colour and spectra - Lanthanoids and Actinoids, Separation by ion-Exchange and Solvent extraction methods - Lanthanoids contraction-Chemistry of thorium and Uranium-Occurrence, Ores, Extraction, properties and uses - Preparation, Properties and uses of ceric ammonium sulphate, thorium dioxide and uranyl acetate.

Unit - V Inorganic polymers: General properties – classification of inorganic polymers based on element in the backbone (Si, S, B and P) - preparation and properties of silicones - polysiloxane- Phosphorous based polymer (polyphosphazines and polyphophonitrilic chloride), sulphur based polymer (polysulfide and polymeric sulphur nitride), boron based polymers (borazine polymers) – industrial Applications of inorganic polymers.

Books for study:

1. Puri B R, Sharma L R, Kalia K C (2011), "*Principles of Inorganic Chemistry*," thirty first edition, Milestone Publishers & Distributors, New Delhi.
2. Satya Prakash, Tuli G.D., Basu S. K., Madan R . D (2009), "*Advanced Inorganic Chemistry*," Eighteenth Edition, Chand & Co, New Delhi.
3. Lee J D, (1991), "*Concise Inorganic Chemistry*," fourth edition, ELBS William Heinemann, London.
4. Malik.W.V., Tuli.G.D., Madan.R.D., (2000), "*Selected Topics in Inorganic Chemistry*," S.Chand and Company Ltd, New Delhi.
5. De.A.K., (1992) ,"*Text book of Inorganic Chemistry*," seventh edition ,Wiley East L.

Books for Reference:

1. Madan R D, Sathya Prakash, (2003), "*Modern Inorganic Chemistry*," second edition, S.Chand and Company, New Delhi.
2. Gopalan R, (2009)," *Inorganic Chemistry for Undergraduates*," first edition, University Press (India) Private Limited, Hyderabad.
3. Sivasankar B, (2013)," *Inorganic Chemistry*." First Edition, Pearson,Chennai.
4. Alan G. Sharp (1992), "*Inorganic Chemistry*," Third Edition, Addition Wesley, England.
5. Peter Atkins, Tina Overton, Jonathan Rourke and Mark Weller,(2014), " *Inorganic Chemistry*," sixth edition ,Oxford University Press,

Web resources/E-books

1. www.epgpathshala.nic.in
2. www.nptel.ac.in
3. http:/swayam.gov.in

Pedagogy:

Chalk and Talk method, Power point Presentations, Seminar, Group Discussion, Quiz, You tube Links, Open book test and Virtual Labs.

Rationale for nature of Course:

Knowledge and Skill:

This course will enable the students to understanding the IUPAC nomenclature and isomerism in coordination compounds, Ligand and Chelate Chemistry, Application of the EAN rule to predict stability and structure. Comparative chemistry of lanthanoids and actinoids, Preparation, structure, and industrial applications of inorganic polymers.

Activities to be given:

1. To Use molecular model kits to construct coordination compounds with coordination numbers 4 and 6.

2. Students shall be assigned with assignment work of data collection of structure of Ferrocene.

COURSE LEARNING OUTCOMES (CLO's):

CLOs	**Course Learning Outcomes Statements**	**Knowledge According to Bloom's Taxonomy (Upto K level)**
CLO1	Explain the isomerism, Werner's Theory and stability of chelate complexes	K1 to K3
CLO2	Discuss about crystal field theory, magnetic properties and spectral properties of complexes.	K1 to K3
CLO3	Utilize the preparation and properties of metal carbonyls	K1 to K4
CLO4	Give a comparative account of the characteristics of lanthanoids and actinoids	K1 to K3
CLO5	Illustrate the properties and uses of inorganic polymers of silicon, sulphur, boron and phosphorous	K1 to K4

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Mapping of Course Learning Outcomes (CLO's) with Programme Outcomes (PO's)

CLO's	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	2	2	2	3	2
CLO2	3	2	2	1	3	2
CLO3	3	2	2	1	3	2
CLO4	3	2	1	3	3	2
CLO5	3	2	1	2	2	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

LESSON PLAN: TOTAL HOURS (75 Hrs)

UNIT	DESCRIPTION	HOURS	MODE
I	**Co-ordination Chemistry – I** IUPAC Nomenclature of coordination compounds, Isomerism in coordination compounds.Werner's Coordination theory – effective atomic number –interpretation of geometry and magnetic properties byPauling's theory – geometry of co-ordination compounds with co-ordination number 4 &6.Chelates – types of ligands forming chelates – stability of chelates, applications of chelates in qualitative And quantitative analysis– application of DMG and oxine in gravimetric analysis –estimation of Hardness of water using EDTA, metal ion indicators.Role of metal chelates in living systems – haemoglobin and chlorophyll	**15**	Chalk and Talk, PPT, and quiz
II	**Co-ordination Chemistry – II** Crystal field theory – Crystal field splitting of energy levels inoctahedral and tetrahedral complexes, Crystal field stabilization energy (CFSE), spectrochemical series - calculation of CFSE in octahedral and tetrahedral complexes - factors influencing the magnitude of crystal field splitting, interpretation of magnetic properties, spectra of $[Ti(H_2O)_6]^{3+}$. Stability of complexes in aqueous solution, stability constants- factors affecting the stability of a complex ion. thermodynamic and kinetic stability (elementary idea). Comparison of VBT and CFT.	**15**	Chalk and Talk, PPT, quiz and You tube Links
III	**Organometallic compounds -Metal Carbonyls** Mono and polynuclear carbonyls, General methods of preparation of carbonyls – general properties of Binary carbonyls – bonding in carbonyls – structure and bonding in carbonyls of Ni, Fe, Cr, Co, Mn,Ru And Os. EAN rule as applied to metal carbonyls. Ferrocene-Methods of preparation, physical and chemical properties	**15**	Chalk and Talk, PPT, quiz and You tube Links
IV	**Inner transition elements (Lanthanoids and Actinoids)** General characteristics of f-block elements - Comparative account oflanthanoids and actinoids Occurrence, Oxidation states, Magnetic properties, Colour and spectra - Lanthanoids and Actinoids, Separation by ion-Exchange	**15**	Chalk and Talk, PPT, quiz and You tube Links

	and Solvent extraction methods - Lanthanoids contraction-Chemistry of thorium and Uranium-Occurrence, Ores, Extraction, properties and uses - Preparation, Properties and uses of ceric ammonium sulphate, thorium dioxide and uranyl acetate.		
V	**Inorganic polymers** General properties – classification of inorganic polymers based on element in the backbone (Si, S, B andP) - preparation and properties of silicones - polysiloxane- Phosphorous based polymer (polyphosphazines and polyphophonitrilic chloride), sulphur based polymer (polysulfide and polymeric sulphur nitride), boron based polymers (borazine polymers) – industrial Applications of inorganic polymers	**15**	Chalk and Talk, PPT, quiz and You tube Links
	Total Hours	**75**	

Course Designers: 1. Mrs. V.Gokilaa

2. Dr.Mrs.A.Ramya

Department of Chemistry						Class: III B.Sc		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**SE**	**Total**
V	Core Course 7	**23OUCH53**	Physical Chemistry -I	4	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1. To acquire the knowledge about Gibbs free energy, Helmholtz free energy, Ellingham's diagram and partial molar properties
2. To study the concept of chemical kinetics and different types of chemical reactions
3. To gain knowledge on adsorption, homogeneous and heterogeneous catalysis.
4. To understand the knowledge on colloids and macromolecules
5. To explain the photochemistry, fluorescence and phosphorescence.

Course Content

Unit -I Thermodynamics – III: Equilibrium constant and free energy change –thermodynamic derivation of law of mass action- equilibrium constants in terms of pressure and concentration–NH_3. Thermodynamic interpretation of Le-Chatelier's principle (Concentration, temperature and pressure). Gibb's Duhem equation. Van't Hoff's reaction isotherm- Van't Hoff's isochore. Clapeyron equation and Clausius–Clapeyron equation-Applications. Partial molar properties – chemical potential, Gibbs Duhem equation, variation of chemical potential with temperature and pressure, chemical potential of a system of ideal gases, Gibbs- Duhem-Margules equation.

Unit - II Chemical Kinetics : Rate of reaction :Average and instantaneous rates, factors influencing rate of reaction - molecularity of a reaction - rate equation - order of reaction. order and molecularity of simple and complex reactions, Rate laws – Rate constants – derivation of rate constants and characteristics for zero, first order, second and third order (equal initial concentration) Derivation of time for half change with examples. concept of activation energy - Arrhenius equation. Theories of reaction rates – Collision theory – derivation of rate constant of bimolecular gaseous reaction. Lindemann's theory of unimolecular reaction. Theory of absolute reaction rates – Derivation of rate constant for a bimolecular reaction. Comparison of collision theory and ARRT. Complex reactions – reversible and parallel reactions (no derivation and only examples).

Unit- III Adsorption L: Chemical and physical adsorption and their general characteristics- distinction between them Different types of isotherms – Freundlich and Langmuir. Adsorption isotherms and their limitations – BET theory, kinetics of enzyme catalysed reaction – Michaelis- Menten -competitive, noncompetitive and uncompetitive (no derivation of rate equations) Catalysis – general characteristics of catalytic reactions, auto catalysis, promoters, negative catalysis, poisoning of a catalyst – theories of homogenous and heterogeneous catalysis – Kinetics of Acid – base and enzyme catalysis. Heterogenous catalysis.

Unit -IV Colloids and Surface Chemistry: **Colloids:** Types of Colloids, Characteristics Colloids (Lyophilic and Lyophobic sols), Preparation of Sols- Dispersion methods, aggregation methods, Properties of Sols- Optical properties, Electrical properties - Electrical double layer, Electro Kinetic properties- Electro-osmosis, Electrophoresis, Emulsions, Gels- preparation of Gels, Applications of colloids Macromolecules: Molecular weight of Macromolecules-Number average molecular weight- average molecular weight, Determination of Molecular weight of macro molecules

Unit- V Photochemistry Laws of photo chemistry – Lambert – Beer, Grotthus – Draper and Stark – Einstein. Quantum efficiency. Photochemical reactions – ratelaw – Kinetics of H_2-Cl_2, H_2-Br_2 reactions, comparison between thermal and photochemical reactions. Fluorescence – applications including fluorimetry – phosphorescence – applications- chemiluminescence and photosensitization.

Books for study:

1. Puri. B.R. and Sharma. L.R., (2021), "*Principles of Physical Chemistry*," forty eighth Edition, Shoban Lal Nagin Chand and Co, New Delhi.
2. Peter Atkins, and Julio de Paula, James Keeler, (2018), "*Physical Chemistry*," eleventh edition, Oxford University press, International, UK.
3. Arun Bahl, B.S. Bahl, G. D. Tuli,, (2019), "*Essentials of physical chemistry*," 28th Edition, S, Chand & Co, Chandigarh.
4. Dogra.S.K., and Dogra.S., (1996), "*Physical Chemistry through Problems*,", fourth edition, New Age International.
5. Rajaram.J and Kuriacose.J.C., (1986), "*Thermodynamics*,"Shoban Lal Nagin Chand and CO.

Books for References:

1.Rajaram.J., and Kuriacose.J.C., (2013), "*Chemical Thermodynamics*," First Edition, Pearson,
2. Keith J. Laidler, (2003), "*Chemical Kinetics*," third edition, Pearson.

3. Atkins. P.W., and Julio de Paula., (2002), "*Physical Chemistry*," seventh edition, Oxford University press,

4. Kapoor.K.L., (2009), "*A Textbook of Physical Chemistry*," third edition, Macmillan India Ltd,.

5. Puri.B.R., Sharma.L.R., and Pathania.M.s., (2001), "*Principles of Physical Chemistry*," forty first edition, Shobanlal Nagin Chand and Co, Jalendhar.

Web resources/E-books:

1. https://nptel.ac.in
2. https://swayam.gov.in
3. www.epgpathshala.nic.in

Pedagogy:

Chalk and Talk method, Power point Presentations, Seminar, Group Discussion, Quiz, You tube Links, Open book test and Virtual Labs.

Rationale for nature of Course:

Knowledge and Skill:

This course will enable the students to acquired knowledge about the Laws of thermodynamics and chemical equilibrium, kinetics reaction rates, mechanisms, and energy profiles, adsorption phenomena and enzyme catalysis, surface and colloidal chemistry. Photochemical principles and applications in real life (e.g., vision, fluorescence).

Activities to be given:

1.To construct a Plot for Freundlich and Langmuir isotherms using origin software.

2. To estimate molecular weight of polymer by viscosity method.

COURSE LEARNING OUTCOMES (CLO's):

CLOs	**Course Learning Outcomes Statements**	**Knowledge According to Bloom's Taxonomy (Upto K level)**
CLO1	Explain Gibbs and Helmholtz free energy functions, partial molar quantities and Ellinghams	K1 to K3
CLO2	Apply the concepts of chemical kinetics to predict the rate of the reaction and order of the reaction, demonstrate the effect of temperature on reaction rate, and the significance of free energy and entropy of activation.	K1 to K3
CLO3	Compare chemical and physical adsorption, Freundlich and Langmuir adsorption isotherms, and Differentiate between homogenous and heterogeneous catalysis.	K1 to K4
CLO4	Demonstrate the types and characteristics of colloids, preparation of sols and emulsions, and determine the molecular weights of macromolecules.	K1 to K3
CLO5	Utilize the concepts of photochemistry in fluorescence, phosphorescence, chemiluminescence and color perception of vision.	K1 to K4

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Mapping of Course Learning Outcomes (CLO's) with Programme Outcomes (PO's)

CLO's	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	2	2	2	3	2
CLO2	3	2	2	1	3	2
CLO3	3	2	2	1	3	2
CLO4	3	2	1	3	3	2
CLO5	3	2	1	2	2	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

LESSON PLAN: TOTAL HOURS (75 Hrs)

UNIT	DESCRIPTION	HOURS	MODE
I	Equilibrium constant and free energy change –thermodynamic derivation of law of mass action- equilibrium constants in terms of pressure and concentration–NH_3. Thermodynamic interpretation of Le-Chatelier's principle (Concentration, temperature and pressure). Gibb's Duhem equation. Van't Hoff's reaction isotherm- van't Hoff's isochore. Clapeyron equation and Clausius–Clapeyron equation-Application.Partial molar properties – chemical potential, Gibbs Duhem equation, variation of chemical potential with temperature and pressure, chemical potential of a system of ideal gases, Gibbs- Duhem-Margules equation.	15	Chalk and Talk, PPT, and quiz
II	**Chemical Kinetics : Rate of reaction** - Average and instantaneous rates, factors influencing rate of reaction - molecularity of a reaction - rate equation - order of reaction. order and molecularity of simple and complex reactions, Rate laws – Rate constants – derivation of rate constants and characteristics for zero, first order, second and third order (equal initial concentration) Derivation of time for half change with examples. concept of activation energy - Arrhenius equation. Theories of reaction rates – Collision theory – derivation of rate constant of bimolecular gaseous reaction. Lindemann's theory of unimolecular reaction. Theory of absolute reaction rates – Derivation of rate constant for a bimolecular reaction. Comparison of collision theory and ARRT. Complex reactions – reversible and parallel reactions (no derivation and only examples)	15	Chalk and Talk, PPT, quiz and You tube Links
III	**Adsorption** – Chemical and physical adsorption and their general characteristics- distinction between them Different types of isotherms – Freundlich and Langmuir. Adsorption isotherms and their limitations – BET theory, kinetics of enzyme catalysed reaction –Michaelis- Menten -competitive, noncompetitive and uncompetitive (no derivation of rate	15	Chalk and Talk, PPT, quiz and You tube Links

	equations) Catalysis – general characteristics of catalytic reactions, auto catalysis, promoters, negative catalysis, poisoning of a catalyst – theories of homogenous and heterogeneous catalysis – Kinetics of Acid – base and enzyme catalysis. Heterogenous catalysis.		
IV	**Colloids and Surface Chemistr**y: **Colloids:** Types of Colloids, Characteristics Colloids (Lyophilic and Lyophobic sols), Preparation of Sols- Dispersion methods, aggregation methods, Properties of Sols- Optical properties, Electrical properties - Electrical double layer, Electro Kinetic properties- Electro-osmosis, Electrophoresis, Emulsions, Gels- preparation of Gels, Applications of colloids Macromolecules: Molecular weight of Macromolecules-Number average molecular weight- average molecular weight, Determination of Molecular weight of macro molecules	**15**	Chalk and Talk, PPT, quiz and You tube Links
V	**Photochemistry** Laws of photo chemistry – Lambert – Beer, Grotthus – Draper and Stark – Einstein. Quantum efficiency. Photochemical reactions – ratelaw – Kinetics of H_2-Cl_2, H_2-Br_2 and H_2-I_2 reactions, comparison between thermal and photochemical reactions. Fluorescence – applications including fluorimetry –sensitised fluorescence, phosphorescence – applications- chemiluminescence and photosensitization.	**15**	Chalk and Talk, PPT, quiz and You tube Links
	Total Hours	**75**	

Course Designers: 1. Mrs.V.Gokilaa

2. Mrs.K.Punitha

Department of Chemistry						Class: III B.Sc		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**SE**	**Total**
V	DSEC I	23OUCHDSE5A	Biochemistry	3	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1.To learn about the relationship between biochemistry and medicine, composition ofblood

2.To understand the structure and properties of amino acids, peptides, enzyme, vitamins and proteins

3. To gain knowledge on biological functions of proteins, enzymes, vitamins and hormones

4. To study the biochemistry of nucleic acids and lipids

5. To acquire knowledge about metabolism of lipids

Course Content

UNIT - I Logic of Living Organisms: Relationship of Biochemistry and Medicine Blood - Composition of Blood, Blood Coagulation – Mechanism.Hemophilia and Sickle Cell Anemia - Maintenance of pH of Blood– Bicarbonate Buffer, Acidosis, Alkalosis.

UNIT- II Peptides and Proteins: Amino acids – nomenclature, classification – essential and Non-essential; Synthesis- Gabriel Phthalimide, Strecker; properties – zwitterion and isoelectric point, electrophoresis a reaction. **Peptides** – peptide bond – synthesis of simple peptides –solid phase. Determination of structure of peptides. **Proteins** – classification based on composition, functions and structure; properties and reactions – colloidal nature, coagulation, hydrolysis, oxidation, denaturation, renaturation; colour tests for proteins; structure of proteins – primary, secondary, tertiary and quaternary.

UNIT- III Enzymes and Vitamins: Nomenclature and classification, characteristics, factors influencing enzyme activity – mechanism of enzyme action – Lock and key hypothesis, Koshland's induced fit model. Proenzymes, antienzymes, coenzymes and isoenzymes; allosteric enzyme regulation. Vitamins as coenzymes – functions of TPP, lipoic acid, NAD, NADP, FMN, FAD, pyridoxal phosphate, CoA, folic acid, biotin, cyanocobalamin.

UNIT- IV Amino acids: Components of nucleic acids - nitrogenous bases and pentose sugars, structure of nucleosides and nucleotides, DNA- structure & functions; RNA –types– structure - functions; biosynthesis of proteins **Hormones** Adrenalin and thyroxine — chemistry, structure and functions (No structure elucidation).

UNIT- V Lipids: Occurrence, biological significance of fats, classification of lipids, Simple lipids – Oils and fats, chemical composition, properties, reactions– hydrolysis, hydrogenation, trans-esterification, saponification, rancidity; analysis of oils and fats – saponification number, iodine number, acid value, R.M. value. Distinction between animal and vegetable fats. Compound lipids – Lipoproteins - VLDL, LDL, HDL, chylomicrons –biological significance Cholesterol – occurrence, structure, test, physiological activity. Metabolism of lipids: β-oxidation of fatty acids.

Books for study:

1.Arun Bahl, B. S.; Bhal, A. (2003), "*Advanced Organic Chemistry"*, third edition S chand New Delhi.

2. Jain, M.K.; Sharma, (2017), S.C. "*Modern Organic Chemistry*", Vishal Publications: New Delhi.

3. Shanmugam, (1999), A. " *Fundamentals of Biochemistry for Medica Students*", sixth edition; Published by the author.

4. Veerakumari, L. (2004), "*Biochemisrty*", first edition, MJP Publication, Chennai.

5. Jain, J. L.;(1983), "*Fundamentals of Biochemistry"*, second edition, S.Chand & Co, New Delhi,

Books for Reference

1.Conn, E. E.; Stumpf, P.K (2002), "*Outline of Biochemistry"*, F ifth Edition.; Wiley Eastern, New Delhi,

2.West, E. S.; Todd, W. R.; Mason, H. S.; Van Bruggen, J.T(1970), *"Text book of biochemistry"* fourth edition Macmillan: New York.

3. Lehninger, A. L. (1993), "*Principles of Biochemistry"*, Second Edition ; CBS Publisher: New Delhi.

4. Rastogi S. C,(2003), " *Biochemistry"*, second edition .; Tata McGraw-Hill: New Delhi.

5. Chatterjea, M. N.; Shinde, R.(2002), *Textbook of Medical Biochemistry*, Fifth Edition.; Jaypee Brothers, New Delhi.

Web resources/E-books:

1. http://library.med.utah.edu/NetBiochem/nucacids.html
2. http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/E/EnzymeKine tics.html
3. https://swayam.gov.in/courses/4384-biochemistry
4. https://onlinecourses.nptel.ac.in/noc19_cy07/previe w

Pedagogy:

Chalk and Talk method, Power point Presentations, Seminar, Group Discussion, Quiz, You tube Links, Open book test and Virtual Labs.

Rationale for nature of Course:

Knowledge and Skill:

This course will enable the students to acquired knowledge about composition of blood, peptides, proteins enzyme and vitamins.

Activities to be given:

1. To prepare power point presentation on structure of protein, amino acids of lipids

COURSE LEARNING OUTCOMES (CLO's):

CLOs	Course Learning Outcomes Statements	Knowledge According to Bloom's Taxonomy (Upto K level)
CLO1	Explain the molecular logic of living organisms, composition of blood and blood coagulation	K1 to K3
CLO2	Illustrate the synthesis and properties of amino acids, determination of structure of peptidesand proteins	K1 to K3
CLO3	Explain the factors influencing enzyme activity and vitamins as coenzymes	K1 to K4
CLO4	Discuss about RNA and DNA structure and functions.	K1 to K3
CLO5	Elucidate the biological significance of simple and compound lipids	K1 to K4

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Mapping of Course Learning Outcomes (CLO's) with Programme Outcomes (PO's)

CLO's	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	2	2	2	3	2
CLO2	3	2	2	1	3	2
CLO3	3	2	2	1	3	2
CLO4	3	2	1	3	3	2
CLO5	3	2	1	2	2	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

LESSON PLAN: TOTAL HOURS (75 Hrs)

UNIT	DESCRIPTION	HOURS	MODE
I	**Logic of Living Organisms:** Relationship of Biochemistry and Medicine Blood - Composition of Blood, Blood Coagulation – Mechanism. Hemophilia and Sickle Cell Anaemia ,Maintenance of pH of Blood– Bicarbonate Buffer, Acidosis, Alkalosis	**15**	Chalk and Talk, PPT, and quiz
II	**Peptides and Proteins : Amino acids** – nomenclature, classification – essential and Non-essential; Synthesis- Gabriel Phthalimide, Strecker; properties – zwitterion and isoelectric point, electrophoresis a reaction. **Peptides** – peptide bond – synthesis of simple peptides –solid phase. Determination of structure of peptides. **Proteins** – classification based on composition, functions and structure; properties and reactions – colloidal nature, coagulation, hydrolysis, oxidation, denaturation, renaturation; colour tests for proteins; structure of proteins – primary, secondary, tertiary and quaternary.	**15**	Chalk and Talk, PPT, quiz and You tube Links
III	**Enzymes and Vitamins:** Nomenclature and classification, characteristics, factors influencing enzyme activity – mechanism of enzyme action – Lock and key hypothesis, Koshland's induced fit model. Proenzymes, antienzymes, coenzymes and isoenzymes; allosteric enzyme regulation. Vitamins as coenzymes – functions of TPP, lipoic acid, NAD, NADP, FMN, FAD, pyridoxal phosphate, CoA, folic acid, biotin, cyanocobalamin.	**15**	Chalk and Talk, PPT, and quiz
IV	**Amino acids:** Components of nucleic acids - nitrogenous bases and pentose sugars, structure of nucleosides and nucleotides, DNA- structure & functions; RNA –types– structure - functions; biosynthesis of proteins. **Hormones** Adrenalin and thyroxine — chemistry, structure and functions (No structure elucidation).	**15**	Chalk and Talk, PPT, and quiz
V	**Lipids:** Occurrence, biological significance of fats, classification of lipids. **Simple lipids** – Oils and fats, chemical composition, properties, reactions– hydrolysis, hydrogenation, trans-esterification, saponification, rancidity; analysis of oils and fats –saponification number, iodine number, acid value, R.M. value. Distinction between animal and vegetable fats. **Compound lipids** – Lipoproteins - VLDL, LDL, HDL, chylomicrons – biological significance Cholesterol – occurrence, structure, test, physiological activity. Metabolism of lipids: β-oxidation of fatty acids	**15**	Chalk and Talk, PPT, and quiz
	Total hours	**75**	

Course Designers: 1. Mrs.V.Gokilaa

2. Dr.Mrs.S.Manimekalai.

Department of Chemistry						Class: III B.Sc		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**SE**	**Total**
V	DSEC I	23OCHDSE5B	Polymer Science	3	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1. To understand the classification of polymers, preparation of polymers
2. To learn about fundamental concept kinetics of polymerization and characterization of polymers
3. To gain knowledge analytical techniques used to characterize polymers
4. To understand about reactions of polymers
5. To outline the specialty polymers like PVC and PMMA

Course Content

UNIT -I Introduction: Difference between polymer and macromolecule – classification –synthetic and natural, organic and inorganic, thermoplastic and thermosetting. Plastics, elastomers, fibres and liquid resins. **Techniques of polymerization** Bulk, solution, emulsion and suspension polymerization

Unit -II Kinetics of polymerization: Kinetics of condensation and addition polymerisation; ionic, free radical, copolymerisation and coordination polymerisation – reactivity ratios – block and graft copolymers. **Characterization of polymers** Appearance, feel and hardness, density, effect of heat, solubility, combustion, tensile strength, shear, stress, impact strength, mechanical, thermomechanical and rheological properties polymers inviscoelastic state.

UNIT - III Molecular Weight and Properties of Polymers: Molecular Weight of Polymers-Number Average and Weight Average, Molecular Weight Distribution, Determination of Molecular Weight polydispersity index – membrane and vapour phase osmometry, light scattering -Zimm plot, ultracentrifuge – sedimentation velocity and sedimentation equilibrium – viscometry – gel permeation chromatography Thermal properties of polymers – Glass Transition Temperature-State of Aggregation and State of Phase Transitions, Factors InfluencingGlass Transition Temperature, Importance of Glass Transition Temperature, Heat Distortion Temperature, TGA / DTA. Crystallinity of Polymers: Crystalline Behaviour, Degree of Crystallinity.

UNIT – IV Reactions of Polymers: Hydrolysis, Acidolysis, Aminolysis, Addition and

Substitution Reactions (One Example Each) Cyclisation, Cross-Linking and Reactions of Specific FunctionalGroups in the Polymer. **Polymer technology** -Processing of polymers– casting thermoforming, moulding– extrusion, compression Blow moulding–foaming, lamination,reinforcing – processing of fibres – melt, wet and dry spinning.

UNIT - V Speciality polymers: Polyelectrolytes, conducting polymers, polymeric supports for solid phase synthesis, biomedical polymers, liquid crystalline polymers, electroluminescent polymers – two examples of each of these polymers. Polyethylene, PVC, PMMA, polyester; rubber – synthetic and natural, vulcanisation of rubber. .**Polymer Degradation** Types of Degradation - Thermal, Mechanical, Ultra Sound, Phot Radiation and Chemical Degradation Methods. Rubber-Natural and Synthetic-Structure, Mechanism of Vulcanisation Biodegradable and Non-Biodegradable Polymers.

Books for Study

1.Gowariker V.R, Viswanthan N.V. and Jayadev Sreedhar.(2015), " *PolymerScience*", New Age International, New Delhi

2. Misra G.S.(2010), "*Introductory Polymer Chemistry".* New Delhi:WileyEastern,

3. Bahadur P and Sastry N V, (2005), "*Principles of Polymer Science,*" Narosa Publishing House, NewDelhi:

4.Ahluwalia, V.K. Anuradha Mishra, (2008), "*Polymer Science A Text Book*",Ane Books New Delhi, India.

5. Morrison, R. R.; Boyd, R. N.; Bhattacharjee, S. K.(2011), "*OrganicChemistry",* seventh edition.; Pearson: New Delhi.

Books for Reference

1. Billmeyer, F.W.(2007), "*Polymer Science*", India: Wiley-Interscience,

2. Seymour,R.B.;Carraher Jr.C.E (1981), ".*Polymer Chemistry: An Introduction",* Marcel Dckker Inc, New York,

3. Sinha, R .(2000), "*Outlines of Polymer Technology",* Prentice Hall ofIndia: New Delhi,

4. Joel R. Fried, (2014) ,"*Polymer Science and Technology"*, third edition, Prentice Hall of India, New Delhi.

Web resources/E-books:

1. https://polymerdatabase.com
2. http://amrita.vlab.co.in/?sub=2&brch=190&sim=603&cnt=1
3. http://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/polymers.
4. .http://nsdl.niscair.res.in/bitstream/123456789/406/2/Molecular+weigh

Pedagogy:

Chalk and Talk method, Power point Presentations, Seminar, Group Discussion, Quiz, You tube Links, Open book test and Virtual Labs.

Rationale for nature of Course:

Knowledge and Skill:

This course will enable the students to acquire knowledge preparation of polymers, polymerization and characterization of polymers and polymers like PVC and PMMA

Activities to be given:

1. Power point presentation on the kinetics of polymerization and characterization of polymers.

COURSE LEARNING OUTCOMES (CLO's):

CLOs	Course Learning Outcomes Statements	Knowledge According to Bloom's Taxonomy (Upto K level)
CLO1	Explain the classification of polymers, elastomers, fibres and liquid resins	K1 to K3
CLO2	Discuss the addition and condensation polymerization, mechanical properties of polymers	K1 to K3
CLO3	Understand the basic concept molecular weight of polymers, and explain the thermal properties of polymers	K1 to K4
CLO4	Asses the reactions of polymers and polymer processing	K1 to K3
CLO5	Classify the speciality polymers like PVC, PMMA, rubbers, biodegradable polymers	K1 to K4

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Mapping of Course Learning Outcomes (CLO's) with Programme Outcomes (PO's)

CLO's	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	2	2	2	3	2
CLO2	3	2	2	1	3	2
CLO3	3	2	2	1	3	2
CLO4	3	2	1	3	3	2
CLO5	3	2	1	2	2	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

LESSON PLAN: TOTAL HOURS (75 Hrs)

UNIT	DESCRIPTION	HOURS	MODE
I	**Introduction**: Difference between polymer and macromolecule – classification –synthetic and natural, organic and inorganic, thermoplastic and thermosetting. Plastics, elastomers, fibres and liquid resins. **Techniques of polymerization** Bulk, solution, emulsion and suspension polymerization	**15**	Chalk and Talk, PPT, and quiz
II	**Kinetics of polymerization:** Kinetics of condensation and addition polymerisation; ionic, free radical, copolymerisation and coordination polymerisation – reactivity ratios – block and graft copolymers. **Characterisation of polymers.** Appearance, feel and hardness, density, effect of heat, solubility, combustion, tensile strength, shear, stress, impact strength, mechanical, thermomechanical and rheological properties polymers inviscoelastic state.	**15**	Chalk and Talk, PPT, quiz and You tube Links
III	**Molecular Weight and Properties of Polymers:** Molecular Weight of Polymers-Number Average and Weight Average, Molecular Weight Distribution, Determination of Molecular Weight polydispersity index – membrane and vapour phase osmometry, light scattering - Zimm plot, ultracentrifuge – sedimentation velocity and sedimentation equilibrium – viscometry – gel permeation chromatography Thermal properties of polymers – Glass Transition Temperature-State of Aggregation and State of Phase Transitions, Factors Influencing Glass Transition Temperature, Importance of Glass Transition Temperature, Heat Distortion Temperature, TGA / DTA. Crystallinity of Polymers: Crystalline Behaviour, Degree of Crystallinity	**15**	Chalk and Talk, PPT, and quiz
IV	**Reactions of Polymers**-Hydrolysis, Acidolysis, Aminolysis, Addition and Substitution Reactions (One Example Each) Cyclisation, Cross-Linking and Reactions of Specific Functional Groups in the Polymer **Polymer technology** Processing polymers– casting, thermoforming, mouldin – extrusion, compression Blow moulding–foaming, lamination, reinforcing – processing of fibres – melt, wet and dry spinning.	**15**	Chalk and Talk, PPT, and quiz
V	**Speciality polymers:** Polyelectrolytes, conducting polymers, polymeric supports for solid phase synthesis, biomedical polymers, liquid crystalline polymers, electroluminescent polymers – two examples of each of these polymers. Polyethylene, PVC, PMMA, polyester; rubber – synthetic and natural, vulcanisation of rubber. **Polymer Degradation** Types of Degradation - Thermal, Mechanical, Ultra Sound, Phot Radiation and Chemical Degradation Methods. Rubber-Natural and Synthetic-Structure, Mechanism of Vulcanisation Biodegradable and Non-Biodegradable Polymers.	**15**	Chalk and Talk, PPT, and quiz
	Total hours	**75**	

Course Designers: 1. Mrs.K.Punitha

2.Dr.(Mrs.)S.Manimekalai

Department of Chemistry						Class: III B.Sc		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**SE**	**Total**
V	DSEC II	23OUCHDSE5C	Industrial Chemistry	3	4	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1. To learn about classifications and characteristics of fuels
2. To understand the preparation of cosmetics
3. To gain the knowledge about manufacture of sugar, paper, cement and leather and food processing
4. To study about applications of abrasives
5. To gain knowledge on lubricants and other industrial products intellectual property rights

Course Content

UNIT -I Survey of Indian Industries and mineral resources in India: Fuels: Classification, characteristics of fuels. Solid fuels: coal - classification; analysis of coal-proximate analysis and ultimate analysis; calorific value-determination, carbonisation of coal, Liquid fuels: Petroleum - characteristics; Gasoline aviation petrol- knocking in internal combustion engines, antiknock agents; unleaded petrol-octane number, cetane number. Gaseous fuel: advantages over solid and liquid fuels; water gas, producergas, carburetted water gas - preparations - uses. Natural gas: LPG-composition, advantages, application; gobar gas-production, composition, advantages, application. Propellants – rocket fuels (basic idea)

UNIT-II Cosmetics: **Skin care**: powders, ingredients; creams and lotion-cleansing, moisturising, all purpose shaving cream, sunscreen; make up preparations. **Dental care**: tooth pastes – ingredients. **Hair care**: shampoos-types, ingredients; conditioners-types, ingredients. **Perfumes**: natural-plant origin-parts of the plant used, chief constituents; animal origin-amber gries, civetone and musk; synthetic-classification- esters-amylsalicylate alcohols-citronellol; terpeneols-gereniol and nerol; ketones-muskone, coumarin; aldehydes-vanilin.

Soaps and Detergents Soaps-properties, manufacture of soap-batch process; types-transparent soap, toilet soap, powder soap and liquid soap – ingredients. Detergents-definition, properties-cleansing action; soapless detergents-anionic, cationic and non-ionic (general idea only); uses

of detergents as surfactants. Biodegradability of soaps and detergents.

UNIT- III Sugar Industry: Manufacture from sugar cane; recovery of sugar from molasses; testing and estimation of sugar. **Food Preservation and processing** Food spoilage – causes; Food preservation - methods – high temperature, low temperature, drying, radiation; Food additives – preservatives, flavours, colours, anti-oxidants, sweetening agents; hazards of using food additives; Food standards – Agmark and Codex alimentarius.

UNIT- IV Abrasives: Definition, characteristics, types-natural and synthetic; natural abrasives – diamond, corundum, emery, garnet, quartz – composition, uses; synthetic abrasives – carborundum, aluminium carbide, boron carbide, boron nitride, synthetic graphite – composition and uses.

Leather Industry Structure and composition of skin, hide; Manufacture of leather – pre-tanning process – curing, liming, beating, pickling; methods of tanning- vegetable, chrome – one bath, two bath process; finishing. **Paper Industry** Manufacture of pulp - mechanical, chemical processes; sulphate pulp, rag pulp; manufacture of paper- beating, refining, filling, sizing, colouring,calendaring; cardboard.

UNIT- V Lubricants: Definition, classification-liquid, semi-solid, solid and synthetic; properties-viscosity index, flash point, cloud point, pour point, aniline point and drop point; greases-properties, types; cutting fluids, selection of lubricants. **Cement Industry** Cement – types, raw materials; manufacture-wet process, constituent of cement, setting of cement; properties of cement-quality, setting time, soundness, strength; mortar, concrete, RCC; curing and decay of concrete. **Intellectual Property Rights** Introduction to Intellectual Property Rights – Patents - Factors for patentability - Novelty, Non obviousness, Industrial applications - Patent offices in India: Trademark - Types of trademarks- Certification marks, logos, brand names, signatures, symbols and service marks

Books for study:

1. Sharma, B.K. (1998), "*Industrial Chemistry*, ninth edition .; Goel Publishing House:Meerut.
2. Wilkinson, J.B.E. Moore Harry's, R.J *(*1982*), Cosmeticology*, seventh edtion Chemical Publishers : New York.
3. Alex V. Ramani,(2009), "*Food Chemistry"*, MJP publishers: Chennai.
4. Jayashree Ghosh, (2006), " *Applied Chemsitry"*, S. Chand : New Delhi.
5. Srilakshmi, B.(2005), "*Food Science"* , fourth edition .; New Age International Publication,

Books for Reference

1. Jain, P.C.; Jain, M. (1992), "*Engineering Chemistry"*, sixteenth edition ·; Dhanapet Rai: New Delhi.
2. George Howard, (1987), "Principles *and Practice of Perfumes and Cosmetics"*, Stanley Therones, Cheltenham: UK,
3. Thankamma Jacob, (1997*), "Foods, Drugs and Cosmetics – A ConsumerGuide*," Macmillan, London,
4. ShankuntalaManay, N.; Shadaksharaswamy, M.(2008), "*Food Facts and Principles"*, Third edition, New Age Publication,
5. Neeraj Pandey, KhushdeepDharni, (2014*), " Intellectual Property Rights"*, PHILearning,

Web resources/E-books:

1.http://www.sciencecases.org/irradiation/irradiation_notes.asp

2.http://discovery.kcpc.usyd.edu.au//9.5.5/

3.https://www.wipo.int/aboutip/en/

4.www.nptel.ac in

Pedagogy:

Chalk and Talk method, Power point Presentations, Seminar, Group Discussion, Quiz, You tube Links, Open book test and Virtual Labs.

Rationale for nature of Course:

Knowledge and Skill:

This course will enable the students to acquire knowledge about classifications and characteristics of fuels, preparation of cosmetics, manufacture of sugar, paper, cement and leather and food processing and lubricants and other industrial products intellectual property rights

Activities to be given:

1. To prepare different types of soaps and detergents in laboratory

COURSE LEARNING OUTCOMES (CLO's):

CLOs	Course Learning Outcomes Statements	Knowledge According to Bloom's Taxonomy (Upto K level)
CLO1	Summarize the properties of fuels which include petroleum, water gas, natural gas and propellents	K1 to K3
CLO2	Evaluate cosmetic products, soaps and detergents.	K1 to K3
CLO3	Explain manufacture of sugar, food spoilages and food additives	K1 to K4
CLO4	Illustrate the properties of abrasives, manufacture of leather and paper	K1 to K3
CLO5	Discuss about the properties and manufacture of lubricants and cement, and intellectual property rights.	K1 to K4

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Mapping of Course Learning Outcomes (CLO's) with Programme Outcomes (PO's)

CLO's	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	2	2	2	3	2
CLO2	3	2	2	1	3	2
CLO3	3	2	2	1	3	2
CLO4	3	2	1	3	3	2
CLO5	3	2	1	2	2	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

LESSON PLAN: TOTAL HOURS (60 Hrs)

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

	detergents as surfactants. Biodegradability of soaps and detergents.		
III	**Sugar Industry:** Manufacture from sugar cane; recovery of sugar from molasses; testing and estimation of sugar. **Food Preservation and processing** Food spoilage – causes; Food preservation - methods – high temperature, low temperature, drying, radiation; Food additives – preservatives, flavours, colours, anti-oxidants, sweetening agents; hazards of using food additives; Food standards – Agmark and Codex alimentarius	**12**	Chalk and Talk, PPT, and quiz
IV	**Abrasives:** Definition, characteristics, types-natural and synthetic; natural abrasives – diamond, corundum, emery, garnet, quartz – composition, uses; synthetic abrasives – carborundum, aluminium carbide, boron carbide, boron nitride, synthetic graphite – composition and uses. **Leather Industry** Structure and composition of skin, hide; Manufacture of leather – pre-tanning process – curing, liming, beating, pickling; methods of tanning- vegetable, chrome – one bath, two bath process; finishing.**Paper Industry** Manufacture of pulp - mechanical, chemical processes; sulphate pulp, rag pulp; manufacture of paper-beating, refining, filling, sizing, colouring, calendaring; cardboard.	**12**	Chalk and Talk, PPT, and quiz
V	**Lubricants:** Definition, classification-liquid, semi-solid, solid and synthetic; properties-viscosity index, flash point, cloud point, pour point, aniline point and drop point; greases-properties, types; cutting fluids, selection of lubricants. **Cement Industry** Cement – types, raw materials; manufacture-wet process, constituent of cement, setting of cement; properties of cement-quality, setting time, soundness, strength; mortar, concrete, RCC; curing and decay of concrete. **Intellectual Property Rights** Introduction to Intellectual Property Rights – Patents - Factors for patentability - Novelty, Non obviousness, Industrial applications - Patent offices in India: Trademark - Types of trademarks- Certification marks, logos, brand names, signatures, symbols and service marks	**12**	Chalk and Talk, PPT, and quiz
	Total hours	**60**	

Course Designers: .Mrs.K.Punitha

Department of Chemistry						Class: III B.Sc		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**SE**	**Total**
V	DSEC II	**23OUCHD SE5D**	Environmental Chemistry	3	4	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1.To gain knowledge about the concepts and scope of environmental Chemistry, chemical and photo chemical reactions in the atmosphere.

2.To understand about corrosion of metals, textile industry and petrochemical industry.

3. To discuss about treatment of different types of trace elements.

4. To gain variety of experience and acquire a basic understanding of environment.

5. To motivate the students understand impact of covid-19 pandemic on water pollution.

Course Content

Unit – I Concept and Scope of Environmental Chemistry: a) Introduction – Nomenclature (Pollutant, contaminant, receptor ,speciation ,dissolved oxygen, chemical oxygen demand ,biological oxygen demand ,threshold limit value.

b) Environmental segments –atmosphere –Hydrosphere – Lithosphere –Biosphere. Composition of the atmosphere.

Unit-II Corrosion of Metals: Definition –disadvantages of corrosion theories of corrosion (dry or chemical and wet or electrochemical theories) prevention of corrosion (methods of preventing corrosion)- painting –coating with other metals (galvanizing ,tinning and electroplating)-anodizing-cathodic protection-corrosion inhibitors.

Unit –III Chemical Toxicology: Toxic chemicals in the Environment-impact of toxic chemicals on enzymes –biochemical effects of arsenic, lead, cadmium, mercury, carbon monoxide, sulphur dioxide cyanide, pesticides, ozone and PAN-carcinogens-bio-warfare agents. Environment and public health –pollution and public health issues –epidermiology-hygiene.

Unit –IV The State Of The Global Environment: The Earth Summits 1992,2002.

State of Global environment –the gulf wars and environment –the earth summits –human development and environmental clean –up- budget –myths and ground realities (Indian

context)-environmental politics and laws (India).

Unit -V Impact Of Covid -19 Pandemic On Environmental Pollution: Impact on air pollution –impact of covid -19 pandemic on water pollution –impact of covid -19 pandemic on ganga river pollution –D.O,B.O.D and C.O.D concentrations of ganga during lock down –the bacteriological quality of the ganga river during the lockdown period –reasons for improvement of water quality of ganga river during lockdown –key lessons from the lockdown and future perspective for pollution control –impact on other rivers.

Books for Study

1.De.A.K., (2010), "*Environmental chemistry"*, New Age International (P)Ltd, New Delhi.

2.Sharma.B.K, .Karur.H., (1997), "*Environmental Chemistry"*, Goel Publishing House, Meerut.

Books for Reference

1. Dutta.V, Sharma.U., Kumar.R..,(2020), "*Environmental concerns and Sustainable development"*, Springer, Singapore.

2.Our Planet, UNEP Magazine ,Vol 4,No.2,1992, Nairobi.

Web resources/E-books:

1. **https://www.publish.csiro.au/en**
2. **https://www.chemistry.uoc.gr/xhm405/Environmental-Chemistry.pdf**
3. **https://cpur.in/library/Books/10.Enviornmental%20Chemistry.pdf**
4. **https://www.routledge.com/Environmental-Chemistry-Eleventh-Edition/Manahan/p/book/9780367560546?srsltid=AfmBOopz7Zt7q5BK6AsT3QQgKyT9zFWTB0syYwJ4cCGQ57BOgYjyyFwb**

Pedagogy:

Chalk and Talk method, Power point Presentations, Seminar, Group Discussion, Quiz, You tube Links, Open book test and Virtual Labs.

Rationale for nature of Course:

Knowledge and Skill:

This course will enable the students to acquired knowledge about the corrosion of metal, chemical toxicology and how to analyse environmental pollution of impact of Covid-19 pandemic.

Activities to be given:

1.To make experiment on prevent corrosion by chemical method.

COURSE LEARNING OUTCOMES (CLO's):

CLO's	Course Learning Outcomes Statements	Knowledge According to Bloom's Taxonomy (Upto K level)
CLO1	Explain the structure and composition of earth sphere	K1 to K3
CLO2	Examine the prevention of corrosion	K1 to K3
CLO3	Analyse the impact of toxic chemicals	K1 to K4
CLO4	Explain the effect of human activities on the environment	K1 to K3
CLO5	Discuss about BOD and COD test for water samples	K1 to K4

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Mapping of Course Learning Outcomes (CLO's) with Programme Outcomes (PO's)

CLO's	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	2	2	2	3	2
CLO2	3	2	2	1	3	2
CLO3	3	2	2	1	3	2
CLO4	3	2	1	3	3	2
CLO5	3	2	1	2	2	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

LESSON PLAN: TOTAL HOURS (60 Hrs)

UNIT	DESCRIPTION	HOURS	MODE
I	**Concept and Scope of Environmental Chemistry** a)Introduction – Nomenclature (Pollutant, contaminant, receptor ,speciation ,dissolved oxygen, chemical oxygen demand ,biological oxygen demand ,threshold limit value. b) Environmental segments –atmosphere –Hydrosphere – Lithosphere –Biosphere. Composition of the atmosphere.	12	Chalk and Talk, PPT, and quiz
II	**Corrosion of Metals:** Definition –disadvantages of corrosion theories of corrosion (dry or chemical and wet or electrochemical theories) prevention of	12	Chalk and Talk, PPT, and quiz

	corrosion (methods of preventing corrosion)- painting –coating with other metals (galvanizing ,tinning and electroplating)-anodizing-cathodic protection-corrosion inhibitors.		
III	**Chemical Toxicology** Toxic chemicals in the Environment-impact of toxic chemicals on enzymes – biochemical effects of arsenic, lead,cadmium,mercury,carbon monoxide ,sulphur dioxide ,cyanide ,pesticides, ozone and PAN-carcinogens-bio-warfare agents. Environment and public health –pollution and public health issues –epidermiology-hygiene.	12	Chalk and Talk, PPT, quiz and You tube Links
IV	**The State Of The Global Environment : The Earth Summits 1992, 2002.** State of Global environment –the gulf wars and environment –the earth summits –human development and environmental clean –up- budget –myths and ground realities (Indian context)-environmental politics and laws (India).	12	Chalk and Talk, PPT, quiz and You tube Links
V	**Impact Of Covid -19 Pandemic On Environmental Pollution:** Impact on air pollution –impact of covid -19 pandemic on water pollution –impact of covid -19 pandemic on ganga river pollution –D.O,B.O.D and C.O.D concentrations of ganga during lock down –the bacteriological quality of the ganga river during the lockdown period –reasons for improvement of water quality of ganga river during lockdown –key lessons from the lockdown and future perspective for pollution control –impact on other rivers.	12	Chalk and Talk, PPT, quiz and You tube Links
	Total hours	**60**	

Course Designers: 1. Dr.Mrs.A.Ramya

2.Dr.Mrs.S.Manimekalai

Department of Chemistry						Class: III B.Sc		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**SE**	**Total**
V	Project	23OUCHPR5	Project with viva-voce	4	4	20	80	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓	✓	

Students have to carry out Project Works under the guidance of the members of the Chemistry Department during V semester 4 hours per week. PROJECT Work may be chosen in any field in Chemistry. Each batch will complete the project work in the month of August and submit their report in November. It will be duly signed by the project guide and the HOD of Chemistry. It will be evaluated 80 marks for external examiner and 20 marks for internal examiner. The viva on project work will be conducted during the Practical Examination at the end of V semester. The viva on project will be conducted jointly by Guide, External Examiner, HOD and the members of staff.

Department of Chemistry						Class: III B.Sc		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**SE**	**Total**
VI	Core Course 8	**23OUCH61**	Organic Chemistry -II	3	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1. To gain the knowledge on classification, isolation and discussing the properties of alkaloids and terpenes
2. To explain the preparation and properties of saccharides
3. To acquire knowledge about biomolecules
4. To understand the mechanism of different molecular rearrangement
5. To study the preparation and properties of organometallic compounds

Course Content:

Unit-I Alkaloids Classification, isolation, general properties- Hofmann Exhaustive Methylation; Structural elucidation – Coniine, piperine and nicotine. **Terpenes:** Classification, Isoprene rule, isolation and structural elucidation of Citral, Menthol and Geraniol.

Unit-II Carbohydrates Definition and Classification of Carbohydrates with examples. relative configuration of sugars. Determination of configuration (Fischer's Proof). Definition of enantiomers, diastereomers, epimers and anomers with suitable examples.

Monosaccharides– configuration – D and L hexoses – aldohexoses and ketohexoses. Glucose, Fructose – Occurrence, preparation, properties, reactions,structural elucidation, uses. Interconversions of sugar series – ascending, descending, aldose toketose and ketose to aldose. **Disaccharides** – sucrose, lactose, maltose - preparation, properties and uses (no structural elucidation).

Polysaccharides – Source, constituents and biological importance of homo polysaccharides- starch and cellulose, hetero polysaccharides –hyaluronic acid, heparin.

Unit –III Molecular rearrangements: Molecular Rearrangement: Type of rearrangements, Mechanism for Benzidine, Favorskii, Clasien, Fries, Hofmann, Curtius, Schmidt and Beckmann, Pinacol-pinacolone rearrangement.

Unit -IV Special reagents in organic synthesis: AIBN, 9BBN, BINAP/BINOL, BOC,

DABCO, DCC, DIBAL, DMAP, NBS/NCS, NMP, PCC, TEMPO. **Organometallic compounds in Organic Synthesis** Preparation, Properties and applications: Grignard Reagents, Organo Lithium Compounds, Ziegler –Natta,Wilkinson, Metal Carbonyl, Zeisel's Salt.

Unit -V Green Chemistry: Principles, chemistry behind each principle and applications in chemical synthesis. Green reaction media – green solvents, green reagents and catalysts; tools used like microwave and ultra-sound in chemical synthesis.

Books for study:

1. Jain. M.K., Sharma. S. C., (2009), "*Modern Organic Chemistry*," Fourth reprint. Vishal Publishing,

2.Mukherji. S.M., and Singh. S.P., (2009), *"Reaction Mechanism inorganic Chemistry,"*Third edition. Macmillan India Ltd.,

3. Arun Bahl and Bahl. B.S., (2012), " *Advanced Organic Chemistry*," Multicolour edition S.Chand & Company Pvt. Ltd, New Delhi,.

4. Soni. P. L., and Chawla. H. M., (2007), *" Text Book of Organic Chemistry*," Twenty ninth edition Sultan Chand & Sons, New Delhi.

Book for Reference:

1. Morrison.R.T., and Boyd.R.N.,(2012), "O*rganic Chemistry*," Sixth edition Pearson Education,Asia..

2. Graham Solomons.T.W.,(2012*),"Organic Chemistry*," Eleventh edition John Wiley & sons.

3. Carey Francis.A.,(2009),"*Organic Chemistry*," Seventh edition, Tata McGraw-Hill Education Pvt. Ltd., New Delhi.

4. Finar. I.L., (2006), "*Organic Chemistry*," Sixth edition, Vol. (1& 2), Wesley Longman Ltd, England,

5. Joule.J.A., and Smith.G.F., (2010), "*Heterocyclic Chemistry*," Fifth Edition Wiley.

Web resources/E-books:

1. www.epgpathshala.nic.in
2. www.nptel.ac.in
3. http:/swayam.gov.in
4. https://vlab.amrita.edu/

Pedagogy:

Chalk and Talk method, Power point Presentations, Seminar, Group Discussion, Quiz, You tube Links, Open book test and Virtual Labs.

Rationale for nature of Course:

Knowledge and Skill:

This course will enable the students to acquire knowledge about alkaloids carbohydrate, Reactivity and Mechanisms, organometallic compounds in organic synthesis, sustainable and green practices.

Activities to be given:

1. Power point presentation on the synthesis of Coniine.
2. To construct a mechanistic step in the synthesis involving a Hofmann rearrangement.

COURSE LEARNING OUTCOMES (CLO's):

CLOs	Course Learning Outcomes Statements	Knowledge According to Bloom's Taxonomy (Upto K level)
CLO1	Assign RS notations to chirals and EZ notations to olefins and explain conformations ofethane and butane.	K1 to K3
CLO2	Explain preparation and properties of aromatic and aliphatic nitro compounds and amines	K1 to K3
CLO3	Explain colour and constitution of dyes and food additives	K1 to K4
CLO4	Discuss preparation and properties of five membered heterocycles like pyrrole, furan and Thiophene	K1 to K3
CLO5	Illustrate the preparation and properties of six membered eterocycles like pyridine,quinoline and isoquinoline	K1 to K4

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Mapping of Course Learning Outcomes (CLO's) with Programme Outcomes (PO's)

CLO's	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	2	2	2	3	2
CLO2	3	2	2	1	3	2
CLO3	3	2	2	1	3	2
CLO4	3	2	1	3	3	2
CLO5	3	2	1	2	2	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

LESSON PLAN: TOTAL HOURS (75 Hrs)

UNIT	DESCRIPTION	HOURS	MODE
I	**Alkaloids:** Classification, isolation, general properties- Hofmann ExhaustiveMethylation; Structural elucidation - Coniine, piperine, nicotine.**Terpenes:** Classification, Isoprene rule, isolation and structural elucidation of Citral,, Menthol Geraniol and Camphor.	**15**	Chalk and Talk, PPT, and quiz
II	**Carbohydrates:** Definition and Classification of Carbohydrates with examples. relative configuration of sugars. Determination of configuration (Fischer's Proof). Definition of enantiomers, diastereomers, epimers and anomers with suitable examples. **Monosaccharides**– configuration – D and L hexoses – aldohexoses and ketohexoses. Glucose, Fructose – Occurrence, preparation, properties, reactions,structural elucidation, uses. Interconversions of sugar series – ascending, descending, aldose toketose and ketose to aldose. **Disaccharides** – sucrose, lactose, maltose - preparation, properties anduses (no structural elucidation).**Polysaccharides** – Source, constituents and biological importance of homopolysaccharides- starch and cellulose, heteropolysaccharides – hyaluronic acid, heparin.	**15**	Chalk and Talk, PPT, quiz and You tube Links
III	**Molecular rearrangements:** Molecular Rearrangement: Type of rearrangements, Mechanism for Benzidine, Favorskii, Clasien, Fries,Hofmann, Curtius, Schmidt and Beckmann, Pinacol-pinacolone rearrangement	**15**	Chalk and Talk, PPT, quiz and You tube Links
IV	**Special reagents in organic synthesis:** AIBN, 9BBN, BINAP/BINOL, BOC, DABCO, DCC, DIBAL, DMAP, NBS/NCS, NMP, PCC, TEMPO. **Organometallic compounds in Organic Synthesis** Preparation, Properties and applications:Grignard Reagents, Organo Lithium Compounds, Ziegler –Natta, Wilkinson, Metal Carbonyl, Zeise's Salt.	**15**	Chalk and Talk, PPT, quiz and You tube Links
V	**Green Chemistry:** Principles, chemistry behind each principle and applications in chemical synthesis. Green reaction media – green solvents, green reagents and catalysts; tools used like microwave and ultra-sound in chemical synthesis.	**15**	Chalk and Talk, PPT, quiz and You tube Links
	Total Hours	**75**	

Course Designers: 1. Mrs.V.Gokilaa

2.Dr.Mrs.S.Manimekalai

Department of Chemistry						Class: III B.Sc		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**SE**	**Total**
VI	Core Course 9	23OUCH62	Inorganic Chemistry -II	3	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1. To understand the tracer elements and their role in the biological system.
2. To acquire knowledge on iron transport and storage
3. To gain knowledge on metalloenzymes and oxygen transport.
4. To study the silicates and their applications
5. To learn about the industrial applications of refractories, alloys, paints and pigments

Course Content:

UNIT I Bioinorganic Chemistry-Essential and trace elements: Role of Na^+, K^+, Mg^{2+}, Ca^{2+}, Fe^{2+}, Cu^{2+} and Zn^{2+} in biological systems. Effect of excess intake (Toxicity) of Metal ions – trace elements - As, Cd, Pb and Hg.

UNIT II Metal ion transport and storage- Iron – storage, transport - Transferrin and Ferretin; Iron-porphyrins – myoglobin, haemoglobin – oxygen transport - Bohr effect; Sodium/potassium pump, calcium pump; transport and storage - copper and zinc.

UNIT III Metalloenzymes-Isomerase and synthetases, structure of cyanocobalamin (Vitamin B_{12}), nature of Co-C bond; Metalloenzymes - functions of carboxy peptidase A, zinc metalloenzyme – mechanism and uses, Zn- Cu enzyme - structure and function, carbonic anhydrase, Vitamin B_{-12} as transferase and isomerase – Iron-sulphur proteins - 2Fe-2S – rubredoxin, 4Fe-2S – ferridoxin, Iron sulphur cluster enzymes. Invivo and Invitro nitrogen fixation – biological functions of nitrogenase and molybdo enzymes.

UNIT IV Silicates - Introduction – general properties of silicates, structure – types of silicates– ortho silicates(zircon), pyrosilicates (thortveitite), chain silicates (pyroxenes), ring silicates(beryl), sheet silicates (talc, mica,asbestos), silicates having three dimensional structure (feldspars, zeolites, ultramarines).

UNIT V Industrial Applications of Inorganic Compounds -Refractories, pyrochemical, explosives. Alloys, Paints and pigments - requirements of a good paint; classification,

constituents of paints – pigments, vehicles, thinners, driers, extenders, anti-knocking agents, anti- skinning agents, plasticizers, binders-application; varnishes- oils, spirit; enamels. Nanocomposite Hydrogels: synthesis, characterization and uses. Industrial visits and internship mandatory.

Books for study:

1. Puri B R, Sharma L R, Kalia K C (2011), "*Principles of Inorganic Chemistry*", Thirty first Edition, Milestone.
2. Tuli.G.d., Basu.S.K., Madan.R.D., (2009), "*Advanced Inorganic Chemistry"*, Publishers & Distributors, Delhi.
3. Chand. S & Co., (1945), "*Advanced Inorganic Chemistry"*, Eighteenth Edition, New Delhi.
4. Lee J D, (1991), "*Concise Inorganic Chemistry"*, Fourth Edition, ELBS, William Heinemann, London.
5. Malik. M.V., Tuli.G.D., and Madan.R.D., (2000), "*Selected Topics in Inorganic Chemistry*", S.Chand and Company Ltd, Delhi.
6. De.A.k., (1992), "*Text book of Inorganic Chemistry"*, Seventh Edition, Wiley East Ltd, Chennai.

Books for Reference

1. Madan R D, Sathya Prakash, (2003), "*Modern Inorganic Chemistry"*, Second Edition, S.Chand Company, New Delhi.
2. Gopalan R, (2009), "*Inorganic Chemistry for Undergraduates"*, First Edition, University Press (India) Private Limited, Hyderabad.
3. Sivasankar B, (2013), "*Inorganic Chemistry",* First Edition, Pearson,Chennai.
4. Alan G. Sharp (1992), "*Inorganic Chemistry"*, Third Edition, Addition Wesley, England.
5. Peter Atkins, Tina Overton, Jonathan Rourke and Mark Weller, (2014), "*Inorganic Chemistry"*, sixth edition, Oxford University Press, India.

Web resources/E-books:

1. www.epgpathshala.nic.in
2. www.nptel.ac.in
3. http:/swayam.gov.in

Pedagogy:

Chalk and Talk method, Power point Presentations, Seminar, Group Discussion, Quiz, You tube Links, Open book test and Virtual Labs.

Rationale for nature of Course:

Knowledge and Skill:

This course will enable the students to acquire knowledge about the role of metal ions and its function, structure and function of HB, MB, Zn-Cu enzyme activity, applications of varnishes, paints and hydrogels.

Activities to be given:

1. Power point presentation on the concept of silictaes and its types.
2. To construct the structure and function of Hb and Mb.

COURSE LEARNING OUTCOMES (CLO's):

CLOs	Course Learning Outcomes Statements	Knowledge According to Bloom's Taxonomy (Upto K level)
CLO1	Explain the importance of tracer elements on biological system.	K1 to K3
CLO2	Determine the metal ion transport, Bohr effect, Na, K, Ca pump.	K1 to K3
CLO3	Explain the function of Vitamin B12, Zn-Cu enzyme, ferredoxin, cluster enzymes.	K1 to K4
CLO4	Classify the types of silicates	K1 to K3
CLO5	Discuss about the manufacture of refractories, explosives, paints and pigments	K1 to K4

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Mapping of Course Learning Outcomes (CLO's) with Programme Outcomes (PO's)

CLO's	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	2	2	2	3	2
CLO2	3	2	2	1	3	2
CLO3	3	2	2	1	3	2
CLO4	3	2	1	3	3	2
CLO5	3	2	1	2	2	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

LESSON PLAN: TOTAL HOURS (75 Hrs)

UNIT	DESCRIPTION	HOURS	MODE
I	**Bioinorganic Chemistry**-Essential and trace elements: Role of Na^+,K^+,Mg^{2+},Ca^{2+},Fe^{2+},Cu^{2+} and Zn^{2+} in biological systems. Effect of excess intake (Toxicity) of Metal ions – trace elements - As, Cd, Pb, Hg.	**15**	Chalk and Talk, PPT, and quiz
II	**Metal ion transport and storage-** Iron – storage, transport - Transferrin and Ferretin; Iron-porphyrins – myoglobin, haemoglobin – oxygen transport - Bohr effect; Sodium/potassium pump, calcium pump; transport and storage - copper and zinc.	**15**	Chalk and Talk, PPT, quiz and You tube Links
III	**Metallo enzymes-** Isomerase and synthetases, structure of cyanocobalamin (Vitamin B_{12}), nature of Co-C bond; Metalloenzymes - functions of carboxy peptidase A, zinc metalloenzyme – mechanism and uses, Zn- Cu enzyme - structure and function, carbonic anhydrase, Vitamin B_{12} as transferase and isomerase – Iron-sulphur proteins - 2Fe-2S – rubredoxin, 4Fe-2S – ferridoxin, Iron sulphur cluster enzymes. Invivo and Invitro nitrogen fixation – biological functions of nitrogenase and molybdo enzymes.	**15**	Chalk and Talk, PPT, and quiz
IV	**Silicates -** Introduction – general properties of silicates, structure – types of silicates– ortho silicates(zircon), pyrosilicates (thortveitite), chain silicates(pyroxenes), ring silicates(beryl), sheet silicates(talc, mica,asbestos), silicates having three dimensional structure (feldspars, zeolites, ultramarines)	**15**	Chalk and Talk, PPT, and quiz
V	**Industrial Applications of Inorganic Compounds -** Refractories, pyrochemical, explosives. Alloys, Paints and pigments - requirements of a good paint;classification, constituents of paints – pigments, vehicles, thinners, driers, extenders, anti-knockingagents, anti- skinning agents, plasticizers, binders-application; varnishes- oils, spirit; enamels.Nanocomposite Hydrogels: synthesis, characterization and uses. Industrial visits and internship mandatory	**15**	Chalk and Talk, PPT, and quiz
	Total hours	**75**	

Course Designers: 1. Dr.Mrs.A.Ramya

2. Dr.Mrs.S.Manimekalai

Department of Chemistry						Class: III B.Sc		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**SE**	**Total**
VI	Core Course 10	23OUCH63	Physical Chemistry -II	3	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1. To enable phase diagram of one and two component systems
2. To provide knowledge on chemical equilibrium,
3. To build on their knowledge on separation techniques for binary liquid mixtures.
4. To gain knowledge about electrical conductance and transport number.
5. To understand the galvanic cells, EMF and significance of electrochemical series.

Course Content

UNIT I Phase rule - Definition of terms; derivation of phase rule ; application to one component systems – water and sulphur- super cooling, sublimation ; two component systems – solid liquid equilibria- simple eutectic (lead - silver and bismuth - cadmium), freezing mixtures (potassium iodide- water), compound formation with- congruent melting points (magnesium – zinc and ferric chloride – water system), peritectic change (sodium – potassium), solid solution (gold-silver); copper sulphate – water system.

UNIT II Chemical equilibrium- Law of mass action – thermodynamic derivation – relationship between Kp and Kc –application to the homogeneous equilibria – dissociation of PCl_5 gas,N_2O_4 gas –equilibrium constant and degree of dissociation - formation of HI, NH_3 ,and SO_3 –heterogeneous equilibrium – decomposition of solid calcium carbonate –Le chatelier principle – van't Hoff reaction isotherm – temperature dependence of equilibrium constant – van't Hoff reaction isochore – Clayperon equation –Clausius Clayperon equation and its applications.

UNIT III Binary liquid mixtures-Ideal liquid mixtures – non ideal solutions – azeotropic mixtures – fractional distillation – partially miscible mixtures – phenol-water, triethyl amine-water, nicotine-water – effect of impurities on criticalsolution temperature; immiscible liquids-steam distillation; Nernst distribution law – applications

UNIT IV Electrical Conductance and Transference- Electrolytic conductance- specific conductance- equivalent conductance- molar conductance-Ionic mobility-Discharge of ions on electrolysis (Hittorf's theoretical devices)-Transport number-determination of transport number by Hittorf's method-moving boundary method- Kohirausch's Law-Applications-Applications of conductance measurements-determination of –degree of dissociation of weak electrolyte-Ionic product of water-Oswald's dilution law-Debye Huckel Theory--strong electrolytes-Debye Huckel Onsager Equation -Interionic effects.

UNIT V-Galvanic Cells and Applications: Galvanic cell, representation, reversible and irreversible cells, EMF and its measurement –sign of EMF and spontaneity of a reaction, thermodynamics and EMF – calculation of ΔG, ΔH, and ΔS from EMF data; reversible electrodes, electrode potential, standard electrode potential, Nernst equation for electrode potential and cell EMF; types of electrodes- electrochemical series – applications of electrochemical series.- concentration cells with and without transport. Applications of EMF measurements: potentiometric titrations – acid base titrations, redox titrations-Industrial component: Galvanic cells- lead storage, Fuel cells.

Books for study

1. Puri. B.R. and L.R. Sharma, (2021), "*Principles of Physical Chemistry"*, Forty Eighth Edition, ShobanLal Nagin Chand and Co., Chandigarh.
2. Peter Atkins, Julio de Paula and James Keeler, (2018), "*Physical Chemistry"*, Eleventh Edition, Oxford University press, International, UK.
3. Arun Bahl, B.S. Bahl, G. D. Tuli, (2019), "*Essentials of Physical Chemistry"*, Twenty Eighth Edition S.Chand & Co.
4. Dogra. S. K. and Dogra. S., (1996), "*Physical Chemistry through Problems*," fourth edition. New Age International" India.
5. Rajaram.J and Kuriacose.J.C., (1986), "*Thermodynamics*", Shoban Lal Nagin Chand and CO. Kottayam.

Books for Reference

1. K. L. Kapoor, (2009), "*A Textbook of Physical Chemistry*", Third Edition, Macmillan India.
2. Gilbert. W. Castellen, (1985), "*Physical Chemistry*", Third Edition, Narosa Publishing House.
3. P. W. Atkins, and Julio de Paula, (2002), "*Physical Chemistry*", Seventh edition, Oxford University press. New York.
4. Puri. B.R., Sharma. L.R. and Pathania. M.S., (2001), "*Principles of Physical Chemistry"*, Forty Fifth Edition, Shobanlal Nagin Chand and Co. Jalendhar, Delhi.

5. Bajpai. D.N., (2001), "*Advanced Physical Chemistry",* S.Chand & Co.

Web resources/E-books:

1. https://nptel.ac.in

2. https://swayam.gov.in

3.https://archive.nptel.ac.in/content/strage2/course112108150/pdf/PPTs/MTS_07_m.pdf

4.https://www.youtube.com/watch?v=f0udxGcoztE

Pedagogy:

Chalk and Talk method, Power point Presentations, Seminar, Group Discussion, Quiz, You tube Links, Open book test and Virtual Labs.

Rationale for nature of Course:

Knowledge and Skill:

This course will enable the students to acquired knowledge about phase rule, chemical equilibrium and galvanic cell and its applications.

Activities to be given:

1. To prepare Power point presentation on the concept of Clausius-Clayperon equation.

2. To construct the structure and function of EMF measurements

COURSE LEARNING OUTCOMES (CLO's):

CLOs	Course Learning Outcomes Statements	Knowledge According to Bloom's Taxonomy (Upto K level)
CLO1	Construct the phase diagram for one component and two component systems, explain the properties of freezing mixture, component with congruent melting points and solid solutions.	K1 to K3
CLO2	Apply the concepts of chemical equilibrium in dissociation of PCl_5. Demonstrate important principles such as Le-Chatelier principle, Van't Hoff reaction isotherm and Clausius-Clayperon equation.	K1 to K3
CLO3	Identify an appropriate distillation method for the separation of binary liquid mixturessuch as azeotropic mixtures, partially miscible mixtures and immiscible liquids.	K1 to K4
CLO4	Explain the significance of Arrhenius theory, Debye-Huckel theory, Onsager equationand Kohlrausch's law in conductance.	K1 to K3
CLO5	Explain about the efficiency of fuel cell	K1 to K4

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Mapping of Course Learning Outcomes (CLO's) with Programme Outcomes (PO's)

CLO's	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	2	2	2	3	2
CLO2	3	2	2	1	3	2
CLO3	3	2	2	1	3	2
CLO4	3	2	1	3	3	2
CLO5	3	2	1	2	2	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

LESSON PLAN: TOTAL HOURS (75 Hrs)

UNIT	DESCRIPTION	HOURS	MODE
I	**Phase rule -** Definition of terms; derivation of phase rule ; application to one component systems – water and sulphur- super cooling, sublimation ; two component systems – solid liquid equilibria- simple eutectic (lead - silver and bismuth - cadmium), freezing mixtures (potassium iodide-water), compound formation with- congruent melting points (magnesium – zinc and ferric chloride – water system), peritectic change (sodium – potassium), solid solution (gold-silver); copper sulphate – water system.	**15**	Chalk and Talk, PPT, and quiz
II	**Chemical equilibrium-** Law of mass action – thermodynamic derivation – relationship between Kpand Kc –application to the homogeneous equilibria – dissociation of PCl_5 gas,N_2O_4 gas –equilibrium constant and degree of dissociation - formation of HI, NH_3 ,and SO_3 –heterogeneous equilibrium – decomposition of solid calcium carbonate –Lechatelier principle – van't Hoff reaction isotherm – temperature dependence of equilibrium constant – van't Hoff reaction isochore – Clayperon equation –ClausiusClayperon equation and its applications.	**15**	Chalk and Talk, PPT, quiz and You tube Links
III	**Binary liquid mixtures-**Ideal liquid mixtures – non ideal solutions – azeotropic mixtures – fractional distillation – partially miscible mixtures – phenol-water, triethyl amine-water, nicotine-water – effect of impurities on critical solution temperature; immiscible liquids- steam distillation; Nernst distribution law – applications	**15**	Chalk and Talk, PPT, and quiz
IV	**Electrical Conductance and Transference-** Arrhenius theory of electrolytic dissociation – Ostwald's dilution law, limitations of Arrhenius theory; behavior of strong electrolytes – interionic effects – Debye Huckel theory – Onsager equation (noderivation), significance of Onsager	**15**	Chalk and Talk, PPT, and quiz

	equation, Debye Falkenhagen effect, Wien effect. Ionic mobility – Discharge of ions on electrolysis (Hittorf's theoretical device), transport number –determination – Hittorf's method, moving boundary method – factors affecting transport number–determination of ionic mobility; Kohlrausch's law- applications; molar ionic conductance and viscosity (Walden's rule);applications of conductance measurements – determination of - degreeof dissociation of weak electrolyte, dissociation constant of weak acidand weak base, ionic product of water, solubility and solubility product of sparingly soluble salts conductometric titrations – acid base titrations.		
V	**Galvanic Cells and Applications:** Galvanic cell, representation, reversible and irreversible cells, EMF and its measurement –sign of EMF and spontaneity of a reaction, thermodynamics and EMF – calculation of ΔG, ΔH, and ΔS from EMF data; reversible electrodes, electrode potential, standard electrode potential, Nernst equation for electrode potential and cell EMF; types of electrodes- electrochemical series – applications of electrochemical series.- concentration cells with and without transport;**Applications of EMF measurements:**potentiometric titrations – acid base titrations, redox titrations-**Industrial component:**Galvanic cells- lead storage, Fuel cells.	**15**	Chalk and Talk, PPT, and quiz
	Total	**75**	

Course Designers: 1.Dr.Mrs.A.Ramya

2.Mrs.K.Punitha

Department of Chemistry						Class: III B.Sc chemistry		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**SE**	**Total**
VI	Core Course lab	23OUCH6P	Physical Chemistry Practical – II	3	4	40	60	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓	✓	

Course Objectives:

1. To gain knowledge on principles of physical chemistry experiments
2. To provide hands on experience in carrying out the experiments

Course Content:

Unit- I Phase diagrams (15 hours)

1. Simple eutectic - determination of eutectic temperature and composition of naphthalene-diphenyl amine or naphthalene-diphenyl system
2. Determination of transition temperature of a salt hydrate.
3. Determination of upper critical solution temperature of phenol –water system
4. Effect of an electrolyte on miscibility temperature of phenol –watersystem
5. Determination of concentration of sodium chloride using phenol- sodium chloride system

Unit- II Distribution law (15 hours)

1. Determination of the distribution coefficient of iodine between carbon tetrachlorine and water.
2. Determination of equilibrium constant of the reaction

$$I_2 + I \rightarrow I_3$$

3. Determination of concentration of the given potassium iodide solution using the above equilibrium constant.

Unit- III Electrochemistry (15 hours)

1. Conductometric titration of hydrochloric acid against sodiumhydroxide
2. Potentiometric titration of ferrous ion against potassium dichromate using quinhydronde electrode.

Books for Reference:

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

2. Khosla, B. D. Garg,V. C.; Gulati, A. (2011), "*Senior PracticalPhysicalChemistry"*, New Delhi.

3.Gupta, Renu, (2017), " *Practical Physical Chemistry",* first edition ·; New Age, New Delhi.

Web resources/E-books:

1. https://www.vlab.co.in/broad-area-chemical-sciences

Pedagogy: Chalk and Talk method, Power point Presentations, Seminar, Group Discussion, Quiz.

LESSON PLAN: TOTAL HOURS (60 Hrs)

S.No	Description	Hrs	Mode
1	Introduction	5	Chalk and Talk
2	Experiments	5	Demonstration
3	Simple eutectic - determination of eutectic temperature and composition of naphthalene-diphenyl amine or naphthalene-diphenyl system	4	Discussion, Procedure with illustration
4	Determination of transition temperature of a salt hydrate.	4	Discussion, Procedure with illustration
5	Determination of upper critical solution temperature of phenol –water system	4	Discussion, Procedure with illustration
6	Effect of an electrolyte on miscibility temperature of phenol –watersystem	4	Discussion, Procedure with illustration
7	Determination of concentration of sodium chloride using phenol-sodium chloride	4	Discussion, Procedure with illustration
8	Determination of the distribution coefficient o iodinebetween carbon tetrachlorine and water.	4	Discussion, Procedure with illustration
9	Determination of equilibrium constant of the reaction $I_2 + I \rightarrow I_3$	4	Discussion, Procedure with illustration
10	Determination of concentration of the given potassium iodide solution using the above equilibrium constant.	4	Discussion, Procedure with illustration
11	Conductometric titration of hydrochloric acid against sodiumhydroxide	4	Discussion, Procedure with illustration
12	Potentiometric titration of ferrous ion against potassium dichromate using quinhydronde electrode	4	Discussion, Procedure with illustration
13	Model	10	
	Total hours	60	

Course Designers: 1.Dr.(Mrs).S.Manimekalai

2. Mrs.K.Punitha

EVALUATION (PRACTICAL*)*

Internal (Formative) : 40 marks

External (Summative) : 60 marks

Total :100 marks

Question Paper Pattern for Internal Practical Examination: 40 Marks

S.No	**Components**	**Marks**
1.	For completion of the experiment	5
2	Lab Performance	5
3.	Graph	5
4.	Tabulation and Calculation	10
5.	Viva	5
6.	Result	10
	Total	**40**

Question Paper Pattern for External Practical Examination (Major): 60 Marks

S.No	**Components**	**Marks**
1.	For completion of the experiment	15
2.	Graph	5
3.	Tabulation and Calculation	10
4.	Viva	10
5.	Result	10
6.	Record	10
	Total	**60**

In respect of external examinations passing minimum is **35% for Under Graduate** Courses and in total, **aggregate of 40%.**

Latest amendments and revisions as per **UGC** and **TANSCHE** norm is taken into consideration to suit the changing trends in the curriculum.

Department of Chemistry						Class: III B.Sc		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**SE**	**Total**
VI	DSEC III	23OUCHDSE6A	Nano Science	3	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1. To understand the nanoparticles/clusters and nanocomposites
2. To acquire knowledge about the properties of nanomaterials
3. To understand the knowledge about nanomaterials by different methods
4. To discuss about semiconductor nanoparticles
5. To outline the carbon nanotubes, graphene, quantum dots, self- assembled nanomaterials applications of nanomaterials as sensors

Course Content

UNIT I Introduction to nanoscience: Definition of terms – nanoscience, nanoparticles, clusters, quantum dots, nanostructures and nanocomposites. Electron behaviour in free space, bulk material and nanomaterials. Synthesis and stabilization of nanomaterials -Top down approach (physical methods), mechanical dispersion – ball milling, methods based on evaporation of a precursor-inert gas condensation, ion sputtering,spray pyrolysis, aerosol synthesis-nanolithography. Bottom–up approach (chemical methods) - sol-gel method, hydrothermal method, sonochemical synthesis, nanomaterials via chemical routes- solvents reducing agents, capping agents- common stabilizers, nanoparticle growth in solution.

UNIT II Properties of materials on a nanoscale: Optical properties of metal and semiconductor nanomaterials- surface Plasmon resonance (SPR), surface enhanced Raman spectra (SERS), quantum confinement effect, tuning of optical spectrum. Magnetic properties - Fe_3O_4 particle, supra magnetic properties, Electronic properties, Chemical properties- chemical process on the surface of nanoparticles, catalysis, mechanical properties.

UNIT III Techniques employed for characterization of nanomaterials: Spectrocopy – UV-visible– Electron microscopy – Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Atomic Force Microscopy (AFM), Optical microscopy – confocal microscopy, X-ray diffraction (XRD) [Principle and Block diagram

only].

UNIT IV Special nanomaterials: Carbon Nano Structures Carbon nanotubes: Introduction - types – zigzag, armchair, helical, synthesis by CVD, Functionalization of Carbon Nanotubes, Reactivity of Carbon Nanotubes, Field emisson, Fuel Cells, Display devices .Other Important Carbon based materials: Preparation an Characterization, Graphene, properties and Applications- Semiconductor nanoparticles: Quantum dots, synthesis – chemical synthesis using clusters, properties, porous silicon – electrochemical etching, aerogel – types – silica aerogel, zeolites – applications. Self Assembled Nanomaterials: Self Assembled Monolayers (SAMS).

UNIT V Application of nanomaterials: Biomedical Applications- drug, drug delivery, biolabelling, artificial implants, cancer treatment Sensors– nanoscale sensors, chemical sensors, biosensors, electronic noses. Optics & Electronics – Nanomaterials in the next generation computer technology, high definition TV, L E D - flat panel displays, quantum dot laser, single electron transistors [SET]. Nanotechnology in agriculture – Fertilizer and pesticides nanomaterials for water purification, nanomaterials in food and packaging materials, fabric industry. Impacts of Nanotechnology – human & environmental safety risks.

Books for Study

1.Sulabha K. Kulkarni, (2009), "*Nanotechnology: Principles and Practices"*, Capital Publishing Co., New Delhi.

2.Pradeep. T, (2007), "*Nano: The Essentials, Understanding Nanoscience and Nanotechnology"*; Tata Mc, Graw-Hill Publishing Company Limited, New Delhi.

3.Shah. M.A. and Tokeer Ahmad, (2010), "*Principles of Nanoscince and Nanotechnology"*; Narosa Publishing House, New Delhi.

4. Murthy. B.S; Shankar. P, Baldev Raj.; Rath. B.B. JamesMurday, (2012), "*Textbook of Nanoscience and Nanotechnology"*; Universities press,India Ltd, Hyderabad.

Books for Reference

1. Sharma. P.K., (2008), "*Understanding Nanotechnology*", Vista International Publishing House, Delhi.

2. Charles P. Poole Jr.; Frank J. Owens. (2003), "*Introduction to Nanotechnology";* A John Wiley & Sons, INC., Publication.

3. Viswanathan B., (2009), "*Nano Materials";* Narosa Publishing House, NewDelhi.

4. Rao. C.N.R., Muller.A; Cheetham. A.K., "*Nanomaterials Chemistry Recent Developments and New Directions"*, WILEY-VCH Verlag GMBH & Co.,KGaA, Darmstad.

*5.*Jing Zhong Zhang, (2008), "*Optical properties and spectroscopy of Nanomaterials"*; World

Scientific Publishing Pvt. Ltd., Singapore.

Web resources/E-books:

1. http://www.nanotechnology.com/docs/wtd015798.pdf
2. http://nccr.iitm.ac.in/Nanomaterials.pdf

Pedagogy:

Chalk and Talk method, Power point Presentations, Seminar, Group Discussion, Quiz, You tube Links, Open book test and Virtual Labs.

Rationale for nature of Course:

Knowledge and Skill:

This course will enable the students to acquired knowledge about nanomaterials ans nanoscale and its characterization.

Activities to be given:

1. Power point presentation on the concept of synthesis, characterize and application of nanomaterials

COURSE LEARNING OUTCOMES (CLO's):

CLOs	Course Learning Outcomes Statements	Knowledge According to Bloom's Taxonomy (Upto K level)
CLO1	Explain the general concepts and physical phenomena of relevance within the field on nanoscience.	K1 to K3
CLO2	Describe the properties, synthesis, characteristics of nanomaterials, specialnanomaterials and applications.	K1 to K3
CLO3	Examine the structure, properties, applicability and characterization of nanomaterials.	K1 to K4
CLO4	Analyze the various synthesis procedures, characterizations and uses of carbon nanotubes,fullerene and grapheme.	K1 to K3
CLO5	Discuss applications of nanomaterials of sensors and in optics and electronics	K1 to K4

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Mapping of Course Learning Outcomes (CLO's) with Programme Outcomes (PO's)

CLO's	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	2	2	2	3	2
CLO2	3	2	2	1	3	2
CLO3	3	2	2	1	3	2
CLO4	3	2	1	3	3	2
CLO5	3	2	1	2	2	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

LESSON PLAN: TOTAL HOURS (75 Hrs)

UNIT	DESCRIPTION	HOURS	MODE
I	Definition of terms – nanoscience, nanoparticles, clusters, quantum dots, nanostructures and nanocomposites. Electron behaviour in free space, bulk material and nanomaterials. Synthesis and stabilization of nanomaterials-Top down approach (physical methods), mechanical dispersion – ball milling, methods based on evaporation of a precursor-inert gas condensation, ion sputtering, spray pyrolysis, aerosol synthesis-nanolithography. Bottom–up approach (chemical methods) - solvothermal synthesis, sonochemical synthesis, electro deposition, sol-gel method, nanomaterials via chemical routes- solvents reducing agents, capping agents-stabilization of nanoparticles - electrostatic and steric stabilization, common stabilizers, nanoparticle growth in solution, templated growth.	15	Chalk and Talk, PPT, and quiz
II	**Properties of materials on a nanoscale-** Optical properties of metal and semiconductor nanomaterials- surfacePlasmon resonance (SPR), surface enhanced Raman spectra (SERS),quantum confinement effect, tuning of optical spectrum. Magneticproperties - Fe_3O_4 particle, supra magnetic properties,Electronic properties, Chemicalproperties- chemical process on the surface of nanoparticles, catalysis, mechanical properties.	15	Chalk and Talk, PPT, quiz and You tube Links
III	**Techniques employed for characterization of nanomaterials- S**pectrocopy – UV-visible– Electron microscopy – Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Atomic Force Microscopy (AFM), Optical microscopy – confocal microscopy, X-ray diffraction (XRD) [Principle and Block diagram only].	15	Chalk and Talk, PPT, and quiz
IV	**Special nanomaterials-C**arbon Nano Structures Carbon nanotubes: Introduction - types - zigzag,armchair, helical, synthesis by CVD, Functionalization of Carbon	15	Chalk and Talk, PPT, and quiz

	Nanotubes, Reactivity of Carbon Nanotubes, Field emisson, Fuel Cells,Display devices .Other Importan Carbon based materials: Preparation an Characterization Fullerene, Graphene, properties,DL Cand nanodiamonds and ApplicationsSemiconductor nanoparticles: Quantum dots, synthesis – chemical synthesis using clusters, properties, porous silicon – electrochemical etching, aerogel – types – silica aerogel, resorcinol formaldehyde (RF) aerogels, zeolites – applications. Self Assembled Nanomaterials: Self Assembled Monolayers (SAMS) – inorganic, organic molecules.		
V	**Application of nanomaterials-** Biomedical Applications- drug, drug delivery, biolabelling, artificial implants, cancer treatment Sensors– Natural nanoscale sensors, chemical sensors, biosensors, electronic noses.Optics & Electronics – Nanomaterials in the next generation computer technology, high definition TV, L E D - flat panel displays, quantum dot laser, single electron transistors [SET].Nanotechnology in agriculture – Fertilizer and pesticides nanomaterials for water purification, nanomaterials in food and packaging materials, fabric industry. Impacts of Nanotechnology – human & environmental safety risks.	**15**	Chalk and Talk, PPT, and quiz
	Total Hours	**75**	

Course Designers: 1.Dr.Mrs.A.Ramya

2. Mrs.K.Punitha

Department of Chemistry						Class: III B.Sc		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**SE**	**Total**
VI	DSEC III	23OUCHDSE6B	Fundamental of Spectroscopy	3	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1.To acquire knowledge about electrical and magnetic properties of organic and inorganic compounds

2.To understand the basic principles of microwave, UV-Visible, infrared, Raman, NMR and Mass spectrometry

3. To study the instrumentation of microwave, UV-Visible, infrared and Raman, NMR and Mass spectrometry

4. To learn about applications of various spectral technique structural elucidation

5. To outline the solving combined spectral problems

Course Content

UNIT- I Electrical and Magnetic properties of molecules: Dipole moment – polar and nonpolar molecules – polarizability of molecules. Application of dipole moments in the study of organic and inorganic molecules. Magnetic permeability, volume susceptibility, mass susceptibility and molar susceptibility; diamagnetism, paramagnetism – determination of magnetic susceptibility using Guoy balance, ferromagnetism, anti- ferromagnetism **Microwave spectroscopy** Rotation spectra - diatomic molecules (rigid rotator approximation) selection rules – determination of bond length, effect of isotopic substitution – instrumentation and applications.

UNIT - II Ultraviolet and Visible spectroscopy: Electronic spectra of diatomic molecules (Born Oppenheimer approximation) - vibrational coarse structure – rotational fine structure of electronic vibration transitions – Frank Condon principle –dissociation in electronic transitions –Birge Sponer method of evaluation of dissociation energy – pre-dissociation transition - σ -σ *, π- π*, n-σ*, n-π* transitions. Applications of UV-Woodward – Fieser rules as applied to conjugated dienes and α, β - unsaturated ketones. Elementary Problems. Colorimetry - principle and applications (estimation of Fe^{3+}).

UNIT- III Infrared spectroscopy : Vibration spectra –diatomic molecules – harmonic oscillator and anharmonic oscillator; Vibration – rotation spectra – diatomic molecule as rigid rotator anharmoni Oscillator (Born-Oppenheimer approximation oscillator) - selection rules, vibrations of polyatomic molecules – stretching and bending vibrations – applications – determination of force constant, moment of inertia and inter nuclear distance – isotopic shift – application of IR spectra to simple organic and inorganic molecules – (group frequencies.) **Raman Spectroscopy** Rayleigh scattering and Raman scattering of light – Raman shift –classical theory of Raman effect – quantum theory of Raman effect – Vibrational Raman spectrum – selection rules – mutual exclusion principle – instrumentation (block diagram) – applications.

UNIT- IV Nuclear magnetic resonance spectroscopy: PMR – theory of PMR – instrumentation - number of signals – chemical shift – peak areas and proton counting – spin-spin coupling – applications. Problems related to shielding a n d deshielding of protons, chemical shifts of protons in hydrocarbons, and in simple mono functional organic compounds; spin-spin splitting of neighbouring protons in vinyl and allyl systems.

UNIT- V Mass spectrometry: Principle – different kinds of ionisation – instrumentation – the mass spectrum – types of ions – determination of molecular formula- fragmentation and structural elucidation – McLafferty rearrangement; Retro Diels Alder reaction - illustrations with simple organic molecules. Solving structure elucidation problems using multiple spectroscopic data (NMR, MS, IR and UV-Vis).

Books for study

1.Sharma, B.K. (1998), "*Industrial Chemistry"*, nineth edtion.; Goel Publishing House, Meerut.

2. Wilkinson, J.B.E. Moore, R.J. *Harry's (*1982), *"Cosmeticology"*, seventh edition.; Chemical Publishers :New York.

3. Alex V. Ramani, (2009) , " *Food Chemistry"*, MJP publishers: Chennai.

4. Jayashree Ghosh, (2006), "*Applied Chemistry"*, S. Chand : New Delhi.

5. Srilakshmi, B .(2005), "*Food Science*", fourth edition .; New Age International Publication.

Books for Reference

1.Jain, P.C.; Jain, M. (1992), "*Engineering Chemistry"*, sixteenth edition ·; Dhanapet Rai: New Delhi.

2. George Howard,(1987), "*Principles and Practice of Perfumes and Cosmetics"*,Stanley

Therones, Cheltenham: UK.

3.Thankamma Jacob,(1997) "*Foods, Drugs and Cosmetics" – A Consumer Guide*, Macmillan London.

4.ShankuntalaManay, N.; Shadaksharaswamy,(2008) , " *Food Facts and Principles"*, Third edition.; New Age Publication.

5. Neeraj Pandey, KhushdeepDharni,(2014), "*Intellectual Property Rights"*,, PHI Learning.

Web resources/E-books:

1.http://www.sciencecases.org/irradiation/irradiation_notes.asp

2.http://discovery.kcpc.usyd.edu.au//9.5.5/

3.https://www.wipo.int/aboutip/en/4.www.nptel.ac.in

4.http:/swayam.gov.in

Pedagogy:

Chalk and Talk method, Power point Presentations, Seminar, Group Discussion, Quiz, You tube Links, Open book test and Virtual Labs.

Rationale for nature of Course:

Knowledge and Skill:

This course will enable the students to acquired knowledge about Electrical and Magnetic properties of molecules, Ultraviolet and Visible Spectroscopy Infrared spectroscopy, Nuclear magnetic resonance spectroscopy and Mass spectrometry

Activities to be given:

To interpret the organic compounds using IR and NMR spectroscopy

COURSE LEARNING OUTCOMES (CLO's):

CLOs	**Course Learning Outcomes Statements**	**Knowledge According to Bloom's Taxonomy (Upto K level)**
CLO1	Explain electrical and magnetic properties of materials and microwave spectroscopy	K1 to K3
CLO2	Discuss about the theory, instrumentation and applications of Infrared and Raman spectroscopy	K1 to K3
CLO3	Apply selection rules to understand spectral transitions, explain Woodward – Fieser's rule for the calculation of wavelength maximum of conjugated dienes	K1 to K4
CLO4	Determination the theory, instrumentation and applications of NMR spectroscopy	K1 to K3
CLO5	Illustrate the theory, instrumentation and applications of Mass spectrometry	K1 to K4

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Mapping of Course Learning Outcomes (CLO's) with Programme Outcomes (PO's)

CLO's	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	2	2	2	3	2
CLO2	3	2	2	1	3	2
CLO3	3	2	2	1	3	2
CLO4	3	2	1	3	3	2
CLO5	3	2	1	2	2	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

LESSON PLAN: TOTAL HOURS (75 Hrs)

UNIT	DESCRIPTION	HOURS	MODE
I	**Electrical and Magnetic properties of molecules** Dipole moment – polar and nonpolar molecules – polarisability of molecules. Application of dipole moments in the study of organic and inorganic molecules. Magnetic permeability, volume susceptibility, mass susceptibility and molar susceptibility; diamagnetism, paramagnetism – determination of magnetic susceptibility using Guoy balance, ferromagnetism, anti ferromagnetism Microwave spectroscopy Rotation spectra - diatomic molecules (rigid rotator approximation)selection rules – determination of bond length, effect of isotopic substitution – instrumentation and applications	**15**	Chalk and Talk, PPT, and quiz
II	**Ultraviolet and Visible spectroscopy** Electronic spectra of diatomic molecule (Born Oppenheimer approximation) - vibrational coarse structure – rotational fine structure of electronic vibration transitions – Frank Condon principle – dissociation in electronic transitions – BirgeSponermethod of evaluation of dissociation energy – pre-dissociation transition - σ -σ *, π- π*, n-σ*, n-π* transitions. Applications of UV-Woodward – Fieser rules as applied to conjugated dienes and α, β - unsaturated ketones. Elementary Problems. Colorimetry - principle and	**15**	Chalk and Talk, PPT, quiz and You tube Links

	applications (estimation of Fe^{3+}).		
III	**Infrared spectroscopy** Vibration spectra –diatomic molecules – harmonic oscillator andanharmonic oscillator; Vibration – rotation spectra – diatomic molecule as rigid rotator anharmoni Oscillator (Born-Oppenheimer approximation oscillator) - selection rules, vibrations of polyatomic molecules – stretching and bending vibrations – applications – determination of force constant, moment of inertia and inter nuclear distance – isotopic shift – application of IR spectra to simple organic and inorganic molecules – (group frequencies.) **Raman Spectroscopy** Rayleigh scattering and Raman scattering of light – Raman shift –classical theory of Raman effect – quantum theory of Raman effect – Vibrational Raman spectrum – selection rules – mutual exclusion principle – instrumentation (block diagram) – applications.	**15**	Chalk and Talk, PPT, and quiz
IV	**Nuclear magnetic resonance spectroscopy** PMR – theory of PMR – instrumentation - number of signals – chemical shift – peak areas and proton counting – spin-spin coupling – applications. Problems related to shielding and deshielding of protons, chemical shifts of protons in hydrocarbons, and in simple monofunctional organic compounds; spin-spin splitting of neighbouring protons in vinyl and allyl systems.	**15**	Chalk and Talk, PPT, and quiz
V	**Mass spectrometry** Principle – different kinds of ionisation – instrumentation – the mass spectrum – types of ions – determination of molecular formula- fragmentation and structural elucidation – McLafferty rearrangement; Retro Diels Alder reaction - illustrations with simple organic molecules.Solving structure elucidation problems using multiple spectroscopic data (NMR, MS, IR and UV-Vis).	**15**	Chalk and Talk, PPT, and quiz
	Total hours	**75**	

Course Designers: .1. Mrs.K.Punitha

2.Dr.Mrs.S.Manimekalai

Department of Chemistry						Class: III B.Sc		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**SE**	**Total**
VI	DSEC IV	23OUCHDSE6C	Pharmaceutical Chemistry	3	4	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓	✓	

Course Objectives:

1.To outline the fundamental concept of drugs design and drug metabolism

2.To acquire knowledge on important Indian medicinal plants, common diseases and antibiotics

3.To learn about drugs for major diseases like cancer, diabetes and AIDS

4.To study the knowledge on analgesics and antipyretic agents

5.To understand the knowledge about significance of clinical tests

Course Content

Unit - I Introduction - important terminologies – drug, pharmacognosy, pharmacy, pharmacology, pharmacodynamics, pharmacokinetics, clinical pharmacology, pharmacotherapeutics, chemotherapy, toxicology, pharmacophore, antimetabolites, mutation, bacteria, virus, fungi, vaccines, and therapeutic index. Sources of drugs – dosage forms – bio availability – routes of administration –absorption, distribution and elimination of drugs – drug metabolism –prescription terms. **Structure and pharmacological activity** -Effect of – unsaturation, chain length, isomerism; groups - halogens amino, nitro, nitrite, cyano, acidic, aldehydic, keto, hydroxyl and alkyl groups. **Development of Drugs**-Development of a drug – classic steps- lead compounds- comparison of traditional and modern methods of development of drugs – drug design by method of variation – disjunction and conjunction methods.

Unit - II Indian medicinal plants -Some important Indian medicinal plants – tulsi, neem, kizhanelli,mango, semparuthi, adadodai, turmeric and thoothuvalai – uses. **Common diseases and their treatment -** Causes, prevention and treatment of the following diseases:Insect borne diseases– malaria, filariasis, plague;Air borne diseases– diphtheria, whooping cough,

influenza, measles, mumps, common cold, tuberculosis; Water borne diseases – cholera, typhoid , dysentery. Digestive system – jaundice; Respiratory system – asthma; Nervous system – epilepsy. **Antibiotics** Definition–classification –structure and therapeutic uses of chloramphenicol,penicillins; therapeutic uses of ampicillin, streptomycin, erythromycin, tetracycline, rifamycin.

Unit - III Drugs for major diseases - Cancer – common causes – chemotherapy – anti neoplastic agents - classification –adverse effects of cytotoxic agents; alkylating agents – chlorambucil; anti metabolites – methotrexate, fluouracil ; Vinca alkaloids – vincristine, vinblastine. Diabetes– types – management of diabetes – insulin; oral hypoglycemic agents -sulphonyl ureas – metformin – thiazolidinediones. Cardiovascular drugs Aldomet. pentoliniumtartarate; vasodilator-tolazoline hydrochloride, sodium nitroprusside. AIDS – causes, symptoms and prevention – anti HIV drugs - AZT, DDC.

Unit - IV Analgesics and Anaesthetics - Analgesics - Classification – action of analgesics – narcotic analgesics –morphine. synthetic analgesics – pethidine, methadone; antipyretic analgesics –salicylic acid derivatives. .**Anaesthetics** - Definition, characteristics, classification - general anaesthetics – volatile anaesthetics - nitrous oxide, ethers, cyclopropane,chloroform,, trichloro ethylene– storage, advantages and disadvantages ; non volatileanaesthetics – thiopental sodium ; local anaesthetics –requisites – advantages- esters – cocaine, benzocaine ; amides –lignocaine, cinchocaine. **Blood and haemotological agents**-Blood– composition, grouping – physiological functions of plasma proteins – mechanism of clotting; Coagulants – vitamin K, protamine sulphate, dry thrombin; Anti coagulants – coumarins, citric acid and heparin; anti fibrinolytic agents – aminocaproic acid and tranexamic acid. Anaemia– causes, types and control – anti anaemic drugs.

Unit - V Clinical Chemistry - Blood tests – blood count – complete haemotogram – Hb, RBC, DC, platelets, PCV, ESR; bleeding and clotting time –- glucosetolerance test. **Significance of Clinical Tests -** Serum electrolytes - blood Glucose - orthotoluidine method**;** Renal functions tests - bloodurea, creatinine; liver function tests – serum proteins, albumin globulin ratio,serum bilirubin, enzymes SGOT, SGPT; lipid profile – cholesterol, triglycerides, HDL, LDL, coronary risk index. Urine examination – pH, tests for glucose, albumin and bile pigment.

Books for study:

1. Jayashree Ghosh, (1999), "*A text book of pharmaceutical chemistry*," Second edition, S.Chand & company, New Delhi.

2. Lakshmi S, (2004), "*Pharmaceutical chemistry*," Third edition, Sultan Chand & Sons, Delhi.

3. Tripathi K D, (2018), *"Essentials of medical pharmacology*," Eighth edition, Jaypee brothers medical publishers (P) Limited, New Delhi.

4. Ashutosh Kar, (2018), *"Medicinal Chemistry*" Seventh edition New age ,International Private Limited, Publishers, New Delhi.

Books for Reference:

1.Chatwal G R, (2013), " *Pharmaceutical chemistry-inorganic,"* (vol-I) Sixth edition, Himalaya publishing house, Bombay.

2.Chatwal G R, (1991), "*Pharmaceutical chemistry-organic,"* (vol-II)., Himalaya publishing house, Bombay.

3. Patrick G, (2002), "*Instant Notes Medicinal Chemistry*," Viva Books Private Limited, New Delhi.

Web resources/E-books:

1.http://www.pharmacy.umaryland.edu/faculty/amackere/courses/pha r5

2._delete/lectures/qsar_1.pdf

3.http://www.indianmedicinalplants.info/

4.https://www.wipo.int/about-ip/en/

Pedagogy:

Chalk and Talk method, Power point Presentations, Seminar, Group Discussion, Quiz, You tube Links, Open book test and Virtual Labs.

Rationale for nature of Course:

Knowledge and Skill:

This course will enable the students to acquire knowledge about the Basic terminologies and Concepts in Pharmacology, Structure-Activity Relationship, Analgesics, Anaesthetics, and Blood Drugs, Clinical Chemistry and Diagnostic Tests**.**

Activities to be given:

1.To make a chart of common diseases and map them to their respective drugs.

2. To find out the uses of medicinal plants.

COURSE LEARNING OUTCOMES (CLO's):

CLOs	Course Learning Outcomes Statements	Knowledge According to Bloom's Taxonomy (Upto K level)
CLO1	Define the pharmaceutical terminologies; describe the principles in pharmacological activity, drug development, clinical chemistry and trademarks.	K1 to K3
CLO2	Discuss the development of drugs, structural activity, disease types, physio-chemical properties of therapeutic agents, significance of medicinal plants. clinicaltests and factors for patentability.	K1 to K3
CLO3	Apply the principle involved in structural activity and drug designing, functions of haematological agents; estimation of clinical parameters and therapeutic application of drugs for major diseases.	K1 to K4
CLO4	Explain the classification of analgesics and anasthetics, and physiological functions of plasma proteins.	K1 to K3
CLO5	Summarize the significance of clinical tests like blood urea, serum proteins and coronary risk index	K1 to K4

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Mapping of Course Learning Outcomes (CLO's) with Programme Outcomes (PO's)

CLO's	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	2	2	2	3	2
CLO2	3	2	2	1	3	2
CLO3	3	2	2	1	3	2
CLO4	3	2	1	3	3	2
CLO5	3	2	1	2	2	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

Annexure-13

LESSON PLAN: TOTAL HOURS (60 Hrs)

UNIT	DESCRIPTION	HOURS	MODE
I	**Introduction** - important terminologies – drug, pharmacognosy, pharmacy, pharmacology, pharmacodynamics, pharmacokinetics, clinical pharmacology, pharmacotherapeutics, chemotherapy, toxicology, pharmacophore, antimetabolites, mutation, bacteria, virus, fungi, actinomycetes, vaccines, pharmacopeia, posology and therapeutic index.Sources of drugs – dosage forms – bio availability – routes ofadministration –absorption, distribution and elimination of drugs – drug metabolism –prescription terms. Structure and pharmacological activity -Effect of – unsaturation, chain length, isomerism; groups - halogens amino, nitro, nitrite, cyano, acidic, aldehydic, keto, hydroxyl and alkyl groups.Development of Drugs-Development of a drug – classic steps- lead compounds- comparison oftraditional and modern methods of development of drugs – drug design by method of variation – disjunction and conjunction methods.	12	Chalk and Talk, PPT, and quiz
II	**Indian medicinal plants** -Some important Indian medicinal plants – tulsi, neem, kizhanelli,mango, semparuthi, adadodai, turmeric and thoothuvalai – uses.Common diseases and their treatment - Causes, prevention and treatment of the following diseases:Insect borne diseases– malaria, filariasis, plague;Air borne diseases– diphtheria, whooping cough, influenza, measles, mumps, common cold, tuberculosis; Water borne diseases – cholera, typhoid , dysentery. Digestive system – jaundice; Respiratory system – asthma; Nervous system – epilepsy.Antibiotics Definition–classification –structure andtherapeutic uses of chloramphenicol. penicillins ; therapeutic uses of ampicillin, streptomycin, erythromycin, tetracycline, rifamycin.	12	Chalk and Talk, PPT, quiz and You tube Links
III	Drugs for major diseases - Cancer – common causes – chemotherapy – anti neoplastic agents - classification –adverse effects of cytotoxic agents ; alkylating agents – chlorambucil ; anti metabolites – methotrexate, fluouracil ; Vincaalkaloids-vincristine, vinblastine.Diabetes– types – management of diabetes – insulin; oral hypoglycemic agents –sulphonylureas -metformin – thiazolidinedione Cardiovascular drugsAldomet,pentoliniumtartarate; vasodilator-tolazoline hydrochloride, sodium nitroprusside.AIDS – causes, symptoms and prevention – anti HIV drugs - AZT, DDC.	12	Chalk and Talk, PPT, quiz and You tube Links
IV	**Analgesics and anaesthetics agents** - Classification – action of analgesics – narcotic analgesics –morphine;synthetic analgesics – pethidine, methadone; antipyretic analgesics –salicylicacid derivatives, Anaesthetics - Definition, characteristics, classification - general anaesthetics – volatile anaesthetics – nitrous oxide, ethers, cyclopropane,chloroform, trichloro ethylene– storage, advantages and disadvantages ; non volatileanaesthetics – thiopental sodium ; local anaesthetics –requisites – advantages- esters – cocaine, benzocaine ; amides –lignocaine, cinchocaine.Blood and haemotological agents-Blood– composition, grouping – physiological functions of plasma proteins – mechanism of clotting; Coagulants – vitamin K, protamine sulphate, dry thrombin; Anti coagulants – coumarins, citric acid and heparin; antifibrinolytic agents – aminocaproic acid and tranexamic acid.Anaemia– causes, types and control – anti anaemic drugs.	12	Chalk and Talk, PPT, quiz and You tube Links

V	**Clinical Chemistry** - Blood tests – blood count – complete haemotogram – Hb, RBC, GTT,TC, DC, platelets, PCV, ESR; bleeding and clotting time –- glucosetolerance test. Significance of Clinical Tests - Serum electrolytes - blood Glucose - orthotoluidine method; Renal functions tests - bloodurea, creatinine; liver function tests – serum proteins, albumin globulin ratio,serum bilirubin, enzymes SGOT, SGPT; lipid profile – cholesterol, triglycerides, HDL, LDL, coronary risk index. Urine examination – pH, tests for glucose, albumin and bilepigment.	12	Chalk and Talk, PPT, quiz and You tube Links
	Total hours	60	

Course Designers: 1.Mrs.V.Gokila

2. Dr.Mrs.A.Ramya

Department of Chemistry						Class: III B.Sc		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**SE**	**Total**
VI	DSEC IV	23OUCHDSE 6D	Non-Conventional & Renewable Sources of Energy	3	4	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1.To gain knowledge on Energy sources and their availability

2.To learn about solar energy

3.To study about solar energy storage

4.To understand Wind Energy & Energy from Ocean

5.To acquire knowledge about Geothermal Energy, Energy from Biomass & Bio Fuels

Course Content

Unit-I Introduction: Energy sources and their availability- renewable and non-renewable sources of energy- conventional energy sources- non-conventional sources of energy- population growth and energy use- conservation of energy- energy planning- reasons for the requirement of non-conventional energy sources.

Unit-II Solar Energy-I: Solar energy- solar radiation at the earth's surface- solar energy collectors- physical principles of the conversion of solar radiation into heat- solar energy collectors-non-concentrating and concentrating collectors

Unit-III Solar Energy-II: A) Solar energy storage- thermal storage- electrical storage- chemical storage- thermochemical energy storage B) Applications of solar energy- solar water heating- solar cooking - solar thermal electric conversion- solar electric power generation (photo-voltaic cells) -.-agriculture and industrial process of heating-

Unit-IV Wind Energy & Energy from Ocean: A) Wind Energy: wind energy conversion- wind energy collector- advantages and disadvantages of wind energy- applications of wind energy. **B) Energy from Oceans**: methods of ocean thermal electric power Generation-Claude

cycle and Anderson cycles energy from tides-basic principle of tidal power- advantages and disadvantages of tidal power generation- prospects of tidal energy in India, Wave energy- advantages and disadvantages of wave energy.

Unit-V Geothermal Energy, Energy from Biomass & Bio Fuels: A) Geothermal Energy: Geothermal sources- hydrothermal- geopressure-magma- advantages and disadvantages of geothermal energy- geothermal energy in India. B) Energy from biomass: Biomass resources- biomass generation- biogas plant used in India- biomass gasification. C) Bio fuels: Ethanol to substitute petrol- fuel from sorghum- petrocrops an alternative to future fuels.

Books for study:

1.Rajput.R.K., (2012), "*Non-Conventional Energy Sources*", first edition, S.Chand Publishers India.

2.Begamudre R. D.(2000), " *Energy Conversions Systems",* New Age International Publishers, New Delhi, India,

3.Desai A. K. And Munasinghe M. (1990), " *Nonconventional Energy",* New Age International, New Delhi, India,

Books for Reference:

1.Rai G.D., (1992), "*Non-Conventional Energy Sources*", Second Edition, Kanna Publications New Delhi,

2. Sharma B.K.,(1997) "*Environmental Chemistry*", Goel Publishing House, Meerut.

3. Kudesia.V.P,(2003) " *Environmental Chemistry*, " 2nd Edition, Pragati Prakashan, Meerut.

Web resources/E-books:

1.https://beeindia.gov.in/sites/default/files/4Ch12.pdf

2.https://unstats.un.org/unsd/envaccounting/londongroup/meeting13/LG13_13a.pdf

3. https://www.energy.gov/eere/wind/advantages-and-challenges-wind-energy

Pedagogy:

Chalk and Talk method, Power point Presentations, Seminar, Group Discussion, Quiz, You tube Links, Open book test and Virtual Labs.

Rationale for nature of Course:

Knowledge and Skill:

This course will enable the students to acquire knowledge about the Basic Energy sources, solar energy, solar energy storage and Geothermal Energy, Energy from Biomass & Bio Fuels

Activities to be given:

1.To make power point presentation on solar energy system.

COURSE LEARNING OUTCOMES (CLO's):

CLOs	Course Learning Outcomes Statements	Knowledge According to Bloom's Taxonomy (Upto K level)
CLO1	Define the renewable and non-renewable sources of energy	K1 to K3
CLO2	Discuss the physical principles of the conversion of solar radiation into heat.	K1 to K3
CLO3	Apply the solar energy and solar water heating	K1 to K4
CLO4	Explain the advantages and disadvantages of wind energy	K1 to K3
CLO5	Summaries the Ethanol to substitute petrol- fuel from sorghum- petrocrops an alternative to future fuels	K1 to K4

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Mapping of Course Learning Outcomes (CLO's) with Programme Outcomes (PO's)

CLO's	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	2	2	2	3	2
CLO2	3	2	2	1	3	2
CLO3	3	2	2	1	3	2
CLO4	3	2	1	3	3	2
CLO5	3	2	1	2	2	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

LESSON PLAN: TOTAL HOURS (60 Hrs)

UNIT	DESCRIPTION	HOURS	MODE
I	**Introduction** - Energy sources and their availability- renewable and non-renewable sources of energy- conventional energy sources- non-conventional sources of energy-population growth and energy use- conservation of energy- energy planning- reasons for the requirement of non-conventional energy sources.	12	Chalk and Talk, PPT, and quiz
II	**Solar Energy-I:** Solar energy- solar radiation at the earth's surface- solar energy collectors- physical principles of the conversion of solar radiation into heat- solar energy collectors-non-concentrating and concentrating collectors	12	Chalk and Talk, PPT, quiz and You tube Links
III	**Solar Energy-II:** A) Solar energy storage- thermal	12	Chalk and Talk,

	storage- electrical storage- chemical storage- thermochemical energy storage B) Applications of solar energy- solar water heating- solar cooking - solar thermal electric conversion- solar electric power generation (photo-voltaic cells) -.-agriculture and industrial process of heating-		PPT, quiz and You tube Links
IV	**Wind Energy & Energy From Ocean:** A) Wind Energy: wind energy conversion- wind energy collector- advantages and disadvantages of wind energy- applications of wind energy B) Energy from Oceans: methods of ocean thermal electric power generation-Claude cycle and Anderson cycles energy from tides-basic principle of tidal power-advantages and disadvantages of tidal power generation-prospects of tidal energy in India, Wave energy- advantages and disadvantages of wave energy.	12	Chalk and Talk, PPT, quiz and You tube Links
V	**Geothermal Energy, Energy From Biomass & Bio Fuels** A) Geothermal Energy: Geothermal sources-hydrothermal- geopressure-magma- advantages and disadvantages of geothermal energy- geothermal energy in India .B) Energy from biomass: Biomass resources-biomass generation- biogas plant used in India- biomass gasification C) Bio fuels: Ethanol to substitute petrol- fuel from sorghum- petrocrops an alternative to future fuels.	12	Chalk and Talk, PPT, quiz and You tube Links
	Total hours	60	

Course Designers: 1.Mrs.K.Punitha

2.Dr.Mrs.S.Manimekalai

Department of Chemistry						Class: III B.Sc		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**SE**	**Total**
VI	SEC 8	23OUCHSEC6	Professional competency skill training for competitive examinations	2	2	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓	✓	

Course Objectives:

1. To gain knowledge on general scientific laws in motion
2. To learn about environmental segments
3. To study about current events
4. To understand about geography of India
5. To know about quantitative aptitude and reasoning ability

Course Content

Unit –I General Science: Nature of Universe – Measurement of Physical Quantities – General Scientific Laws in Motion – Force, Pressure and Energy. Main concepts of life sciences-classification of living organisms, evolution, genetics, physiology, nutrition, health and hygiene, human diseases.

Unit –II Mathematical treatment in error analysis: error analysis: introduction- Error in scientific computation-Evaluation of analytical data: Reporting of analytical data-uncertainty in results. Statistical treatment of analytical data-calculation of confidence limit.

Unit – III Current Events: National symbols - Profile of States - Eminent personalities and places in news – Sports – Books and authors. Economics-Current socio-economic issues. Latest inventions in Science and Technology.

Unit – IV Geography of India: Earth location – Physical features - Monsoon, Rainfall, Weather and Climate - Water Resources - Rivers in India - Soil, Minerals and Natural Resources - Forest and Wildlife - Agricultural pattern. Natural calamity – Disaster Management – Environmental pollutions: Reasons and preventive measures – Climate change – Green energy.

UNIT-V Quantitative Aptitude and Reasoning Ability: Simplification–Percentage-Highest Common Factor (HCF)- Lowest Common Multiple(LCM). Ratio and Proportion. Simple Interest-Compound Interest-Area-Volume-Time and Work. Logical Reasoning-Puzzles-Blood Relation-Visual Reasoning-Alpha Numeric Reasoning – Number Series.

Books for study:

1. V.V.K. Subburaj (2019), "*TNPSC Group 2 and CCSE-II Preliminary All-In-one exam books*," Surya's publications.
2. V.V.K.Subburaj (2019), "*TNPSC CCSE IV Group 4 cum VAO Q- bank with explanary Answer*," Surya's publications, India.
3. S.Sambasivan , A.Basheer Ahamed (2018), " *TNPSC Group IV(4) & VAO exam book*," Sakthi publishing house, India.

Books for Reference:

1. R.S. Aggarwal (2017), "*Quantitative aptitude for competitive Examinations*, " S Chand publishing house, India.
2. V.V.K. Subburaj (2024), "*TNPSC Group-IV CCSE-IV General Studies and Aptitude and Mental Ability*, "Surya's publications, India.
3. Aggarwal R.S., (2017), "*Quantitative aptitude for competitive Examinations," S Chand publishing house*," India.
4. Gopalan R. Subramanian P.S. & Rengarajan K., (2005) "*Elements of Analytical Chemistry*", S. Chand & Sons New Delhi. 2005

Web resources/E-books:

1. https://mis.alagappauniversity.ac.in/siteAdmin/ddeadmin/uploads/2/__UG_B.Ed._Education_70123%20D%20-%20Teaching%20of%20Science%20_9061.pdf
2. https://archive.nptel.ac.in/content/storage2/courses/122106030/Pdfs/1_1.pdf
3. https://resources.saylor.org/wwwresources/archived/site/wp-content/uploads/2012/07/Chapter411.pdf
4. https://www.geeksforgeeks.org/aptitude/hcf-and-lcm-aptitude-questions/

Pedagogy:

Chalk and Talk method, Power point Presentations, Seminar, Group Discussion, Quiz, You tube Links, Open book test and Virtual Labs.

Rationale for nature of Course:

Knowledge and Skill:

This course will enable the students to acquire knowledge about general science, mathematical treatment in error analysis, current events, geography of India and quantitative Aptitude and

Reasoning Ability.

Activities to be given:

1.To make a chart of human diseases.

2. To find out the uses of medicinal plants.

COURSE LEARNING OUTCOMES (CLO's):

CLOs	Course Learning Outcomes Statements	Knowledge According to Bloom's Taxonomy (Upto K level)
CLO1	Define Force, Pressure and Energy	K1 to K3
CLO2	Discuss the Statistical treatment of analytical data	K1 to K3
CLO3	Illustrate about Latest inventions in Science and Technology	K1 to K3
CLO4	Explain the Environmental pollution	K1 to K3
CLO5	Calculate the Ratio, Proportion and Simple Interest	K1 to K3

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Mapping of Course Learning Outcomes (CLO's) with Programme Outcomes (PO's)

CLO's	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	2	2	2	3	2
CLO2	3	2	2	1	3	2
CLO3	3	2	2	1	3	2
CLO4	3	2	1	3	3	2
CLO5	3	2	1	2	2	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

1

Annexure-13

LESSON PLAN: TOTAL HOURS (30 Hrs)

UNIT	DESCRIPTION	HOURS	MODE
I	**General Science:** Nature of Universe – Measurement of Physical Quantities – General Scientific Laws in Motion – Force, Pressure and Energy. Main concepts of life sciences-classification of living organisms, evolution, genetics, physiology, nutrition, health and hygiene, human diseases.	6	Chalk and Talk, PPT, and quiz
II	**Mathematical treatment in error analysis:** error analysis: introduction- Error in scientific computation-Evaluation of analytical data: Reporting of analytical data-uncertainty in results. Statistical treatment of analytical data-calculation of confidence limit.	6	Chalk and Talk, PPT, and quiz
III	**Current Events:** National symbols - Profile of States - Eminent personalities and places in news – Sports – Books and authors. Economics-Current socio-economic issues. Latest inventions in Science and Technology.	6	Chalk and Talk, PPT, quiz and You tube Links
IV	**Geography of India:** Earth location – Physical features - Monsoon, Rainfall, Weather and Climate - Water Resources - Rivers in India - Soil, Minerals and Natural Resources - Forest and Wildlife - Agricultural pattern. Natural calamity – Disaster Management – Environmental pollution: Reasons and preventive measures – Climate change – Green energy.	6	Chalk and Talk, PPT, quiz and You tube Links
V	**Quantitative Aptitude and Reasoning Ability:** Simplification–Percentage-Highest Common Factor (HCF)- Lowest Common Multiple(LCM). Ratio and Proportion. Simple Interest-Compound Interest-Area-Volume-Time and Work. Logical Reasoning-Puzzles-Blood Relation-Visual Reasoning-Alpha Numeric Reasoning – Number Series.	6	Chalk and Talk, PPT, quiz and You tube Links
	Total hours	**30**	

Course Designers: 1.Dr.(Mrs.) S.Manimekalai

2.Mrs.V.Gokilaa