

# B.Sc. Chemistry

## Syllabus

### AFFILIATED COLLEGES

Program Code: 22D

2023 – 2024 Onwards



# BHARATHIAR UNIVERSITY

(A State University, Accredited with “A++” Grade by NAAC,  
Ranked 21<sup>st</sup> among Indian Universities by MHRD-NIRF)

Coimbatore - 641 046, Tamil Nadu, India



<b>Program Specific Outcomes (PSOs)</b>	
After the successful completion of <b>B.Sc. Chemistry</b> program, the students are expected to	
<b>PSO1</b>	Apply chemistry knowledge to solve the problems in various areas.
<b>PSO2</b>	Acquire a skill for safe handling of chemicals, apparatus and instruments
<b>PSO3</b>	Identify and analyze problems and gain skills to interpret chemical information
<b>PSO4</b>	Gain practical knowledge and analytical skills in designing and carrying out chemical experiments
<b>PSO5</b>	Have enough chemistry knowledge to go for higher studies and become entrepreneur



<b>Program Outcomes (POs)</b>	
On successful completion of the <b>B.Sc.Chemistry</b> program	
<b>PO1</b>	Understand the chemistry and apply their knowledge in day-to-day life
<b>PO2</b>	Explore the knowledge of analytical techniques to the industries for various analysis
<b>PO3</b>	Develop skills to carry out experiments in various fields of chemistry
<b>PO4</b>	Identify, formulate and solve the technological problems of the industry
<b>PO5</b>	Apply their theoretical knowledge to make the common people to understand the chemistry behind every chemical changes.
<b>PO6</b>	Confidence with skills and techniques necessary to succeed in the competitive examinations
<b>PO7</b>	Have the knowledge of science principles to practical situations in their respective professional career.

**BHARATHIAR UNIVERSITY:COIMBATORE641 046**  
**B.Sc.Chemistry–Revised Scheme of Examinations (CBCS Pattern)**

(For the students admitted during the academic year 2023– 24 onwards)

Part	Title of the Course	Hours/ Week	Examination				Credits
			Duration in Hours	MaximumMarks			
				CIA	CEE	Total	
<b>Semester I</b>							
I	Language- I	6	3	25	75	100	4
II	English-I	6	3	25	75	100	4
III	CorePaperI–General Chemistry-I	7	3	25	75	100	4
III	CorePractical I (InorganicQualitative Analysis)	3	3	-	-	-	-
III	Allied A:PaperI <sup>#</sup> (or)	6	3	25	75	100	4
	Allied A:PaperI <sup>@</sup>	4	3	20	55	75	3
III	Allied A:Practical <sup>@</sup>	2	-	-	-	-	-
IV	EnvironmentalStudies*	2	3	-	50	50	2
<b>Total</b>		<b>30</b>		<b>95</b>	<b>330</b>	<b>425</b>	<b>17</b>
<b>Semester II</b>							
I	Language– II	6	3	25	75	100	4
II	English–II	4	3	25	25	50*	2
	<b>Naan Mudhalvan Skill Course- Language Proficiency for Employability</b> <a href="http://kb.naanmudhalvan.in/Special:Filepath/Cambridge_Course_Details.pdf">http://kb.naanmudhalvan.in/Special:Filepath/ Cambridge_Course_Details.pdf</a>	2	-	25	25	50**	2
III	CorePaperII–GeneralChemistry-II	7	3	25	75	100	4
III	CorePractical I (InorganicQualitative Analysis)	3	3	40	60	100	4
III	Allied A:PaperII <sup>#</sup> (or)	6	3	25	75	100	4
	Allied A:PaperII <sup>@</sup>	4	3	20	55	75	3
III	Allied A:Practical <sup>@</sup>	2	3	20	30	50	2
IV	ValueEducation –HumanRights*	2	3	-	50	50	2
<b>Total</b>		<b>30</b>		<b>180</b>	<b>395</b>	<b>575</b>	<b>23</b>
<b>Semester III</b>							
I	Language–III	6	3	25	75	100	4
II	English–III	6	3	25	75	100	4
III	CorePaperIII– InorganicChemistry-I	3	3	25	75	100	4
III	CorePaperIV–PhysicalChemistry-I	3	3	25	75	100	4
III	Allied B: Paper I <sup>#</sup> (or)	6	3	25	75	100	4
	Allied B: Paper I <sup>@</sup>	4	3	20	55	75	3
III	CorePractical II (Volumetricand OrganicAnalysis)	3	-	-	-	-	-
III	AlliedB: Practical <sup>@</sup>	2	-	-	-	-	-
IV	Skill based Subject1: Chemistry ofNatural and Synthetic Fibers	2	3	20	55	75	3
IV	Tamil** / Advanced Tamil*(OR) Non- majorelective-I(YogaforHuman Excellence)* / Women’sRights*	1	3	-	50	50	2
<b>Total</b>		<b>30</b>		<b>140</b>	<b>460</b>	<b>600</b>	<b>24</b>

<b>SemesterIV</b>							
I	Language–IV	6	3	25	75	100	4
II	English–IV	6	3	25	75	100	4
III	CorePaperV–OrganicChemistry-I	4	3	25	75	100	4
III	CorePractical II (Volumetricand OrganicAnalysis)	3	6	<b>30</b>	<b>45</b>	<b>75</b>	<b>3</b>
III	AlliedB:PaperII <sup>#</sup>	6	3	25	75	100	4
	AlliedB:Paper II <sup>@</sup>	4	3	20	55	75	3
III	AlliedB: Practical <sup>@</sup>	2	3	20	30	50	2
IV	SkillbasedSubject2:Technologyof DyeingofNaturalFibers	<b>2</b>	<b>3</b>	<b>25</b>	<b>25</b>	<b>50</b>	<b>2</b>
IV	Tamil**/AdvancedTamil*(OR) Non-majorelective-II(GeneralAwareness*)	1	3	-	50	50	2
	<b>Naan Mudhalvan Skill Course -Digital Skills for Employability – Office Fundamentals</b> <a href="http://kb.naanmudhalvan.in/Special:FilePath/Microsoft_Course_Details.xlsx">http://kb.naanmudhalvan.in/Special:FilePath/Microsoft_Course_Details.xlsx</a>	<b>2</b>	<b>-</b>	<b>25</b>	<b>25</b>	<b>50**</b>	<b>2</b>
	<b>Total</b>	<b>30</b>		<b>195</b>	<b>455</b>	<b>650</b>	<b>26</b>
<b>SemesterV</b>							
III	CorePaperVI(InorganicChemistryII)	5	3	25	75	100	4
III	CorePaperVII(Spectroscopy)	5	3	25	75	100	4
III	CorePaperVIII(Electrochemistry)	5	3	25	75	100	4
III	CorePaperIX(AnalyticalChemistry)	4	3	25	75	100	4
III	CorePractical III (GravimetricAnd Physical)	5	-	-	-	-	-
III	ElectiveI	4	3	25	75	100	4
IV	SkillbasedSubject3:Water&Effluent Treatment And PollutionControl	2	3	20	55	75	3
	<b>Total</b>	<b>30</b>		<b>145</b>	<b>430</b>	<b>575</b>	<b>23</b>
<b>SemesterVI</b>							
III	CorePaperX(OrganicChemistryII)	6	3	25	75	100	4
III	CorePaperXI(PhysicalChemistryII)	6	3	25	75	100	4
III	CorePractical III (GravimetricAnd Physical)	5	6	40	60	100	4
III	ElectiveII	4	3	20	55	75	3
III	ElectiveIII	4	3	20	55	75	3
III	CorePracticalforElectiveSubjects	3	3	40	60	100	4
IV	SkillBasedSubject4: (TextileChemistryPractical)	2	3	30	45	75	3
	<b>Naan Mudhalvan Skill Course- Employability Readiness – IBM Skills build</b>	-	-	-	-	-	-
	Extension Activities@	-	-	50	-	50	2
	<b>Total</b>	<b>30</b>		<b>250</b>	<b>425</b>	<b>675</b>	<b>27</b>
	<b>GrandTotal</b>	<b>180</b>		<b>1005</b>	<b>2495</b>	<b>3500</b>	<b>140</b>

**Note**

# For subjects without practical.

@ For subjects with practical.

\* No Continuous Internal Assessment (CIA). Only University Examinations.

\*\* No University Examinations. Only Continuous Internal Assessment (CIA).

**\* English II- University semester examination will be conducted for 50 marks (As per the existing pattern of Examination) and it will be converted for 25 marks.**

**\*\* Naan Mudhalvan – Skill courses- external 25 marks will be assessed by Industry and internal 25 marks will be offered by respective course teacher.**

**Semester IV Skill based Subject 2: Technology of Dyeing of Natural Fibers University examination will be conducted for 45 marks (As per the existing pattern of examination) and it will be converted for 25 marks**

Allied Subjects (Colleges can choose any two subjects)		
1. Mathematics, 2. Physics, 3. Botany, 4. Zoology, 5. Biochemistry		
List of Elective papers		
(Colleges can choose any one of the paper as electives)		
***These elective papers are included in the curriculum as a part of industry 4.0.		
<b>Elective-I</b>	A	Polymer Chemistry
	B	Agro Industrial Chemistry***
	C	Pharmaceutical Chemistry***
<b>Elective-II</b>	A	Leather Chemistry
	B	Chemistry of Plant Based Products
	C	Dye Chemistry
<b>Elective-III</b>	A	Analytical Chemistry III Lab Techniques***
	B	Environmental Chemistry
	C	Textile Chemistry***



# First Semester



<b>Coursecode</b>	<b>13A</b>	<b>GENERAL CHEMISTRY-I</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>CORE</b>		Core I–Paper- I	<b>6</b>	<b>1</b>	<b>-</b>	<b>4</b>
<b>Pre-requisite</b>		<b>Higher Secondary Level Chemistry</b>	<b>Syllabus Version</b>		<b>2019-2020</b>	
<b>CourseObjectives:</b>						
The main objectives of this course are to:						
<ol style="list-style-type: none"> <li>1. Explain the properties of periodic table and bonding theories</li> <li>2. Outline the reactivity of alkenes and alkynes and conformation of alkanes</li> <li>3. Describe the laws of thermodynamics and black body radiation</li> </ol>						
<b>ExpectedCourseOutcomes:</b>						
On the successful completion of the course, student will be able to:						
1	Understand the properties of period and groups in periodic table					<b>K1, K2</b>
2	Able to name the hydrocarbons and Identify the products of elimination and addition reactions.					<b>K2-K4</b>
3	Discuss the various polar effects in alkanes and alkenes. Describe the preparation of cycloalkanes					<b>K1-K3</b>
4	Explain the theory of black body radiation					<b>K1, K2</b>
5	Understand the first and second law of thermodynamics					<b>K1, K2</b>
<b>K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate;K6-Create</b>						
<b>Unit:1</b>	<b>Periodic Properties and Theory of Bonding</b>					<b>21hours</b>
<ol style="list-style-type: none"> <li>1. Periodic table-Introduction-Periodic properties- Ionisation energy, Electron affinity, Electronegativity and their variations along the period and groups.</li> <li>2. Hybridization and geometry of <math>\text{BeCl}_2</math>, <math>\text{BF}_3</math>, <math>\text{CH}_4</math>, <math>\text{PCl}_5</math>, <math>\text{IF}_7</math> and <math>\text{SF}_6</math>. VSEPR Theory. Covalent Bond- Molecular orbital theory-application to molecules such as <math>\text{H}_2^+</math>, <math>\text{He}_2</math>, <math>\text{F}_2</math>, <math>\text{O}_2</math>, <math>\text{N}_2</math>, <math>\text{CO}</math> and <math>\text{NO}</math>.</li> </ol>						
<b>Unit:2</b>	<b>Reaction of Alkenes and Alkynes</b>					<b>21hours</b>
<ol style="list-style-type: none"> <li>1. Nomenclature of acyclic alkane, alkene and alkyne.</li> <li>2. Alkenes: Preparation by Wittig reaction – Mechanisms of beta elimination – E1, E2 and cis-elimination – Hoffmann's rule and Saytzeff's rule. Addition reactions with hydrogen, halogen, hydrogen halide (Markownikoff's rule) and hydrogen bromide (Peroxide effect). Dienes: Stability of isolated and conjugated dienes-1, 2 and 1, 4 additions, Diels -Alder reaction. Free Radical addition – Polymerization– synthetic rubber.</li> <li>3. Alkynes: Acidity of Alkynes – formation of acetylides-addition of water with <math>\text{HgSO}_4</math> catalyst-hydroboration.</li> </ol>						
<b>Unit:3</b>	<b>Polar Effects and Conformations of Alkanes</b>					<b>21hours</b>
<ol style="list-style-type: none"> <li>1. Polar effects – inductive effect, mesomeric effect, electromeric effect, hyper conjugation and steric effects. Classification of reagents: Electrophiles, Nucleophiles and Free radicals. Types of reaction: Polar reactions involving carbonium ions and carbanions with simple examples.</li> <li>2. Aliphatic Hydrocarbons: Restricted rotation about single bond preferred rotational conformations.</li> <li>3. Cycloalkanes: Preparation by Dieckmann ring closure and by reduction of aromatic hydrocarbons– ring opening reactions of cyclopropane with <math>\text{H}_2</math>, <math>\text{Br}_2</math> and <math>\text{HI}</math>.</li> </ol>						

<b>Unit:4</b>	<b>Liquid Crystals and Black Body Radiation</b>	<b>21 hours</b>
<p>1. Liquid crystals the concept of mesomorphic state - typical liquid crystalline substances and their properties.</p> <p>2. Failure of classical theory in explaining black body radiation- Planck's theory of quantization of energy – Einstein's theory of photoelectric effect-Compton effect. de-Broglie theory of wave-particle dualism. Particle in one dimensional box (Wave length determination only) -Schrodinger equation.</p>		
<b>Unit:5</b>	<b>Laws of Thermodynamics</b>	<b>21 hours</b>
<p>The laws of thermodynamics, generalities and Zeroth law – kinds of energy – Scope of the first and second laws of thermodynamics-thermodynamic terms-definitions–heat–work of expansion – work of compression – maximum and minimum quantities of work – Reversible and irreversible transformations of energy. First law of thermodynamics – properties of energy changes in relation to properties of system- isothermal and adiabatic changes – meaning of the thermodynamic state function–properties of exact and inexact differentials–Joule Thomson experiment</p>		
<b>Total Lecture hours</b>		<b>105 hours</b>
<b>Text Book(s)</b>		
1	Principles of Inorganic Chemistry, B.R.Puri L.R.Sharma, S.Chand & Co.	
2	Inorganic Chemistry, P.L.Soni, Sultan Chand & Sons.	
3	Organic Chemistry, Vol. 1, 2 & 3, S. M. Mughgergee, S.P. Singh, R.P. Kapoor, Wiley Eastern.	
<b>Reference Books</b>		
1	Advanced Organic Chemistry, B.S.Bahl, Arunbahl, S.Chand & Co.	
2	Essentials of Physical Chemistry, B.S.Bahl and G.D.Tuli, S.Chand & Co.	
3	Textbook of Physical Chemistry, P.L.Soni, D.B. Dharmarke, S.Chand & Co.	
4	Principles of Physical Chemistry, B.R.Puri, L.R.Sharma and M.S.Phathania, S.Chand & Co.	
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>		
1	<a href="https://nptel.ac.in/content/storage2/courses/104101005/downloads/LectureNotes/chapter%207.pdf">https://nptel.ac.in/content/storage2/courses/104101005/downloads/LectureNotes/chapter%207.pdf</a>	
2	<a href="https://www.youtube.com/watch?v=4LQ8jdKZTEo">https://www.youtube.com/watch?v=4LQ8jdKZTEo</a>	
3	<a href="https://www.khanacademy.org/science/organic-chemistry/bond-line-structures-alkanes-cycloalkanes/conformations-alkanes-cycloalkanes/v/conformational-analysis-of-ethane">https://www.khanacademy.org/science/organic-chemistry/bond-line-structures-alkanes-cycloalkanes/conformations-alkanes-cycloalkanes/v/conformational-analysis-of-ethane</a>	
<b>Course Designed By: Dr.S.P. Rajasingh</b>		

#### Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	M	M	S	S	S	S
CO2	M	M	M	M	S	S	M
CO3	M	M	S	S	S	M	M
CO4	S	M	S	S	M	S	S
CO5	S	S	M	S	S	S	M

\*S-Strong; M-Medium; L-Low



# Second Semester

Coursecode	23A	GENERAL CHEMISTRY-II	L	T	P	C
<b>CORE</b>		Core II–Paper - II	<b>6</b>	<b>1</b>	<b>-</b>	<b>4</b>
<b>Pre-requisite</b>		<b>HigherSecondaryLevelChemistry</b>	<b>Syllabus</b>		<b>2019-2020</b>	
<b>CourseObjectives:</b>						
Themain objectives ofthis courseareto:						
<ol style="list-style-type: none"> <li>1. Outlinethefundamentals ofvolumetricestimations</li> <li>2. Explainelectrophilicandnucleophilicsubstitutionreactions</li> <li>3. Describetheapplicationof boronandsilicate chemistry</li> <li>4. Discussthermodynamicsandsolidstatechemistry</li> </ol>						
<b>ExpectedCourseOutcomes:</b>						
Onthesuccessful completionofthecourse,student willbe ableto:						
1	Understandtheprinciplesofvolumetricanalysis andestimateanunknown ion					<b>K1, K2</b>
2	Outlinethestructureandpropertiesofboronand silicatecompounds					<b>K1, K2</b>
3	Explainthearomaticelectrophilic substitutionandaliphaticnucleophilic substitutionreactions withmechanism					<b>K2-K4</b>
4	Understandtherelationbetweenthermodynamicproperties					<b>K1-K3</b>
5	Understandthepackingandstructureof crystals					<b>K1, K2</b>
<b>K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate;K6-Create</b>						
<b>Unit:1</b>	<b>Volumetric Analysis and Redox Reactions</b>					<b>21hours</b>
<ol style="list-style-type: none"> <li>1. Principles of VolumetricAnalysis: Terms used in volumetric analysis primary and secondary standard substances,standardization of solutions.</li> <li>2. Concentration units: ppm, molality, Formality, molarity, molefraction, normality, weight percent and volume percent. Determination of equivalent weight of acids, bases, oxidant, reductant and simple salts. Types of volumetric titrations, acid-base, redox, precipitation and complexometric titrations.</li> <li>3. Indicators: Effect of change in pH, neutralization, redox, adsorption and metal ion indicators.</li> <li>4. Oxidation and reduction reactions: balancing redox equations by oxidation number and ion-electronmethod.</li> </ol>						
<b>Unit:2</b>	<b>Boron and Silicates</b>					<b>21hours</b>
Chemistry of Boron–Group discussion –Electron acceptor behavior and electron deficiency of boron hydrides;bonding in diboranes;NaBH <sub>4</sub> and borazole-preparation,properties, structure and uses. Silicates-Classification of silicate- simple silicates, chain silicatesandsheet silicates only.						
<b>Unit:3</b>	<b>ElectrophilicandNucleophilicSubstitution</b>					<b>21hours</b>
Structure of benzene-Aromaticity-Huckel’srule.Electrophilicsubstitutioninbenzenewithmechanism - Nucleophilic substitution reaction – SN <sub>1</sub> , SN <sub>2</sub> and SN <sub>i</sub> reactions – Grignard reagentandsyntheticapplications-Eliminationversussubstitution-Benzynemechanismandintermediatecomplexmechanism.						

<b>Unit:4</b>	<b>Thermodynamics</b>	<b>21hours</b>
Relation between E and H, $C_p$ and $C_v$ . The heat of reaction – conventions in the values of H. Hess's law – heats of combustion – determination by Bomb Calorimeter – Bond energies – Resonance energies – Heats of solution – integral and differential heat of dilution – Heats of reaction at constant volume – dependence of the heat of reaction on temperature and Kirchoff's equation.		
<b>Unit:5</b>	<b>Solid State Chemistry</b>	<b>21hours</b>
Crystalline and amorphous solids, crystal systems, Bravais lattice, unit cell, law of rational indices (Weiss indices), Miller indices, Symmetry elements in crystals (for cubic system only). X-ray diffraction by crystals - derivation of Bragg's equation - Bragg method - powder method. Crystal structure of NaCl, Wurtzite, $CaF_2$ and $TiO_2$ - radius ratio rules and packing in crystals.		
<b>Total Lecture hours</b>		<b>105hours</b>
<b>Text Book(s)</b>		
1	Principles of Inorganic Chemistry, B.R.Puri L.R.Sharma, S.Chand & Co.	
2	Textbook of Physical Chemistry, P.L.Soni, D.B. Dharmaraj, S.Chand & Co.	
3	Essentials of Physical Chemistry, B.S.Bahl and G.D.Tuli, S.Chand & Co.	
<b>Reference Books</b>		
1	Inorganic Chemistry, P.L.Soni, Sultan Chand & Sons.	
2	Advanced Organic Chemistry, B.S.Bahl, Arun Bahl, S.Chand & Co.	
3	Physical Chemistry, G. N. Castellan, Addison-Wesley Pub. Co.	
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>		
1	<a href="https://web.iit.edu/sites/web/files/departments/academic-affairs/academic-resource-center/pdfs/SN1_SN2.pdf">https://web.iit.edu/sites/web/files/departments/academic-affairs/academic-resource-center/pdfs/SN1_SN2.pdf</a>	
2	<a href="https://nptel.ac.in/content/storage2/courses/104101005/downloads/LectureNotes/chapter%209.pdf">https://nptel.ac.in/content/storage2/courses/104101005/downloads/LectureNotes/chapter%209.pdf</a>	
<b>Course Designed By: Dr.M.Sivakumar</b>		

<b>Mapping with Programme Outcomes</b>							
<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	S	M	M	S	S	S	S
<b>CO2</b>	M	M	M	M	S	S	M
<b>CO3</b>	M	M	S	S	S	M	M
<b>CO4</b>	S	M	S	S	M	S	S
<b>CO5</b>	S	S	M	S	S	S	M

\*S-Strong; M-Medium; L-Low

Coursecode	23P	<b>INORGANIC QUALITATIVE ANALYSIS</b>	L	T	P	C
<b>CORE</b>		<b>CORE III-CHEMISTRY PRACTICAL I</b>	-	-	3	4
<b>Pre-requisite</b>		<b>Higher Secondary Level Practical Knowledge</b>	<b>Syllabus Version</b>		<b>2010-2011</b>	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
<ol style="list-style-type: none"> <li>1. Impart knowledge to the students in handling laboratory equipment and reagents</li> <li>2. Improve the skill of inorganic mixture analysis.</li> <li>3. Make the students to analyze and identify the cations and anions in the mixture of salts.</li> </ol>						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	Do preliminary tests and identify interfering and non-interfering radicals and confirm their presence				<b>K1-K5</b>	
2	Remove interfering anions, carry out a systematic analysis and identify the cations in a given sample				<b>K1-K5</b>	
<b>K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create</b>						
<b>Part I</b>	<b>ANALYSIS OF CATIONS</b>				<b>45 hours</b>	
<b>CATIONS TO BE STUDIED:</b> Lead, Copper, Bismuth, Cadmium, Iron, Aluminum, Zinc, Manganese, Cobalt, Nickel, Barium, Calcium, Strontium, Magnesium and Ammonium.						
<b>Part II</b>	<b>ANALYSIS OF ANIONS</b>				<b>45 hours</b>	
<b>ANIONS TO BE STUDIED:</b> Carbonate, Sulphate, Nitrate, Chloride, Bromide, Fluoride, Borate, Oxalate, and Phosphate.						
<b>Total Practical hours</b>					<b>90 hours</b>	
<b>Text Book(s)</b>						
1	Basic Principles of Practical Chemistry, Kulandaivelu A.R. Veeraswamy R., Venkateswaran, Sultan Chand & Sons, 2017.					
2	Practical Chemistry for B.Sc Chemistry, A.O. Thomas					
<b>Reference Books</b>						
1	A Text Book of Qualitative Analysis including semi-micro methods, A.I. Vogel.					
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>						
1	<a href="https://www.youtube.com/watch?v=O9ba90MJws0">https://www.youtube.com/watch?v=O9ba90MJws0</a>					
2	<a href="https://www.youtube.com/watch?v=oz1LNI90SSU">https://www.youtube.com/watch?v=oz1LNI90SSU</a>					
3	<a href="https://www.youtube.com/watch?v=QQo1e-BUZWs">https://www.youtube.com/watch?v=QQo1e-BUZWs</a>					
<b>Course Designed By: Dr. J. Balamani</b>						

<b>Mapping with Programme Outcomes</b>							
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	M	S	S	M	S	M	S
CO2	S	M	S	S	M	S	S

\*S-Strong; M-Medium; L-Low



# Third Semester

<b>Coursecode</b>	<b>33A</b>	<b>INORGANIC CHEMISTRY-I</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>CORE</b>		Core IV – Paper III	<b>3</b>	<b>-</b>	<b>-</b>	<b>4</b>
<b>Pre-requisite</b>		<b>Higher Secondary Level Chemistry</b>	<b>Syllabus Version</b>		<b>2020-2021</b>	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
<ol style="list-style-type: none"> <li>1. Explain the fundamental concepts involved in metallurgical processes for extraction of metals.</li> <li>2. Discuss the theories and stability of metal complexes.</li> <li>3. Outline the importance of organometallic compounds and their catalytic applications.</li> <li>4. Describe the structure &amp; functioning of biomolecules and role of metals in biology.</li> </ol>						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	Explain various chemical and electrochemical principles involved in the extraction of metals.					<b>K1, K3</b>
2	Make use of the occurrence and extraction of important metals and their compounds					<b>K2, K3</b>
3	Outline the importance of solvents and solubility in chemical reactions					<b>K2</b>
4	Define and classify the structure and properties of organometallic compounds					<b>K1-K3</b>
5	Describe the structure & functioning of biomolecules and role of metals in biology					<b>K1, K2</b>
<b>K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create</b>						
<b>Unit:1</b>	<b>Methods of Extraction</b>					<b>9hours</b>
General methods of Extraction: Concentration – Gravity separation, Froth Flotation, magnetic separation, Extraction – Chemical and Electrolytic methods of refining, Zone refining, Van Arkel refining and Electrolytic refining with examples. Occurrence, extraction, properties and uses of Germanium and Titanium and their important compounds such as $\text{GeCl}_4$ and $\text{TiO}_2$ .						
<b>Unit:2</b>	<b>Extraction of Metals and Their Compounds</b>					<b>9hours</b>
Occurrence, extraction, properties and uses of Zirconium, Vanadium, Molybdenum and Tungsten – their important compounds such as $\text{V}_2\text{O}_5$ , $\text{ZrOCl}_2$ , $(\text{NH}_4)_2\text{MoO}_4$ , $\text{WO}_2$ , and tungsten bronzes.						
<b>Unit:3</b>	<b>Role of Solvents</b>					<b>9hours</b>
The solvents- solubility of compounds – effect of temperature on solubility – Role of water as solvent- chemical structure and solubility. Classifications of solvents – general behaviour – properties of ionizing solvents. Types of reactions in non-aqueous solvents – protonic solvents – ammonia, hydrogen fluoride. Non Protonic solvents – $\text{SO}_2$ and $\text{BrF}_3$ . Organic solvents – $\text{C}_2\text{H}_5\text{OH}$ and Ether.						



<b>Unit:4</b>	<b>Organo metallicCompounds</b>	<b>9hours</b>
Definition–Nomenclature of Organo metallic compound Synthesis of organometallic compounds of Be, Mg, Zn, B and Al – Ferrocene: Preparation – Aromaticity of: Ferrocene, cyclic C <sub>n</sub> H <sub>n</sub> Ligands–Application of: Grignard reagent and Gilman Reagent-alkene polymerization using Ziegler-Natta catalyst.		
<b>Unit:5</b>	<b>Bio inorganic Chemistry</b>	<b>9hours</b>
Importance of metals in biological systems – chemistry of hemoglobin and myoglobin –Role of: Na <sup>+</sup> and K <sup>+</sup> ions – Mg <sup>2+</sup> and Ca <sup>2+</sup> ions – Biological functions and toxicity of trace elements: Cr,Mn,Co,Ni and Cu–Ultra trace elements:As,Se,Mo,I,Fe and Zn–Biological fixation of nitrogen–Metallo-enzymes:Carbonic anhydrase,Carboxy peptidase.		
<b>TotalLecturehours</b>		<b>45hours</b>
<b>TextBook(s)</b>		
1	PrinciplesofInorganicChemistry, B.R.Puri L.R. Sharma,S.Chand&Co.	
2	PrinciplesofInorganicChemistry,B.R.Puri,L.R.SharmaandK.C.Kalia,,Milestone Publishers(2012)	
3	InorganicChemistry,P.L.Soni,Sultan Chand&Sons.	
<b>ReferenceBooks</b>		
1	Huheey,J.E.;Keiter,E. A.;Keiter,R. L.InorganicChemistry,PrinciplesofStructure andReactivity,4thed.,HarperCollins,1993.	
2	Lee.J.D,Concise Inorganicchemistry, Vedition,Chapman&Hall Ltd,London,2000	
3	Shriver,D.F.;Atkins,P.W.;Langford,C.H.InorganicChemistry,3rded., Oxford UniversityPress, 2000.	
4	Cotton,F.A.;Wilkinson,G.;Murillo, C.A.;Bochmann,M.AdvancedInorganic Chemistry,6thed.,JohnWiley,1999.	
RelatedOnlineContents[MOOC,SWAYAM,NPTEL,Websitesetc.]		
1	<a href="https://nptel.ac.in/content/storage2/courses/104101005/downloads/LectureNotes/chapter%207.pdf">https://nptel.ac.in/content/storage2/courses/104101005/downloads/LectureNotes/chapter%207.pdf</a>	
2	<a href="https://youtu.be/BZ_tY88o0oI">https://youtu.be/BZ_tY88o0oI</a> ,Co-ordinationchemistry, IITKharagpur,Prof.D.RaY.	
3	<a href="https://youtu.be/FziKko-ZQww">https://youtu.be/FziKko-ZQww</a> forbioinorganicchemistry.	
<b>CourseDesignedBy:Dr.S.P.RajasinghandDr.P.Rajesh</b>		

MappingwithProgrammeOutcomes							
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	M	S	S	S	S	S	S
CO2	M	M	S	M	S	M	S
CO3	S	M	S	M	S	S	S
CO4	S	M	M	M	M	S	S
CO5	S	M	M	M	S	S	S

\*S-Strong;M-Medium;L-Low

Coursecode	33B	PHYSICAL CHEMISTRY-I	L	T	P	C
CORE		Core V – Paper IV	3	-	-	4
Pre-requisite		Basics of Physical Chemistry	Syllabus Version		2020-2021	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
<ol style="list-style-type: none"> <li>1. Enable the students in understanding the second and third law of thermodynamics</li> <li>2. Explain various systems in phase rule and their application</li> <li>3. Application of the computer C programming in chemistry</li> </ol>						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	Understand the concepts of thermodynamics, Second law, and Entropy change.					K1, K2
2	Understand the Spontaneity and its conditions, Gibb's free energy and knowledge of third law.					K2, K3
3	Understand the concept of Phase rule and its application to various systems.					K2-K4
4	Know the different laws of solutions and evaluate the Colligative properties					K3, K5
5	Understand the C-Program and evaluate the various parameters.					K2, K5
<b>K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create</b>						
<b>Unit:1</b>	<b>Thermodynamics I</b>					<b>9 hours</b>
Need of second law of thermodynamics – Carnot cycle – entropy – Definition – Entropy changes in isothermal transformation – Trouton's rule. Entropy as function of T and V – Entropy as a function of T and P – Changes of entropy with T, Entropy changes in ideal gas – entropy of mixing of ideal gases.						
<b>Unit:2</b>	<b>Thermodynamics II</b>					<b>9 hours</b>
General conditions of equilibrium and spontaneity- conditions of equilibrium and spontaneity – definition of $\Delta A$ and $\Delta G$ – physical significance of $dA$ and $dG$ - Temperature and pressure dependence of $G$ – Gibbs – Helmholtz equation. Chemical equilibrium – The concept of chemical potential – chemical potential in a mixture of ideal gases – Van't Hoff Isotherm, and isochore – Third law of thermodynamics – statement and applications - Exception to third law.						
<b>Unit:3</b>	<b>Phase Rule</b>					<b>9 hours</b>
Phase equilibria – equilibrium condition - Stability of phase of a pure substance – Pressure dependence of $\mu$ and T curves. The Clapeyron and Clapeyron-Clausius equations. Derivation of Gibbs phase rule. Phase equilibria in one component system – Water and Sulphur systems. Reduced phase rule – Phase diagram for two component system – construction of the phase diagram - Thermal analysis method – Phase Diagram of Simple eutectic systems: Pb-Ag System - extraction of Silver from Argentiferous Lead, Compound forming type – Congruent melting point: Zn-Mg, Incongruent melting point: Na-K systems.						

<b>Unit:4</b>	<b>Solutions</b>	<b>9hours</b>
Ideal and non-ideal – Raoult’s law- Positive and negative deviation Henry’s law – Nernst distribution law and its applications. Colligative properties- relative lowering of vapour pressure ,elevation of boiling point,depression of freezing point and osmoticpressure-their applications.		
<b>Unit:5</b>	<b>CProgramforChemistry</b>	<b>9hours</b>
Structure of C program, Variables in C, Keywords and constants in C, Operators in C– Arithmetic, Increment, Decrement, relational and logical operators - Program: To calculate the pH of solutions– Calculation of pH of solution using Henderson equation- to compute the rate constant of a first order reaction–to compute half – life period of a reaction–to compute the Energy of activation of a reaction.		
<b>TotalLecturehours</b>		<b>45hours</b>
<b>TextBook(s)</b>		
1	Principlesofphysicalchemistry, B.P.Puri, L.R.SharmaandM.S.Phathania, S.Chand&Company	
2	PhysicalchemistryG,W.Castelan,NarosaPublishers.	
3	Physicalchemistry(Vol.II)–N.B.Singh,ShivasaranDas,A.K.Singh–NewAge InternationalPublishers–Firstedition(2009)	
<b>ReferenceBooks</b>		
1	ElementsofPhysicalChemistry,PuriSharma,Pathania,2013-14Edn., Vishal PublishingCo.Jalandhar,Delhi.	
2	PrinciplesofPhysicalchemistry,PuriSharmaPathania,46 <sup>th</sup> Edn.VishalPublishing Co.Jalandhar	
3	ComputerforChemists– ByPundirBansal – PragatiPrakasamPubs.	
RelatedOnlineContents[MOOC,SWAYAM,NPTEL,Websitesetc.]		
1	<a href="https://nptel.ac.in/courses/112/108/112108148/">https://nptel.ac.in/courses/112/108/112108148/</a>	
2	<a href="https://www.youtube.com/watch?v=2LywAiZBQW4">https://www.youtube.com/watch?v=2LywAiZBQW4</a>	
<b>CourseDesignedBy:Dr.P.Rajesh</b>		

<b>MappingwithProgrammeOutcomes</b>							
<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	S	L	M	L	S	S	M
<b>CO2</b>	S	L	S	M	M	S	S
<b>CO3</b>	M	S	M	L	L	M	M
<b>CO4</b>	S	S	M	M	S	L	L
<b>CO5</b>	M	S	L	M	M	S	M

\*S-Strong;M-Medium;L-Low

<b>Course code</b>	<b>3ZA</b>	<b>CHEMISTRY OF NATURAL AND SYNTHETIC FIBERS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SBS</b>	<b>Skilled Based Subject – I</b>		<b>2</b>	<b>-</b>	<b>-</b>	<b>3</b>
<b>Pre-requisite</b>	<b>HigherSecondaryLevelChemistry</b>		<b>Syllabus Version</b>		<b>2010-2011</b>	
<b>CourseObjectives:</b>						
Themain objectives ofthis courseareto:						
1. Detailexplanationoftheclassificationofnaturalfiber,itsmeritsanddemerits						
2. Outlineaboutthepreparation,properties anduses ofviscose, syntheticand acrylicfiber						
3. Describethereactionofnylonandpolyesterfiber						
<b>ExpectedCourseOutcomes:</b>						
Onthesuccessful completionofthecourse,student willbe ableto:						
1	Tounderstandtheclassification,propertiesand usesofnaturalfibers.					<b>K1, K2</b>
2	Ableto knowabout thechemicalstructureofcellulose fiber. Wet spinningprocess.					<b>K1– K3</b>
3	Discussaboutsynthetic andacrylicfiber.Detailaboutfiberforming polymerandschioprocess.					<b>K1,K2, K4,K6</b>
4	Explainthenamingreactionofnylonfiber.Explanationofstructureand usesofKevlarfiber.					<b>K1, K2</b>
5	Discussaboutpolyesterfiber.SynthesisofDMT,ethyleneglycoland PET					<b>K1, K3, K4</b>
<b>K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate;K6-Create</b>						
<b>Unit:1</b>	<b>Natural Textile Fibers</b>					<b>6hours</b>
Natural Textile Fibers:Definition, Classification of Natural Textile Fibers-Vegetable fibers, Animal fibers.Properties,Uses and Features of Cotton, Wool, Silk and Jutefibers. Genetically Modified Cotton: its merits and demerits.						
<b>Unit:2</b>	<b>Viscose Fiber</b>					<b>6hours</b>
Viscose Fibre:Chemical structure, chemistry of regenerated cellulose. Production of Viscose Fibre:a simple flow chart,wet spinning of viscose filaments.Properties and uses of Viscose Fibre.						
<b>Unit:3</b>	<b>Synthetic and Acrylic Fibers</b>					<b>6hours</b>
Synthetic Fibers: Definition of monomers, polymers and polymerization. Simple examples of Condensation and Addition Polymerization reactions. Criteria for fibre forming polymers. Acrylic fibers: Synthesis of Acrylonitrile from propylene (SohioProcess), solution polymerization of acrylonitrile. Properties and uses of acrylic fibers.						
<b>Unit:4</b>	<b>Nylon Fibers</b>					<b>6hours</b>
Nylon Fibres:Synthesis of caprolactum from aniline, adipic acid from cyclohexane and hexa methylene diamine from adiponitrile .Polycondensation reactions leading to the formationo fNylon6 and Nylon6,6. Properties and uses of Nylon fibers. Structure and uses Of Kevlar fibers.						

Unit:5	Reaction of Polyester Fibers	6 hours
Polyester Fibers: Synthesis of Dimethyl Terephthalate (DMT) from p – xylene, terephthalic acid from benzoic acid (Henkel- II process) and synthesis of ethylene glycol. Chemical reactions of Polyethylene Terephthalate (PET) Preparation, properties and uses of Polyester fibers.		
<b>Total Lecture hours</b>		<b>30 hours</b>
<b>Text Book(s)</b>		
1	Moses, J. Jeyakodi, and M. Ramasamy. "Quality Improvement on Jute and Jute Cotton Materials Using Enzyme Treatment and Natural Dyeing". <i>Man-Made Textiles in India</i> . Vol.47, no. 7 (Jul. 2004): 252–255. (AN14075527)	
2	"cotton". <i>The Columbia Encyclopedia</i> , Sixth Edition. 2001-07.	
3	A.A.Vidya, ed.: <i>Production of Synthetic Fibers</i> , Prentice-Hall of India, 1988, New-Delhi.	
<b>Reference Books</b>		
1	Stephen Yafa (2004). <i>Cotton: The Biography of a Revolutionary Fiber</i> . Penguin (Non-Classics), 16. ISBN 0-14-303722-6.	
2	Kadolph, Sara J., ed.: <i>Textiles</i> , 10th edition, Pearson/Prentice-Hall, 2007, ISBN 0-13-118769-4.	
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>		
1	<a href="https://www.youtube.com/watch?v=ypUkIR894AM">https://www.youtube.com/watch?v=ypUkIR894AM</a>	
2	<a href="https://www.youtube.com/watch?v=0hoHvN289Xs">https://www.youtube.com/watch?v=0hoHvN289Xs</a>	
<b>Course Designed By: Dr J. Balamani</b>		

Mapping with Programme Outcomes							
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S	S	S	S
CO2	M	S	M	S	S	S	M
CO3	S	M	S	S	S	M	M
CO4	S	M	S	S	M	S	S
CO5	S	S	M	S	S	S	S



# Fourth Semester

Coursecode	43A	ORGANIC CHEMISTRY-I	L	T	P	C
CORE		CoreVI– Paper V	4	-	-	4
Pre-requisite		Basics of Organic Chemistry	Syllabus Version		2020-2021	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
<ol style="list-style-type: none"> <li>1. Understand the carbonyl compound's reactivity and various reduction reactions</li> <li>2. Explain the reactivity of active methylene compounds with electrophiles</li> <li>3. Outline the reactivity of monohydric alcohols and amines.</li> </ol>						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	Know the knowledge of Preparation and Properties of Carbonyl Compounds.					K1
2	Understand the mechanism of certain named reactions.					K2, K3
3	Understand the concepts of active Methylene compounds and Geometrical isomerism of certain organic compounds.					K2, K4
4	Know the classification of Phenols, Preparation of phenolic compounds with chemical properties.					K2
5	Know the concepts of amines, types, separation and their basic nature.					K3, K4
<b>K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create</b>						
<b>Unit:1</b>	<b>Chemistry of Carbonyl Compounds–I</b>					<b>12hours</b>
<b>Nomenclature, Preparation &amp; Properties:</b> Structure of carbonyl-general physical properties -Reaction with: Grignard reagent, NH <sub>3</sub> , primary amine Reaction Mechanism of haloform reaction, Reformatsky reaction. <b>Reduction Reactions:</b> with LiAlH <sub>4</sub> and NaBH <sub>4</sub> –Clemmensen reduction, Wolff Kishner reduction, MPV reduction						
<b>Unit:2</b>	<b>Chemistry of Carbonyl Compounds–II</b>					<b>12hours</b>
<b>Mechanism of:</b> -Aldol condensation, Cannizzaro reaction, Perkin reaction, Knoevenagel reaction, Claisen-Schmidt reaction, benzoin condensation, Mannich reaction.						
<b>Unit:3</b>	<b>Active Methylene Compounds</b>					<b>12hours</b>
Acetoacetic ester: preparation from Ethyl acetate – synthesis of succinic acid, 1,3-diketones, antipyrine - Malonic ester: Preparation from potassium cyanoacetate – synthesis of cinnamic acid, ketoacids, barbituric acid-cyanoacetic ester: preparation from chloroacetic acid – synthesis of malonic acid and adipic acid-Tautomerism of acetoacetic ester. <b>Geometrical isomerism:</b> Cis & Trans, E & Z notations – Geometrical isomerism in maleic acid and fumaric acid-physical and chemical properties of geometrical isomers.						

<b>Unit:4</b>	<b>Phenols</b>	<b>12hours</b>
Classification of phenols–Preparation of phenol from chlorobenzene, cumene– Reaction with mechanism:Schotten – Bauman and Gattermann reactions <b>Di and Trihydricphenols</b> : Preparation of Catechol, Resorcinol, Quinol, Pyrogallol and Phloroglucinol– Houben -Hoeschreaction		
<b>Unit:5</b>	<b>Amines</b>	<b>12hours</b>
Preparation of aliphatic and aromatic primary, secondary and tertiary amines – their separation, comparison of their basicity <b>ReactionsofAromaticAmine</b> : ringsubstitution,diazotizationandcouplingreaction– Diazomethane:preparation and syntheticapplications		
	<b>TotalLecturehours</b>	<b>60hours</b>
<b>TextBook(s)</b>		
1	Advanced OrganicChemistry, B.S.Bahl,Arunbahl,S.Chand&Co.,	
2	TextbookOrganicChemistry,P.L.Soni,S.M.Chawla,SultanChand&Sons	
<b>ReferenceBooks</b>		
1	Stereochemistry,Conformationandmechanisms,Kalsi,Wiley-EasternLtd.,	
2	Organicchemistry,R.T.MorrisonandR.W.Boyd,Prentice–Hall.	
3	FundamentalsofOrganicChemistry,T.W.GrahamSolomen,John-Wiley&Sons	
RelatedOnlineContents[MOOC,SWAYAM,NPTEL,Websitesetc.]		
1	<a href="https://nptel.ac.in/content/storage2/courses/104101005/downloads/LectureNotes/chapter%2010.pdf">https://nptel.ac.in/content/storage2/courses/104101005/downloads/LectureNotes/chapter%2010.pdf</a>	
2	<a href="https://www.youtube.com/watch?v=JgmzmehMiWM">https://www.youtube.com/watch?v=JgmzmehMiWM</a>	
<b>CourseDesignedBy:Dr.S.P.RajasinghandDr. C .Sudhakar</b>		

MappingwithProgrammeOutcomes							
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	L	M	L	M	M	L
CO2	M	L	S	L	L	M	M
CO3	L	M	S	M	L	L	S
CO4	S	M	S	L	M	M	L
CO5	S	L	M	M	L	M	L

\*S-Strong;M-Medium;L-Low



Coursecode	43P	VOLUMETRIC AND ORGANIC ANALYSIS	L	T	P	C
CORE PRACTICAL		CORE VII-CHEMISTRY PRACTICAL II	-	-	3	3
Pre-requisite		Basics Knowledge on Volumetric and Organic Reactions	Syllabus Version		2010-2011	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
<ol style="list-style-type: none"> <li>Inculcate the students how to skillfully handle the laboratory equipments, reagents, lab apparatus and preparation of standard solutions.</li> <li>Impart the first-hand knowledge and experience on estimation of anion, acid and base both directly as well as indirectly.</li> <li>Provide the student knowledge on analysis of an unknown organic substance using Preliminary and confirmation test and prepare a suitable derivative.</li> <li>Make the students skillful enough and prepare for a position in an analytical laboratory or a company.</li> </ol>						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	Estimate the amount of ion present in the given solution through volumetric analysis both by direct and indirect method				K1-K6	
2	Find the groups/elements and characters present in the given organic substance through qualitative analysis and prepare a suitable derivative.				K1-K6	
K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create						
<b>Part I</b>	<b>VOLUMETRIC ANALYSIS</b>				<b>45 hours</b>	
A. Acidimetry & Alkalimetry: Estimation of $\text{Na}_2\text{CO}_3$ B. Permanganometry: <ol style="list-style-type: none"> <li>Estimation of Ferrous sulphate &amp; Oxalic acid</li> <li>Estimation of Calcium- Direct method.</li> </ol> C. Dichrometry: Estimation of Ferrous iron using internal indicator. D. Iodimetry: <ol style="list-style-type: none"> <li>Estimation of <math>\text{K}_2\text{Cr}_2\text{O}_7</math></li> <li>Estimation of Copper.</li> <li>Estimation of <math>\text{As}_2\text{O}_3</math>.</li> </ol>						
<b>Part II</b>	<b>ORGANIC ANALYSIS</b>				<b>45 hours</b>	
Systematic analysis of an organic compound Preliminary tests, detection of elements present, Aromatic or Aliphatic, Saturated or unsaturated, nature of the functional group, confirmatory tests and preparation of derivatives. Substances- Aldehydes, Ketones, Amines, Amides, Diamide, Carbohydrates, Phenols, Acids, Esters & Nitro compounds.						
<b>Total Practical hours</b>					<b>90 hours</b>	

<b>TextBook(s)</b>	
1	BasicPrinciplesofPracticalChemistry,KulandaiveluA.R.,VeeraswamyR.Venkateswaran, SultanChand &Sons, 2017.
2	PracticalChemistry, PandeyD.N., SultanChand Publishers,2018
<b>ReferenceBooks</b>	
1	Vogel's Text book of Practical Organic Chemistry, Brian S. Furniss, Antony J.Hannaford,PeterW. G. Smith,Fifth Edition,BathPress, GreatBritan,1989
2	Vogel'sTextbookofQuantitativeChemicalAnalysis,GHJeffery,JBassett,J Mendham,RCDenney,FifthEdition,BathPress,Great Britan,1989
<b>RelatedOnlineContents[MOOC,SWAYAM, NPTEL, Websitesetc.]</b>	
1	<a href="https://nptel.ac.in/courses/104/106/104106108/">https://nptel.ac.in/courses/104/106/104106108/</a>
2	<a href="https://www.youtube.com/watch?v=n4esSHxz_J8">https://www.youtube.com/watch?v=n4esSHxz_J8</a>
3	<a href="http://wwwchem.uwimona.edu.jm/lab_manuals/c10expt25.html/">http://wwwchem.uwimona.edu.jm/lab_manuals/c10expt25.html/</a>
4	<a href="https://www.youtube.com/watch?v=7bmQkQW8bbs">https://www.youtube.com/watch?v=7bmQkQW8bbs</a>
5	<a href="https://www.youtube.com/watch?v=wRAo-M8xBHM">https://www.youtube.com/watch?v=wRAo-M8xBHM</a>
<b>CourseDesignedBy: Dr.J .Balamani&amp;Dr . M .Padmapriya</b>	

<b>MappingwithProgrammeOutcomes</b>							
<b>Cos</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	S	S	S	S	S	S	S
<b>CO2</b>	S	S	S	S	S	S	S

Course code	4ZB	TECHNOLOGY OF DYEING OF NATURAL FIBERS	L	T	P	C
SBS		Skilled Based Subject – II	2	-	-	2
Pre-requisite		Basic Knowledge in Fibers	Syllabus Version		2010-2011	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
1. To impart knowledge and skill in career oriented with a special reference to dyeing textile industry.						
2. To help students to acquire additional knowledge of dyeing auxiliaries and methods used in textile industry.						
3. To give students an overview on process and mechanism of dyeing.						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	State the basic aspects of colour and dyeing auxiliaries.					K2, K4,
2	Outline various methods of dyeing.					K2, K3
3	Demonstrate the process of azoic dyes and their applications.					K2, K3
4	Acquire knowledge in vat dyes and the procedures followed for dyeing.					K2, K3
5	Summarize the properties and mechanism of dyeing particularly sulfur and acid dyes.					K3, K4, K5
<b>K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create</b>						
<b>Unit:1</b>	<b>Introduction to Dyeing</b>					<b>6 hours</b>
Theory of Colour, chromophore, auxochrome, chromogen. Primary and Secondary colour. Chromatic and Achromatic Colours – Classification of dyes. Definition – Affinity, Substantivity, Exhaustion, % Shade, Adsorption, Diffusion, Aggregation, Migration – Effects of M:L ratio, salt, time and temperature. of dyeing. Properties of direct dyes – Application of direct dyes of Cotton: Mechanism of dyeing. Stripping and Redyeing. After treatment with CuSO <sub>4</sub> , K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> and dye fixing agents.						
<b>Unit:2</b>	<b>Methods of Dyeing</b>					<b>6 hours</b>
Reactive dyes – properties, Cold Brand, Hot Brand, Vinyl sulphone dyes, LS dyes, HE dyes, bifunctional dyes, Mechanism of dyeing. Exhaust dyeing, pad-batch, pad-steam, pad-cure, pad-silicate Methods. Stripping and redyeing.						
<b>Unit:3</b>	<b>Naphthols and Fast Bases</b>					<b>6 hours</b>
Naphthols and Fast Bases :properties and application – Diazotisation and coupling. Brief study on dissolution (classification of naphthols, cold and hot dissolution methods). Bases – direct and indirect method of diazotization. Application procedure of any one naphthols and base using Jigger and pad-dry-develop method. Stripping and Redyeing.						
<b>Unit:4</b>	<b>Vat Dyes</b>					<b>6 hours</b>
Types of Vat dyes. Details of vatting, dyeing, oxidation and soaping. Application procedure :Leucovat, vatacid – pigment padding – pad steam process. Merits and demerits of above methods. Dyeing of yarn with vat dyes by conventional method.						

Unit:5	Properties and Application of Dyes	6 hours
Brief study – solubilized vat dyes – properties – advantages and disadvantages over vat dyes – application – exhaust dyeing method. Sulphur dyes – Properties of Sulphur dyes – application. Jigger and continuous dyeing defects. Bronziness and acid tendering – Stripping and redyeing. Use of hydros. Properties of basic dyes mordants used for cotton. Dyeing wool & silk with basic dyes. Eco-friendly sulphur dyeing. Acid dyes – Properties, classification of dyes – leveling acid dyes, milling acid dyes – super milling acid dyes – application to wool and silk. Mechanism of dyeing – Dyeing of nylon with acid dyes.		
<b>Total Lecture hours</b>		<b>30 hours</b>
<b>Text Book(s)</b>		
1	Shenai V.A., Technology of Textile Processing Vol.1 and 2, Chemistry of Dyes and Principle of Dyeing Ed. 3, 1983, Sevak Publication, 306, Sri Hanuman Industrial Estate, GC Ambedkar Road, Wadala, Bombay 400031.	
2	Chakravarthy RR and Trivedi S.S., Technology of Bleaching and Dyeing of Textile Fibre Vol 1, Part 1, 1979, Mahajan Book Publishers, Supermarket Basement, Near Nataraj Cinema, Ashram Road, Ahmedabad 380009.	
3	Srivastava SB, Recent Process of Textile Bleaching, Dyeing and Finishing, 1981, SBSrivastava, SBP Board Consultant, SBP Buildings, 4/45 Roopnagar, Delhi 110007.	
<b>Reference Books</b>		
1	Trotman E.R., Dyeing and Chemical Technology of Textile Fibre, Charles Griffin & Co, 42, Dhury Lane, London WC2	
2	Gokhle S.V. and Shah R.C., Cotton Piece Dyeing, 1981, Ahmedabad Textile Industrial Research Assn. (ATIRA), PO Polytechnic, Ahmedabad 380015.	
3	Prayag R.S., The Bleaching and Dyeing of Cotton Material 1983, Weaver's Service Cent., 15A, Mamparamanand Marg, Near Roxy Cinema, Bombay 400 004.	
4	D.M. Lewis, Wool Dyeing, SDC Publications, UK.	
5	J.K. Aspland, Textile Dyeing and Colouration, AATCC Publications, USA.	
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>		
1	<a href="https://onlinecourses.swayam2.ac.in/cec19_te01/preview">https://onlinecourses.swayam2.ac.in/cec19_te01/preview</a>	
2	<a href="https://www.classcentral.com/course/swayam-textile-finishing-14326">https://www.classcentral.com/course/swayam-textile-finishing-14326</a>	
<b>Course Designed By: Dr. S. Rajalakshmi</b>		

Mapping with Programme Outcomes							
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S	S	S	S
CO2	S	S	M	M	S	S	S
CO3	S	M	S	M	S	S	S
CO4	S	S	M	M	S	M	S
CO5	S	S	M	M	M	M	S

\*S-Strong; M-Medium; L-Low



# **Fifth Semester**

Coursecode	53A	INORGANIC CHEMISTRY-II	L	T	P	C
<b>CORE</b>		Core VIII – Paper-VI	5	-	-	4
<b>Pre-requisite</b>		Basics of Inorganic Chemistry	<b>Syllabus</b>		<b>2020-2021</b>	
<b>Course Objectives:</b>						
<p>The main objectives of this course are to:</p> <ol style="list-style-type: none"> <li>To acquire knowledge on nuclear reactions, reactivity of atom bomb and hydrogen bomb, the importance of nuclear reactors in production of electricity.</li> <li>To describe the structure of metals and alloys along with its classifications and to impart basic on semiconductors along with its uses.</li> <li>To develop chemistry knowledge on isotopes, the importance of radioactive compounds in food preservation, archaeological dating and medical diagnosis and treatment.</li> <li>To study about the concepts related to the coordination compounds.</li> </ol>						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	Rationalise the conductivity of metals, semiconductors along with its applications.				K1, K2, K3	
2	Understand the types of nuclear reactions and its importance in generation of electricity.				K1, K2	
3	Acquire enormous knowledge on uses of isotopes and radioactive substances.				K1, K2	
4	Understand the terms - ligand, chelate, coordination number and various types of isomerism possible in coordination compounds.				K3, K4	
5	Outline various theories of coordination compounds and complete understanding on Crystal Field and Valence Bond Theory.				K2, K3	
<b>K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create</b>						
<b>Unit:1</b>						
		<b>Metals and Solid Solutions</b>	<b>15hours</b>			
Structure of metals and alloys-substitutional and interstitial solid solution- Hume Rothery ratios- metallic bonding-electrical, optical and mechanical properties of metals-semiconductors, intrinsic and extrinsic-their uses. Superconductors-An elementary treatment.						
<b>Unit:2</b>						
		<b>Radioactivity and Nuclear Reactions</b>	<b>15hours</b>			
Artificial radio activity. Artificial transmutation of elements, synthesis of radio isotopes and nuclear fission and fusion. Nuclear reactors – principle of working – production of electrical energy – atomic projects in India – Safety measures; disposal of reactor wastes – pollution. Nuclear reactions, mechanisms and different types of stellar energy.						
<b>Unit:3</b>						
		<b>Isotopes and Their Applications</b>	<b>15hours</b>			
Nature of isotopes and isobars – detection and isolation of isotopes – various methods – Importance of discovery of isotopes – uses of isotopes in various fields. Nuclear stability n/p ratio, magic numbers, C-12 atomic weight scale, C-14 dating, mass defect and nuclear						

Binding energies. Radio active disintegration series.		
<b>Unit:4</b>	<b>Co-ordination Chemistry -I</b>	<b>15hours</b>
Co-ordination chemistry – I Types of ligands, IUPAC Nomenclature, Isomerism - Ionisation, hydrate, linkage, ligand and coordination isomerism. Stereoisomerism- geometrical and optical isomerism in 4 & 6 coordinated complexes. Theories of coordination compounds – Werner’s and Sidgwick’s EAN concept, Valence Bond theory – hybridization, geometry and magnetic properties of $[\text{Ni}(\text{CN})_4]^{2-}$ , $[\text{NiCl}_4]^{2-}$ , $[\text{Fe}(\text{CN})_6]^{4-}$ , $[\text{Co}(\text{NH}_3)_6]^{3+}$ and $[\text{CoF}_6]^{3-}$ .		
<b>Unit:5</b>	<b>Co-ordination Chemistry -II</b>	<b>15hours</b>
Limitations of valence bond theory, an elementary idea of crystal field theory, crystal field splitting in octahedral, tetrahedral and square planar complexes, low spin & high spin complexes, factors affecting the crystal-field parameters. Explanation of colour and magnetic properties using CFT, comparison of VBT and CFT. A brief outline of thermodynamic stability of metal complexes and factors affecting the stability, stability constants of complexes and their determination, substitution reactions of square planar complexes.		
<b>Total Lecture hours</b>		<b>75hours</b>
<b>Text Book(s)</b>		
1	Malik, Wahid U., G.D. Tuli and R.D. Madan. Selected Topics in Inorganic Chemistry, 7th ed., New Delhi S. Chand & Company Ltd., 2007.	
2	B.R. Puri, L.R. Sharma, K.C. Kalia, Principles of Inorganic Chemistry, Shoban Lal Nagin Chand and Co., Delhi, 1996.	
3	H.J. Arnikar, Essentials of Nuclear Chemistry, 4th ed., New Age International, New Delhi, 1995.	
<b>Reference Books</b>		
1	J.E. Huheey, E.A. Keiter and R.L. Keiter, Inorganic Chemistry, 4th ed., Harper Collins, New York, 1993.	
2	F.A. Cotton, G. Wilkinson, C. Murillo and M. Bochman, Advanced Inorganic Chemistry, 6th ed., John Wiley, New York, 1999.	
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>		
1	<a href="https://nptel.ac.in/courses/104/105/104105033/">https://nptel.ac.in/courses/104/105/104105033/</a>	
2	<a href="https://www.encyclopedie-environnement.org/en/physics/radioactivity-and-nuclear-reactions/">https://www.encyclopedie-environnement.org/en/physics/radioactivity-and-nuclear-reactions/</a>	
<b>Course Designed By: Dr. S. P. Rajasingh and Mr. C. Sudhakar</b>		

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	M	S	M	S	M	S	S
CO2	M	M	M	M	S	S	M
CO3	S	M	S	M	S	M	M
CO4	M	M	S	S	S	M	M
CO5	S	S	M	M	S	M	S

\*S-Strong; M-Medium; L-Low

Coursecode	53B	SPECTROSCOPY	L	T	P	C
CORE		COREIX-PAPERVII	5	-	-	4
Pre-requisite		Knowledge on basic structure and reaction of simple organic compounds.	Syllabus Version		2020-2021	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
<ol style="list-style-type: none"> <li>1. Understand the basic concepts and theory behind the principles of different spectroscopic methods.</li> <li>2. Study the instrumentation and applications of UV-Visible, IR, Raman, NMR, Mass and ESR spectroscopic techniques.</li> <li>3. Predict the structure of organic compounds using IR, NMR and mass spectrometry.</li> </ol>						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, students will be able to:						
CO1	Gain the knowledge of different electromagnetic radiations, basic concepts, instrumentation and applications of UV-Visible spectra.					K2, K3
CO2	Know different types of vibrational frequencies, comparison between IR and Raman spectroscopy as well as their applications.					K2, K3
CO3	Study the basic principles, instrumentation and applications of NMR spectroscopy pertaining to some simple organic compounds.					K2, K3, K4
CO4	Acquire the knowledge on the basic concepts, instrumentation and applications associated with ESR.					K2, K3, K4
CO5	Understand the different concepts of mass spectrometry along with the determination of molecular formula.					K2- K5
K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create						
<b>Unit:1</b>	<b>Ultra Violet-Visible Spectroscopy</b>					<b>15hours</b>
<p><b>Spectroscopy:</b> Absorption and Emission spectra – Fundamental concepts – Electromagnetic spectrum with relative energies in each region.</p> <p><b>Ultra Violet – Visible Spectroscopy:</b> Introduction – Beer-Lambert's law – Instrumentation (block diagram) – Formation of absorption bands – Theory – Types of Electronic Transitions – Transition probability – The Chromophore and Auxochrome concepts – Absorption and Intensity shifts (Bathochromic, hypsochromic, hyperchromic and hypochromic shifts) – Types of absorption bands – Frank Condon principle – Applications of UV-Visible spectra.</p>						
<b>Unit:2</b>	<b>IR and Raman Spectroscopy</b>					<b>15hours</b>
<p><b>IR Spectroscopy:</b> Principle – Types of molecular vibrations – Vibrational frequencies – Factors affecting vibrational frequencies – Instrumentation (block diagrams with description of components) – Finger print region – Characteristic absorption bands of various functional groups – Applications of IR spectra.</p> <p><b>Raman Spectra:</b> Theory - Comparison of IR and Raman spectra – Applications of Raman Spectra.</p>						



<b>Unit:3</b>	<b>NMRSpectroscopy</b>	<b>15hours</b>
Introduction and basic principles–Spin–Spin relaxation, Spin–lattice relaxation–Instrumentation (Block diagram) – Chemical shift – Importance of TMS – Factors influencing chemical shift –Shielding and deshielding effects– Number of signals – Applications of NMR to simple molecules like Ethylalcohol (Pure and Impure), Toluene, Phenol, Acetaldehyde and Diethylether.		
<b>Unit:4</b>	<b>ESRSpectroscopy</b>	<b>15hours</b>
Basic Principle–The g factor–Hyperfine splitting –Instrumentation–Applications to methyl radical and Naphthalene negative ion.		
<b>Unit:5</b>	<b>Mass Spectrometry</b>	<b>15hours</b>
Basic Principles–Theory–The molecular ion–Determination of molecular formula– McLafferty rearrangement–Metastable peaks–Nitrogen rule–Retro Diels –Alder reaction.		
<b>Total Lecture hours</b>		<b>75hours</b>
<b>Text Book(s)</b>		
1	Elementary Organic Spectroscopy (Principles and chemical applications)–Y.R.Sharma, S. Chand & Company Ltd. Publications, Fifth revised Edn, 2017.	
2	Organic Spectroscopy (Principles and Applications)–Jag Mohan, Narosa Publishing House, Second Edn, 2012.	
<b>Reference Books</b>		
1	Spectroscopy of Organic compounds–P.S.Kalsi, New Age International Ltd. Publishers, Sixth Edn, 2005.	
2	Analytical Chemistry (Theory and Practice)–U.N.Dash, S.Chand & Sons, Second Edition, 2005.	
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>		
1	<a href="https://ndl.iitkgp.ac.in/">https://ndl.iitkgp.ac.in/</a>	
2	<a href="https://nptel.ac.in/course.html">https://nptel.ac.in/course.html</a>	
3	<a href="https://ocw.mit.edu/">https://ocw.mit.edu/</a>	
	<a href="https://www.oercommons.org/advanced-search">https://www.oercommons.org/advanced-search</a>	
<b>Course Designed By: Dr. A. Thirumoorthi</b>		

<b>Mapping with Programme Outcomes</b>							
<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	M	S	S	M	M	S	M
<b>CO2</b>	M	S	S	S	M	S	S
<b>CO3</b>	S	S	H	S	M	S	S
<b>CO4</b>	M	M	M	M	L	M	M
<b>CO5</b>	M	S	M	M	M	S	M

\*S-Strong; M-Medium; L-Low

Course code	53C	ELECTRO CHEMISTRY	L	T	P	C	
<b>CORE</b>		CoreX– Paper VIII	5	-	-	4	
<b>Pre-requisite</b>		<b>HigherSecondaryLevelKnowledge</b>	<b>Syllabus Version</b>		<b>2016-2017</b>		
<b>CourseObjectives:</b>							
Themain objectives ofthis courseareto:							
1. Makethestudentsunderstandbasic electrochemicalprinciples							
2. Givethem aninsight intothetypesofstorage cells &theirapplications							
3. Enablethestudenttounderstandtheconstruction&workingofdifferents types of electrodes							
<b>ExpectedCourseOutcomes:</b>							
Onthesuccessful completionofthecourse,student willbe ableto:							
1	Describe the principle of solubility product andrelate the pH of a solutioncontainingamixtureofthetwocomponentstotheaciddissociationconst ant,Ka					<b>K1-K3</b>	
2	Understandthedifferencebetweenmetallicconductance&electrolyticconductance					<b>K1,K2</b>	
3	Recognize the different types of electrochemical cells and calculate the cellpotentialfrom standardcell potential					<b>K2,K3</b>	
4	Distinguishbetweencells anduse theNernst equationfor calculatingEMFofacell.					<b>K1-K4</b>	
5	Understand the working principles of fuel cells, storage cells and batterydesign.					<b>K2-K4</b>	
<b>K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate;K6-Create</b>							
<b>Unit:1</b>		<b>Ionic Equilibrium</b>				<b>15hours</b>	
Ionic Equilibria- Solubility and solubility product-determination of solubility product-Applications of solubility product principle. Dissociation of weakacids and bases-Dissociation constants- pH scale- common ion effect-buffer solutions-Determination of pH values of buffer mixtures-Henderson 'sequation-Hydrolysis of salts-Degree of hydrolysis.							
<b>Unit:2</b>		<b>ConductivityofIons</b>				<b>15hours</b>	
Electricalconduction,conductioninmetalsandinelectrolyticsolutions.Measurementofconductivity in electrolytic solutions. Migration of ions-Kohlrausch's law. Arrhenius theory ofelectrolytic dissociation-Ostwald's dilution law. Theory of strong electrolytes-Debye-Huckel-Onsagartheory(elementaryaccountonly)verification.Debye-Falkenhageneffect-Wieneffect-Transportnumbers-Determination.Conductometricitrations.							

<b>Unit:3</b>	<b>Electrochemical Cells</b>	<b>15hours</b>
Electro chemical cells. Electrode potentials- The standard hydrogen electrode kinds of electrodes and their potentials-Nernst equation .EMF- computation and measurement of cell EMF. Single Electrode potential – Determination and significance of electrode potentials -electrochemical series- temperature dependence of the cell EMF- Thermodynamic quantities of cell reactions.		
<b>Unit:4</b>	<b>Electrode Potential</b>	<b>15hours</b>
Reference electrodes-Electrodes for measurement of pH- concentration cells with and without transport-liquid junction potential- applications of EMF measurements.Redox potential- Redox indicators-uses.Potentiometric titrations.		
<b>Unit:5</b>	<b>Fuel and Storage Cells</b>	<b>15hours</b>
Fuel cells: Hydrogen- oxygen cell and hydrocarbon - oxygen cell. Storage cells. Lead storage cell and Nickel cadmium cell. Decomposition voltage-over voltage-Deposition and discharge potential.		
	<b>Total Lecture hours</b>	<b>75hours</b>
<b>Text Book(s)</b>		
1	B.R.Puri and L.R.Sharma, Principles of physical chemistry, Shoban Lal Nagin Chand and Co. 33rd edition, 1992.	
2	S.H.Maron and J.B.Lando, Fundamentals of physical chemistry, Macmillan limited, New York, 1966.	
<b>Reference Books</b>		
1	S.K.Dogra and S.Dogra, Physical chemistry through problems, New age international, 4th edition 1996.	
2	P.W. Atkins, Physical chemistry, Oxford university press, 1978	
3	K.L. Kapoor, A text book of Physical chemistry, (volume-2 and 3) Macmillan, India Ltd, 1994.	
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>		
1	<a href="https://chem.pg.edu.pl/documents/175289/4235721/Electrochemistry-supplement%20text.pdf">https://chem.pg.edu.pl/documents/175289/4235721/Electrochemistry-supplement%20text.pdf</a>	
2	<a href="https://nptel.ac.in/courses/104/106/104106105/">https://nptel.ac.in/courses/104/106/104106105/</a>	
3	<a href="https://nptel.ac.in/content/storage2/courses/103108100/module6/module6.pdf">https://nptel.ac.in/content/storage2/courses/103108100/module6/module6.pdf</a>	
<b>Course Designed By: Dr.N.Bhuvaneshwari</b>		

Mapping with Programme Outcomes							
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	M	M	S	S	M	M
CO2	M	S	M	S	S	L	M
CO3	M	M	S	M	S	S	M
CO4	S	S	M	M	M	S	S
CO5	S	L	S	M	M	M	M

\*S-Strong; M-Medium; L-Low

<b>Coursecode</b>	<b>53D</b>	<b>ANALYTICAL CHEMISTRY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>CORE</b>		CoreXI–Paper IX	<b>4</b>	<b>-</b>	<b>-</b>	<b>4</b>
<b>Pre-requisite</b>		<b>HigherSecondaryLevel</b>	<b>SyllabusVersion</b>		<b>2009-2010</b>	
<b>CourseObjectives:</b>						
Themain objectives ofthis courseareto:						
<ol style="list-style-type: none"> <li>1. Understandtheprinciplesofvariousanalyticaltechniquesandtheirapplications</li> <li>2. Analyzeerrorsandperformvarioustestsforanalyticaldata</li> <li>3. Outline the concepts ofgravimetricmethods in quantitative analysis</li> </ol>						
<b>ExpectedCourseOutcomes:</b>						
Onthesuccessful completionofthecourse,student willbe ableto:						
1	Understandtheprinciplesofvariousanalyticaltechniquesandtheirappli cations				<b>K2, K3</b>	
2	Evaluatedifferenttypesoferrorsandcorrectthem.				<b>K1, K5</b>	
3	Performvarioustestsforsetofanalyticaldata				<b>K3, K4</b>	
4	Understandthetheory ofquantitativeanalysis				<b>K1, K6</b>	
5	Determineananalytequantitativelyusinggravimetricmethods				<b>K3, K5</b>	
<b>K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate;K6-Create</b>						
<b>Unit:1</b>		<b>AnalyticalTechniques</b>			<b>12hours</b>	
Basic principles and applications of Analytical techniques suchas Precipitation, filtration, sample drying,transfer of precipitates,distillation,vacuum distillation,fractional distillation and steam distillation. Sublimation,crystallization,fractional crystallization and Refractive Indices.						
<b>Unit:2</b>		<b>DataAnalysis</b>			<b>12hours</b>	
Evaluation of Analytical data:Accuracy and precision, methods for their expression,classification of errors,detection and correction of determinate and indeterminate errors.The normal law of Distribution of Indeterminate errors.						
<b>Unit:3</b>		<b>StatisticalTestsandSignificantFigures</b>			<b>12hours</b>	
The Fttest and the Ttest, rejection of data-the method of leastsquares, propagation of errors in computation-significant figures.						
<b>Unit:4</b>		<b>QuantitativeAnalysisandChemicalE quilibrium</b>			<b>12hours</b>	
Theory of Quantitative Analysis; Application of Chemical equilibrium to analytical separations andestimations:Theequilibriumconstants,activitycoefficients.Acid- Base equilibria, solubility equilibria, distribution equilibria,Complex ion equilibria and stability constant Separationsand estimations: illustrated with examples.						
<b>Unit:5</b>		<b>GravimetricMethods</b>			<b>12hours</b>	
Theory of indicators,Theory of precipitation,Co-precipitation,Post- precipitation, theory of purifying the precipitates,Acid-Base, redox ,ComplexometricandprecipitationTitrations,Volumetricanalysis.						
<b>TotalLecturehours</b>					<b>60hours</b>	

<b>TextBook(s)</b>	
1	ElementsofAnalyticalChemistry. R.Gopalan,Sultan Chand&Sons
<b>ReferenceBooks</b>	
1	QuantitativeChemicalAnalysis,A.I. Vogel.
2	InstrumentalMethodsofAnalysis,Skoog.
3	InstrumentalMethodsofAnalysis,Willard,Dean, MerritandSettle,CBS.
4	Vogel’s Textbook of Quantitative Chemical Analysis, G H Jeffery, J Bassett, J Mendham, RCDenney, Fifth Edition,Bath Press,GreatBritan,1989
<b>RelatedOnlineContents[MOOC,SWAYAM, NPTEL, Websitesetc.]</b>	
1	<a href="https://www.mobt3ath.com/uplode/book/book-19965.pdf">https://www.mobt3ath.com/uplode/book/book-19965.pdf</a>
2	<a href="https://chem.libretexts.org/Courses/University_of_California_Davis/UCD_Chem_105/Chapters/5. Errors_in_chemical_analysis">https://chem.libretexts.org/Courses/University_of_California_Davis/UCD_Chem_105/Chapters/5. Errors_in_chemical_analysis</a>
<b>CourseDesignedBy:Dr.S.P.RajasinghandDr.J .Balamani</b>	

<b>MappingwithProgrammeOutcomes</b>							
<b>Cos</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	S	M	L	S	S	S	M
<b>CO2</b>	S	M	M	S	S	M	S
<b>CO3</b>	M	M	S	S	S	M	S
<b>CO4</b>	S	S	S	M	S	M	S
<b>CO5</b>	S	M	L	M	S	S	S

Course code	5ZC	WATER & EFFLUENT TREATMENT AND POLLUTION CONTROL		L	T	P	C
SBS		Skilled Based Subject – III		2	-	-	3
Pre-requisite		Higher Secondary Level Chemistry		Syllabus Version		2010-2011	
<b>Course Objectives:</b>							
The main objectives of this course are to:							
<ol style="list-style-type: none"> <li>1. Overview of impact of man on the environment</li> <li>2. Detail view of pollution and water softening techniques</li> <li>3. Description about water effluent treatment and pollution analysis techniques</li> </ol>							
<b>Expected Course Outcomes:</b>							
On the successful completion of the course, student will be able to:							
1	To understand urbanization and biodiversity along with environmental pollution.					K1, K2	
2	Acquire the knowledge about water pollution and water softening methods.					K1, K2, K3, K4	
3	Importance about water analysing methods along with determination of BOD, COD and toxicity.					K2, K3, K4,	
4	Detailed explanation of primary, secondary and tertiary water treatment methods.					K2, K3, K4, K5	
5	Discuss about effect of noise pollution along with brief study on modern methods for pollution analysis.					K1, K2, K4	
<b>K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create</b>							
<b>Unit:1</b>		<b>Sources of Pollution</b>				<b>6hours</b>	
Impact of man on the Environment – an overview of Urbanization and Biodiversity. Environmental pollution – classification of pollution – Effect of industrial effluents – a detailed study of effluents discharged by Soap and detergent manufacture industry and Textile processing industry (study includes origin of effluent, important characteristic and general mode of treatment) . Constituents of water and their effect on Textile wet processing – Water pollution – Harmful effects of water pollution and source of water pollution.							
<b>Unit:2</b>		<b>Water Pollution and Softening Methods</b>				<b>6hours</b>	
WHO, ISO standards for raw water criteria – A general study on raw water pollution and consequence of river water pollution – Effluent discharge standards for inland surface water public sewers, on land for irrigation, marine coastal areas and drinking water parameters- A general study on boiler water requirements which includes problem caused by water and effect and feed water requirements for low and medium pressure boilers and at a pressure of 450 – 500psi. Water softening – study includes Cation Exchange softening, lime soda softening, softening by Sequestering agents and De-mineralization with schematic diagram of removal of carbon dioxide and silica.							

<b>Unit:3</b>	<b>Analysis Techniques for Water</b>	<b>6hours</b>
Removal of colour and turbidity (simple Coagulation, Flocculation and Filtration methods). General study on removal of Iron and Manganese by Aeration, setting and filtration method- Water analysis – colour, pH value, dissolved solids, suspended solids, total hardness (Calcium +Magnesium). EDTA Titrimetric method, total iron- thiocyanate method, Determination of Alkalinity by Titrimetric method–thiocyanate method, Determination of Alkalinity by Titrimetric method- Determination of chlorides by silver nitrate method- Determination of dissolved oxygen by iodimetry–Determination of BOD, COD TDS and Toxicity.		
<b>Unit:4</b>	<b>Water Treatment Methods</b>	<b>6hours</b>
Effect of effluents–General treatment procedure parameters to be determined at Sizing, Desizing, Kier boiling, Bleaching, Mercerizing, Dyeing, Printing, Combined effluent treatment of industrial wastes- Brief study on Screening, Sedimentation, Equalization, Neutralization, Coagulation, Secondary treatment– Trickling filtration Activated sludge process, oxidation ponds, Anaerobic Digestion, Tertiary treatment- Evaporation (solar & steam). Reverse osmosis, ion exchange, chemical precipitation and removal by Algae and activated carbon treatment.		
<b>Unit:5</b>	<b>Analysis Techniques for Pollution</b>	<b>6hours</b>
Model schematic diagram for waste water treatment plant for textile mills-Primary & secondary units –Effects of air pollution –Effects of Sulphur oxide on human health – Ambient air quality standards- Noise pollution –ill effects of noise-Noise level in decibels. Brief study on modern methods for pollution analysis like molecular luminescence ,BOD incubator , ion exchange chromatography and HPLC.		
<b>Total Lecture hours</b>		<b>30hours</b>
<b>Reference Book(s)</b>		
1	Environment Pollution control Engineering by C.S.Rao. Newage International Ltd & Publishers.	
2	Industrial safety & Pollution control Hand Book by National safety council and Associate Data Publisher Pvt Ltd.	
3	Industrial Effluents by N.Manivasakam, Sakthi Publications, Coimbatore.	
4	Water used in Textile Processing by N.Manivaskam, Sakthi Publications, Coimbatore.	
5	Tamilnadu state publications and Handbook of pollution control –Central Board of pollution control.	
6	Textile Effluents by Padma Varkar, NCUTE Publications, IIT, Delhi.	
7	Environmental Chemistry and pollution Control, S.S.Dhara, S.Chand & Co., Delhi.	
8	Pollution in Textile Industry, K.B.Krishnakumar, SSMITT Students Cooperative Stores, Komarapalayam.	
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>		
1	<a href="https://nptel.ac.in/courses/105/104/105104102/">https://nptel.ac.in/courses/105/104/105104102/</a>	
<b>Course Designed By: Dr.S.P.Rajasingh and Dr.S.Rajalakshmi</b>		

<b>MappingwithProgrammeOutcomes</b>							
<b>Cos</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	S	S	S	M	S	S	S
<b>CO2</b>	M	S	M	S	S	S	M
<b>CO3</b>	S	M	S	S	S	M	M
<b>CO4</b>	S	M	S	S	M	S	S
<b>CO5</b>	S	S	M	S	S	S	S

\*S-Strong;M-Medium;L-Low







# Sixth Semester

Coursecode	63A	ORGANIC CHEMISTRY-II	L	T	P	C
CORE		COREXII -PAPER X	5	6	-	4
Pre-requisite	Knowledge on basic structure and reactions of simple organic compounds.		Syllabus Version		2020 - 2021	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
<ol style="list-style-type: none"> <li>1. Understand the optical activity of various molecules and their naming patterns.</li> <li>2. Study the mechanism of different rearrangement reactions.</li> <li>3. Acquire the knowledge on reactions and structures of heterocyclic compounds, amines and proteins.</li> <li>4. Predict the structure of natural products like vitamins, alkaloids, terpenoids and hormones.</li> </ol>						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, students will be able to:						
CO1	Gain the knowledge on different types of optically active molecules and their naming methods.		K2, K4, K5			
CO2	Understand the mechanisms of inter and intramolecular rearrangement reactions with examples.		K2, K4			
CO3	Acquire the knowledge on the preparation, properties and uses of heterocyclic compounds, amino acids and proteins.		K2, K3			
CO4	Know the classification, structural elucidation and synthesis of terpenoids and vitamins.		K2, K4, K5			
CO5	Understand the different types and structural elucidation of alkaloids and hormones.		K2, K4, K5			
K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create						
<b>Unit:1</b>	<b>Stereochemistry</b>		<b>15 hours</b>			
Optical activity – Asymmetric carbon – Racemisation – Resolution – Asymmetric synthesis – D, L and R,S notation. Optical activity due to restricted rotation in biphenyls, allenes and spiranes – Molecular overcrowding.						
<b>Unit:2</b>	<b>Molecular Rearrangements</b>		<b>15 hours</b>			
Mechanism of Pinacol – Pinacolone rearrangement – Beckmann rearrangement – Hoffmann rearrangement – Curtius rearrangement – Benzilic acid rearrangement – Schmidt rearrangement – Lossen rearrangement – Cope rearrangement and Claisen rearrangement.						
<b>Unit:3</b>	<b>Heterocyclic Compounds and Proteins</b>		<b>15 hours</b>			
<b>Heterocyclic Compounds:</b> Chemistry of Furan, Pyrrole, Thiophene, Pyridine – Synthesis and uses of Quinoline, Isoquinoline and Indole.						
<b>Proteins:</b> Amino acids – Classification – Peptide linkage – Proteins – Classification based on physical properties and biological functions – Primary, Secondary and Tertiary structure – Uses.						

<b>Unit:4</b>	<b>Terpenoids and Vitamins</b>	<b>15 hours</b>
<p><b>Terpenoids:</b> Introduction–Classification–General methods of isolation– Isoprene rule- structural elucidation and synthesis of Geraniol, Terpeneol and dipentene.  <b>Vitamins:</b>Introduction–Importance of vitamins– Structural elucidation and synthesis of Retinol, Riboflavin and Ascorbic acid.</p>		
<b>Unit:5</b>	<b>Alkaloids and Hormones</b>	<b>15 hours</b>
<p><b>Alkaloids:</b> Introduction – Classification and General Characteristics – General methods of determining structures–Hoffmann’s exhaustive methylation– Structural elucidation and synthesis of Nicotine, Piperine and Papaverin.  <b>Hormones:</b> Introduction–Structural elucidation and synthesis of Adrenaline and Thyroxine.</p>		
	<b>Total Lecture hours</b>	<b>75 hours</b>
<b>Text Book(s)</b>		
1	Advanced Organic Chemistry–B.S. Bahland Arun Bahl, S. Chand & Co., 2012.	
2	Organic Chemistry, R.T. Morrison and R.N. Boyd, Pearson Education, Sixth Edn., 2002.	
3	Textbook Organic Chemistry, P.L. Soni, S.M. Chawla, Sultan Chand & Sons, 2007.	
<b>Reference Books</b>		
1	Organic Chemistry–Vol. 1 and Vol. 2, I.L. Finar, Pearson Education, Sixth Edn., 2006.	
2	Stereochemistry of Organic compounds, D. Nasipuri, New Age International (P) Ltd, Second Edn., 2005.	
3	Stereochemistry: Conformation and Mechanism-P.S. Kalsi, New Age International Private Ltd., 2015	
<b>Online References (Go to the following websites and search with the specific topics/ keywords)</b>		
1	<a href="https://ndl.iitkgp.ac.in/">https://ndl.iitkgp.ac.in/</a>	
2	<a href="https://nptel.ac.in/course.html">https://nptel.ac.in/course.html</a>	
3	<a href="https://ocw.mit.edu/">https://ocw.mit.edu/</a>	
4	<a href="https://www.oercommons.org/advanced-search">https://www.oercommons.org/advanced-search</a>	
<b>Course Designed By: Dr. A. Thirumoorthi</b>		

<b>Mapping with Programme Outcomes</b>							
<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	M	S	S	S	M	S	M
<b>CO2</b>	L	M	M	S	L	S	S
<b>CO3</b>	S	S	M	M	M	S	S
<b>CO4</b>	S	M	S	S	M	S	S
<b>CO5</b>	S	S	S	S	M	S	S

\*S-Strong; M-Medium; L-Low

Coursecode	63B	PHYSICAL CHEMISTRYII	L	T	P	C
<b>CORE</b>		CoreXIII– Paper XI	5	5	-	4
<b>Pre-requisite</b>		HigherSecondaryLevelChemistry	<b>Syllabus Version</b>		<b>2010-2011</b>	
<b>CourseObjectives:-</b>						
The main objectives of this course are to:						
1. Impart knowledge on electrical and magnetic properties of molecules						
2. Describe the order and molecularity of reaction and determination of order of reactions						
3. Broad description of the theoretical aspects and experimental techniques of kinetics of different types of reactions.						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	Understand the electrical properties of molecules and its application					<b>K1-K3</b>
2	Understand magnetic properties of molecules and its application for solving problem for structure determination					<b>K1-K3</b>
3	Know about the order and molecularity of reaction and also determination of order of reactions					<b>K2-K4</b>
4	Understand and learn the theoretical and experimental aspects of kinetics of reactions					<b>K1-K4</b>
5	Gain detailed knowledge on photochemical and thermal reactions.					<b>K1-K3</b>
<b>K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate;K6–Create</b>						
<b>Unit:1</b>		<b>Electrical Properties of Molecules</b>			<b>15 hours</b>	
Electrical properties of molecules: Molar polarization, Orientation polarization and Distortion polarization polar and non-polar molecules. Determination of dipole moment of polar gases, liquids and solids-Application of dipole moment in the study of simple molecules.						
<b>Unit:2</b>		<b>Magnetic Properties of Molecules</b>			<b>15 hours</b>	
Magnetic properties of molecules; Meaning of the terms magnetic susceptibility, magnetic moment, diamagnetism, paramagnetism and ferromagnetism, Determination of magnetic susceptibility by Guoy's method. Application of magnetic properties in solving structural problems.						
<b>Unit:3</b>		<b>Order and Molecularity of Reactions</b>			<b>15 hours</b>	
Empirical laws and experimental aspects. Rate laws, Stoichiometry, order and molecularity of reactions- Setting up and solving simple differential equation for first order, second order, third order and zero order reactions. Characteristics of I, II, III and Zero order reactions. Determination of order of reactions.						

<b>Unit:4</b>	<b>Kinetics of Reaction</b>	<b>15 hours</b>
Experimental techniques involved in following kinetics of reaction. Volumetry, manometry, polarimetry and colorimetry, typical examples for each of the techniques. Theoretical aspects. Effect of temperature on rate constant. The activation energy. The collision theory of reaction rates and its limitation. Lindemann theory of unimolecular reactions. The theory of Absolute reaction rates. Comparison of the collision theory with the Absolute reaction rate theory.		
<b>Unit:5</b>	<b>Photochemical Reactions</b>	<b>15 hours</b>
Thermal chain reaction $H_2/Br_2$ reaction. Kinetics of photochemical reactions. Absorption of light and photochemical process. The Stark-Einstein law of photochemical equivalence. Photochemical chain reaction $H_2/Br_2$ reaction. Quantum yield of photochemical reactions. Comparison of thermal & photochemical kinetics of $H_2/Br_2$ reaction. Photo sensitized reactions. Fluorescence, phosphorescence and chemiluminescence.		
<b>Total Lecture hours</b>		<b>75 hours</b>
<b>Text Book(s)</b>		
1	Principles of Physical Chemistry, B.R. Puri, L.R. Sharma and M.S. Phathania, Shobanlal Nagin Chand & Co	
2	Essentials of Physical Chemistry, B.S. Bahadur and G.D. Tuli, S. Chand & Co	
3	Textbook of physical Chemistry, P.L. Soni, Dharmaraj; Sultan Chand & Son	
<b>Reference Books</b>		
1	Physical Chemistry, P.W. Atkins, Oxford	
2	Physical Chemistry, R.A. Alberty, John. Wiley & Sons	
3	Elements of physical Chemistry, S. Glasstone and D. Lewis, McMillan	
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>		
1	<a href="https://archive.org/details/2015.135344.ElementsOfPhysicalChemistryEd2nd/page/n9/module/2up">https://archive.org/details/2015.135344.ElementsOfPhysicalChemistryEd2nd/page/n9/module/2up</a>	
2	<a href="https://nptel.ac.in/content/storage2/courses/122101001/downloads/lec-26.pdf">https://nptel.ac.in/content/storage2/courses/122101001/downloads/lec-26.pdf</a>	
3	<a href="https://www.youtube.com/watch?v=W8FhIGNnMkg&amp;t=5447s">https://www.youtube.com/watch?v=W8FhIGNnMkg&amp;t=5447s</a>	
<b>Course Designed By: Dr. T. Selvaraju</b>		

Mapping with Programme Outcomes							
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	M	S	M	S	S
CO2	M	S	S	M	S	S	S
CO3	S	M	S	L	S	M	M
CO4	S	S	L	S	M	S	S
CO5	S	M	S	S	M	S	M

\*S-Strong; M-Medium; L-Low

Coursecode	63P	GRAVIMETRIC ANALYSIS AND PHYSICAL CHEMISTRY	L	T	P	C
<b>CORE PRACTICAL</b>		<b>COREXIV-CHEMISTRY PRACTICAL III</b>	-	-	5	4
<b>Pre-requisite</b>		<b>Basics Knowledge on Analytical and Physical Chemistry</b>	<b>Syllabus Version</b>		<b>2019-2020</b>	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
<ol style="list-style-type: none"> <li>1. Make the student to learn a technique to determine the amount of an analyte (cation) through the measurement of mass.</li> <li>2. Impart understanding about conductance of a solution by the addition or removal of ions.</li> <li>3. Realize and explore the fundamentals of basic physical chemistry experiments, including chemical kinetics, phase diagram and molecular weight determinations.</li> </ol>						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	Understand the concept of gravimetric analysis.					<b>K1-K6</b>
2	Find a suitable precipitation method and perform effective precipitation to determine the amount of the cation.					<b>K1-K6</b>
3	Calculate the conductance of the solution at various stages of neutralization					<b>K2-K5</b>
4	Determine the rate and dissociation constant for a reaction					<b>K2-K4</b>
5	Perform graphical analysis to arrive at experimental results based on the physical chemistry experiments.					<b>K1-K6</b>
<b>K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create</b>						
<b>Part I</b>	<b>Sintered Crucible Based Gravimetric Analysis</b>				<b>30 hours</b>	
<ol style="list-style-type: none"> <li>1. Estimation of Barium as Barium Chromate.</li> <li>2. Estimation of Lead as Lead Chromate.</li> <li>3. Estimation of Nickel as Nickel Dimethyl Glyoxime.</li> </ol>						
<b>Part II</b>	<b>Silica Crucible Based Gravimetric Analysis</b>				<b>30 hours</b>	
<ol style="list-style-type: none"> <li>1. Estimation of Sulphate as Barium Sulphate</li> <li>2. Estimation of Calcium as Calcium Oxalate.</li> </ol>						
<b>Part III</b>	<b>Conductometric Physical Experiments</b>				<b>30 hours</b>	
<ol style="list-style-type: none"> <li>1. Conductometric titrations, strong acid-strong base.</li> <li>2. Conductometric titrations, Weak acid-strong base.</li> <li>3. Determination of cell constant, specific conductivity and equivalent conductivity of strong electrolyte.</li> </ol>						
<b>Part IV</b>	<b>Physical Organic Experiments</b>				<b>30 hours</b>	
<ol style="list-style-type: none"> <li>1. Determination of rate constant of acid-catalysed hydrolysis of an ester (Methyl acetate or Ethyl acetate).</li> <li>2. Determination of dissociation constant of a weak acid (acetic acid).</li> </ol>						

PartV	Temperature Based Physical Experiments	30hours
1. Determination of K <sub>f</sub> / molecularweight by Rast's macromethod -Naphthalene, Diphenyl and diphenylamine 2. Determination of critical solution temperature of Phenol-Water system. 3. Effect of impurity (NaCl, /succinicacid) on CST. 4. Phase Diagram –Simple Eutectic system. 5. Determination of the transition temperature		
<b>TotalPracticalhours</b>		<b>150hours</b>
<b>TextBook(s)</b>		
1	BasicPrinciplesofPracticalChemistry, Kulandaivelu A.R., Veeraswamy R., Venkateswaran, Sultan Chand & Sons, 2017.	
2	PracticalChemistryfor B.ScChemistry, A.O.Thomas	
<b>ReferenceBooks</b>		
1	Vogel'sTextbookofQuantitativeChemicalAnalysis, GHJeffery, JBassett, JMendham, RCDenney, FifthEdition, BathPress, Great Britan, 1989	
2	AdvancedPractical PhysicalChemistry, YadavJ.B., GoelPublishingHouse, 2014.	
<b>RelatedOnlineContents[MOOC, SWAYAM, NPTEL, Websitesetc.]</b>		
1	<a href="https://www.youtube.com/watch?v=6Kd0qIczD24">https://www.youtube.com/watch?v=6Kd0qIczD24</a>	
2	<a href="https://www.youtube.com/watch?v=peMyqdJ57dA">https://www.youtube.com/watch?v=peMyqdJ57dA</a> (EstimationofNickel)	
3	<a href="https://www.youtube.com/watch?v=-GS6uoFf3qQ">https://www.youtube.com/watch?v=-GS6uoFf3qQ</a> (strong-acid-strongbase)	
4	<a href="https://www.youtube.com/watch?v=Dc4aUdADqY8">https://www.youtube.com/watch?v=Dc4aUdADqY8</a> (weekacid-strongbase)	
5	<a href="https://www.youtube.com/watch?v=xo1wNSZpE4w">https://www.youtube.com/watch?v=xo1wNSZpE4w</a> (KineticsofEsterHydrolysis)	
6	<a href="https://www.youtube.com/watch?v=5oVnpYhmMVU">https://www.youtube.com/watch?v=5oVnpYhmMVU</a> (CSTofPhenol-WaterSystem)	
7	<a href="https://www.youtube.com/watch?v=2VzEpsEZOYo">https://www.youtube.com/watch?v=2VzEpsEZOYo</a> (Rast'sMacroMethod)	
<b>CourseDesignedBy:Dr.S. P.RajasinghandDr. A.Thirumoorthi</b>		

MappingwithProgrammeOutcomes							
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S
CO3	M	S	S	S	M	S	M
CO4	M	S	M	S	M	M	M
CO5	M	S	M	S	S	M	M

\*S-Strong;M-Medium;L-Low

Coursecode	63Q	PRACTICALFORELECTIVE SUBJECTS	L	T	P	C
<b>COREPRACTICAL</b>		<b>COREXV</b>	-	-	3	4
<b>Pre-requisite</b>		<b>Basics Knowledge on Organic, Inorganic and Physical Chemistry</b>	<b>Syllabus Version</b>		<b>2010-2011</b>	
<b>CourseObjectives:</b>						
Themain objectivesof this courseareto:						
<ol style="list-style-type: none"> <li>1. Impartskillsin thestudent toanalyseasubstancebyfindingtheirphysical constants.</li> <li>2. Impartknowledgetopreparesvariousorganometallicandorganicsubstancesusingcomplexation,oxidation,reduction, hydrolysis andothertechniques.</li> <li>3. MakethestudentslearnthetechniqueofestimationofasubstanceusingComplexometrictitrations.</li> <li>4. Inculcatetheknowledge andskillsintheestimation ofasubstanceusingcolourandlight</li> </ol>						
<b>ExpectedCourseOutcomes:</b>						
Onthesuccessfulcompletion ofthecourse, studentwill beable to:						
1	Usethephysicalconstantsintheanalysisof asubstance.					<b>K1-K5</b>
2	Prepareinorganiccomplexes					<b>K1-K6</b>
3	Performorganictransformationinvolvingsubstitutionandoxidation reactions					<b>K1-K5</b>
4	Useeffectivelythe Complexometric method to estimatehardnessof water					<b>K2-K6</b>
5	Colorimetricmethodsintheestimationofvarioussaltsandions.					<b>K1-K5</b>
<b>K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate;K6-Create</b>						
<b>PartI</b>	<b>Determination of Melting and Boiling Point</b>				<b>3hours</b>	
1.Determination of Meltingpoint/ Boilingpoint of an organicsubstance.						
<b>PartII</b>	<b>Preparation of InorganicComplexes</b>				<b>18hours</b>	
<ol style="list-style-type: none"> <li>(a) Tetramminecopper(II)sulphate</li> <li>(b) PotassiumTrioxalatochromate(III)</li> <li>(c) Prussian Blue</li> <li>(d) HexamineCobalt(II) chloride</li> <li>(e) PotassiumTrioxalatoFerrate(III)</li> <li>(f) SodiumCuprousThiosulphate.</li> </ol>						
<b>PartIII</b>	<b>Organic Preparation</b>				<b>12hours</b>	
Preparation involving, Hydrolysis,Oxidation,Halogenation,NitrationandBenzoylation.						
<b>PartIV</b>	<b>Estimation Using EDTA Method</b>				<b>3hours</b>	
Estimation of Hardness of Water using EDTA.						
<b>PartV</b>	<b>Estimation Using Calorimetric Method</b>				<b>9hours</b>	
Calorimetric experiments involving Nessler'stubes.						
<ol style="list-style-type: none"> <li>(a) Extimiation of <math>Fe^{3+}</math> with Ammonium thiocyanate.</li> <li>(b) Extimiation of Ni as NickelDimethylglyoxime.</li> <li>(c) Estimation of <math>Mn^{2+}</math>in Potassiumpermanganate</li> </ol>						
					<b>TotalPracticalhours</b>	<b>45hours</b>



<b>TextBook(s)</b>	
1	BasicPrinciplesofPracticalChemistry,Kulandaivelu A.R.,Veeraswamy R., Venkateswaran,Sultan Chand&Sons,2017.
2	PracticalChemistry,PandeyD.N.,SultanChandPublishers,2018
<b>ReferenceBook</b>	
1	Vogel’sTextbookofQuantitativeChemicalAnalysis,GHJeffery,J Bassett,J Mendham,RCDenney, FifthEdition,BathPress, GreatBritan,1989
<b>RelatedOnlineContents[MOOC,SWAYAM, NPTEL, Websitesetc.]</b>	
1	<a href="https://nptel.ac.in/courses/104/101/104101006/">https://nptel.ac.in/courses/104/101/104101006/</a>
2	<a href="https://nptel.ac.in/content/storage2/courses/104105033/Questions%20Answers%20Coordination.pdf">https://nptel.ac.in/content/storage2/courses/104105033/Questions%20Answers%20Coordination.pdf</a>
3	<a href="https://www.youtube.com/watch?v=EQxvY6a42Dw">https://www.youtube.com/watch?v=EQxvY6a42Dw</a>
4	<a href="https://www.youtube.com/watch?v=noUSORH5JWo">https://www.youtube.com/watch?v=noUSORH5JWo</a>
5	<a href="https://en.wikipedia.org/wiki/Colorimetric_analysis">https://en.wikipedia.org/wiki/Colorimetric_analysis</a>
<b>CourseDesignedBy:Dr.K.Velumani</b>	

<b>MappingwithProgrammeOutcomes</b>							
<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	S	S	S	M	S	M	S
<b>CO2</b>	S	S	S	S	S	S	S
<b>CO3</b>	S	S	S	S	S	S	S
<b>CO4</b>	S	S	S	S	S	M	S
<b>CO5</b>	S	S	S	S	S	S	S



# Skill Based Subject

Coursecode	6ZP	TEXTILECHEMISTRYPRACTICAL	L	T	P	C
<b>SKILLBASEDSUBJECT</b>		<b>TEXTILECHEMISTRYPAPER– IV</b>	-	-	2	3
<b>Pre-requisite</b>		<b>KnowledgeofHigherSecondaryLevela ndDyeChemistry</b>	<b>Syllabus Version</b>		<b>2015- 2016</b>	
<b>CourseObjectives:</b>						
Themain objectives ofthis courseareto:						
<ol style="list-style-type: none"> <li>1. Impartskills and knowledgeto thestudents in handlinglaboratoryequipment and reagents</li> <li>2. MakethestudentslearnthetechniqueintheanalysisofwaterqualityusingpHandvolumetrictechniques for industrial use.</li> <li>3. Impartskillsintheestimationofvariousindustrialsubstances</li> <li>4. Impartknowledgeinthe preparationofvariousindustrialdyes anddyeing.</li> </ol>						
<b>ExpectedCourseOutcomes:</b>						
Onthesuccessful completionofthecourse,student willbe ableto:						
1	Analyze the qualityofwaterforindustrial useaswell asvarious substancesofindustrialuse					<b>K1-K6</b>
2	Learnthevariousmethodsofdye preparationand dyeing.					<b>K1-K6</b>
<b>K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate;K6-Create</b>						
<b>PartI</b>	<b>Analysis</b>					<b>15hours</b>
<ol style="list-style-type: none"> <li>1. Estimation of pH-paper,digital pH meter,pH solution</li> <li>2. Volumetric analysis of Sodium Nitrite</li> <li>3. Estimation of available chlorine in bleaching powder</li> <li>4. Analysis of acidity of water byVolumetry</li> <li>5. Analysis of alkalinity of water byVolumetry</li> </ol>						
<b>PartII</b>	<b>PreparationofDyes</b>					<b>15hours</b>
<ol style="list-style-type: none"> <li>1. Methyl Red</li> <li>2. Malachite Green</li> <li>3. Methyl Orange</li> <li>4. Paranitrobenzene azobetanaphthol</li> <li>5. Azoaminobenzene.</li> </ol>						
					<b>TotalPracticalhours</b>	<b>30hours</b>
<b>TextBook(s)</b>						
1	ElementaryIdeaofTextileDyeing,Printingand Finishing”KanwarVarinderPalSingh, KalyaniPublishers,2009					
2	InstrumentalMethodsofchemical <i>Analysis</i> ,B.KSharma,2014					
3	The Complete Technology Book on Dyes & Dye Intermediates by National Institute ofIndustrialResearch, 2004					
<b>ReferenceBooks</b>						
1	HandbookofWaterAnalysis,3 <sup>rd</sup> Edition byNollet, TaylorandFrancis, 2013.					
2	Vogel'stext bookofquantitative Chemical <i>Analysis</i> ,Sixthedition-JMendham,RC Denney,J DBarnes,MJKThomas, PearsonEductionPublshers,2009.					

<b>RelatedOnlineContents[MOOC,SWAYAM, NPTEL, Websitesetc.]</b>	
1	<a href="https://nptel.ac.in/content/storage2/courses/105101010/downloads/Lecture27.pdf">https://nptel.ac.in/content/storage2/courses/105101010/downloads/Lecture27.pdf</a>
2	<a href="https://en.wikipedia.org/wiki/Analysis_of_water_chemistry">https://en.wikipedia.org/wiki/Analysis_of_water_chemistry</a>
3	<a href="https://www.youtube.com/watch?v=cNiRWfMjQMU">https://www.youtube.com/watch?v=cNiRWfMjQMU</a>
4	<a href="https://nptel.ac.in/courses/103/107/103107081/">https://nptel.ac.in/courses/103/107/103107081/</a>
5	<a href="https://study.com/academy/lesson/chemicals-dyes-used-in-the-textile-industry.html">https://study.com/academy/lesson/chemicals-dyes-used-in-the-textile-industry.html</a>
<b>CourseDesignedBy: Dr.S.P. Rajasingh</b>	

<b>MappingwithProgrammeOutcomes</b>							
<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	S	S	S	S	S	S	S
<b>CO2</b>	S	S	S	S	S	S	S





# Elective Courses

Coursecode	5EA	POLYMER CHEMISTRY	L	T	P	C
<b>ELECTIVE</b>		Elective-I(A)	4	-	-	3
<b>Pre-requisite</b>		<b>Higher Secondary Level Chemistry</b>	<b>Syllabus Version</b>		<b>2019-2020</b>	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
<ol style="list-style-type: none"> <li>1. To understand the types, nature and the various methods of preparation of polymers.</li> <li>2. To learn about the different types of polymerisation reaction mechanism, bonding and properties of polymers.</li> <li>3. To study the molecular weight determination methods, preparation and properties of commercially important polymers.</li> </ol>						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	Classify Polymers based on their origin, mechanism of formation, citing example. Understand the methods of preparation process and apply the correct method of preparation for a particular polymer.					K1-K3
2	Analyze the reaction mechanisms of polymerization.					K1, K4
3	Understand the relation between the bond forces and structural properties of polymers.					K2, K4
4	Understand the principles behind the molecular determination methods and applying them to calculate the different molecular weights of polymers.					K2, K4
5	Explain the basic preparation methods and have a good knowledge on the Industrial Applications of Polymers.					K2, K3
<b>K1-Remember; K2-Understand; K3- Apply; K4-Analyze; K5-Evaluate; K6-Create</b>						
<b>Unit:1</b>	<b>Classification and Preparation of Polymers</b>					<b>12 hours</b>
<ol style="list-style-type: none"> <li>1. Classification Of Polymers-Natural Polymers And Synthetic Polymers. Synthetic Polymers- Addition Polymers, Condensation Polymers.</li> <li>2. Methods Of Preparation Of Polymers-Bulk, Solution, Suspension And Emulsion</li> </ol>						
<b>Unit:2</b>	<b>Types of Polymerization</b>					<b>12 hours</b>
Different Types Of Polymerization-Step Growth Polymerization, Addition Polymerization And Co-Polymerization-Random, Alternate, Block And Graft Polymerization.						
<b>Unit:3</b>	<b>Properties of Polymers</b>					<b>12 hours</b>
Primary And Secondary Bond Forces In Polymers-Coherence Energy-Structure Property Relationship i) Mechanical Properties ii) Thermal Stability- Glass Transition Temperature iii) Flame Resistance iv) Chemical Resistance v) Degradability vi) Electrical Conductivity						

<b>Unit:4</b>	<b>Determination of Molecular Weight Methods</b>	<b>12 hours</b>
Molecular Weight of Polymers- Number Average and Weight Average Molecular Weight Methods . Number Average Molecular Weight Methods 1. Osmometry (membrane) 2. Cryoscopy & Ebullioscopy 3. Osmometry (Vapour pressure) 4. Viscometry 5. End Group Analysis . Weight Average Molecular Weight Methods. 1. Light scattering 2. Ultracentrifugation Molecular weight distribution.		
<b>Unit:5</b>	<b>Industrial Polymers</b>	<b>12 hours</b>
Important industrial polymers, preparation and applications of i) Polyethylene , polypropylene ii) Polyamides iii) Polyvinyl chloride and poly methylmethacrylate iv) Polyesters and polycarbonates v) Polyurethanes vi) Phenol-formaldehyde and melamine- formaldehyde vii) Polysilanes and polysiloxanes viii) Polyaniline		
<b>Total Lecture hours</b>		<b>60 hours</b>
<b>Text Book(s)</b>		
1	Polymer Science-VR Gowariker; NV Viswanathan; Jayadev Sreedhar-New Age International-2003	
<b>Reference Books</b>		
1	Polymer chemistry an introduction-M.P. Stevens, Oxford-1990	
2	Textbook of polymer science-FW Billmeyer, Wiley-1984.	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1	<a href="https://youtu.be/k_RERdKwaAg">https://youtu.be/k_RERdKwaAg</a>	
2	<a href="https://youtu.be/H1Y1oxQ5eUA">https://youtu.be/H1Y1oxQ5eUA</a>	
3	<a href="https://youtu.be/7AWQyFr_GLA">https://youtu.be/7AWQyFr_GLA</a>	
<b>Course Designed By: Dr. S.P. Rajasingh and Dr. K. Velumani</b>		

Mapping with Programme Outcomes							
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	M	L	S	S	S	M
CO2	S	M	M	S	S	M	S
CO3	M	M	S	S	S	M	S
CO4	S	S	S	M	S	M	S
CO5	S	M	L	M	S	S	S

\*S-Strong; M-Medium; L-Low

Course code	AGROINDUSTRIAL CHEMISTRY		L	T	P	C
<b>ELECTIVE</b>	Elective I(B)		4	-	-	3
<b>Pre-requisite</b>	Basic Knowledge in Agriculture		<b>Syllabus Version</b>		<b>2010-2011</b>	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
<ol style="list-style-type: none"> <li>1. Let students know the sources of water for agriculture. Impart the knowledge of water and soil analysis.</li> <li>2. Inculcate the students about available fertilizers and pesticides and their role.</li> <li>3. To describe the various stages of process in sugar production and starch fermentation.</li> <li>4. Knowledge on oil, fats and waxes and their contribution to day to day life.</li> </ol>						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	Have knowledge on the sources of water for agriculture and analysis of water and basic on wastewater treatment				<b>K2-K4</b>	
2	Acquire the knowledge about soil, soil fertility and various parameters involved in evaluation of soil.				<b>K1-K5</b>	
3	Describe the importance of nutrients, fertilizers and pesticides for plant growth				<b>K2-K4</b>	
4	Understand the sources and production of sugar and uses of molasses.				<b>K1-K6</b>	
5	Outline the chemistry of oils, fats and waxes and their role in everyday life				<b>K2-K6</b>	
<b>K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create</b>						
<b>Unit:1</b>	<b>Water source for agriculture-Water Treatment &amp; Analysis</b>				<b>12 hours</b>	
Sources of water supply for agriculture. Hard and soft water. Water softening methods: lime soda process, phosphate conditioning, permutit and ion-exchange processes. Water analysis; determination of hardness of water, acidity, alkalinity, pH value, amount of free CO <sub>2</sub> , fluoride content, chloride content and their estimation. Biological oxygen demand (BOD), chemical oxygen demand (COD), chlorine demand and their determinations. Recycling of water.						
<b>Unit:2</b>	<b>Chemistry of soil-soil classification and soil analysis</b>				<b>12 hours</b>	
Definition of soils. Classification of soils. Properties of soils-physical properties and mechanical analysis. Structure and Texture. Soil water, soil air and soil temperature. Chemical properties-soil mineral matter-soil colloids, ion-exchange reactions. Soil fertility and its evaluation. Soil organic matter and their influence on soil properties –N ratio effects. Soil reactions. Soil pH, acidity, alkalinity, buffering of soils and its effects on the availability of N, P, K, Ca, Mg, I, Al, Mn & sulphuric acid. Soils salinity, acid & alkaline soils-their formation and reclamation.						
<b>Unit:3</b>	<b>Fertilizers and Pesticides</b>				<b>12 hours</b>	
<b>Fertilizers:</b> 1. Effect of N, P, K, secondary nutrients and micronutrients on plant growth and development.						
2. Importance of nitrogenous fertilizers. Nitrogen cycle and fixation of atmospheric nitrogen, principle and manufacture of ammonium nitrate, ammonium sulphate, and urea						



3. Phosphate fertilizers. Preparation and uses of mono and diammonium phosphates, superphosphate and triple super phosphate.		
4. Potassium fertilizers-potassium nitrate, potassium chloride, potassium sulphate. Mixed fertilizers. Methods of compost in green manuring, concentrated organic manures and their chemical composition. Oil cakes, horn and hoof meal.		
<b>Pesticides</b> Classification-Insecticides, fungicides and herbicides. General methods of preparation, application and toxicity. Insect attractants and repellents-fluorine compounds, boron compounds, arsenic compounds, organomercuric compounds, DDT, BHC, 2,4 -D compounds, pyridine compounds.		
<b>Unit:4</b>	<b>Chemistry of sugar and fermentation</b>	<b>12 hours</b>
1. Details of manufacture of sucrose from cane sugar - extraction of juice, purification, concentration, crystallization, separation and refining of crystals, recovery of sucrose from molasses. Manufacture of sucrose from beetroot. Estimation of sucrose and inversion sugar by polarimetry. 2. Manufacture of alcohol from molasses and starch by fermentation process.		
<b>Unit:5</b>	<b>OILS, fats and Waxes</b>	<b>12 hours</b>
Classification of oils fats and waxes: distinction between oil, fats and waxes Hydrogenation of oils-principle and manufacturing details. Definition and determination of soapification value, acid value, iodine value RM value and Hehner value and their significance. Elaidin test for oils. Some common waxes like spermaceti, Beeswax, bayberry wax and their uses. Soap and its manufacture; toilet and transparent soaps. Cleansing action of soap. Detergent.		
<b>Total Lecture hours</b>		<b>60 hours</b>
<b>Text Book(s)</b>		
1	Soil Chemistry – Shivanand Tolani, CBS Publishers & Distributors 2 <sup>nd</sup> Edition, 2018.	
	Insecticides, Pesticides and Agro based Industries – R.C. Palful, K. Goel, R.K. Gupta	
2	Industrial Chemistry-B.N Chakrabarty, Oxford & IBH Publishing Co, New Delhi, 1981	
3	Industrial Chemistry-B.K. Sharma, GOEL Publishing House, 2000	
<b>Reference Book</b>		
1	Nature and properties of soils - Nyle C. Brandy, Ray R. Weil, Pearson Education India; 14 <sup>th</sup> Edition, 2013.	
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>		
1	<a href="https://www.cdc.gov/healthywater/other/agricultural/index.html">https://www.cdc.gov/healthywater/other/agricultural/index.html</a>	
2	<a href="http://nmsp.cals.cornell.edu/publications/NMSPLabManual2017.pdf">http://nmsp.cals.cornell.edu/publications/NMSPLabManual2017.pdf</a>	
3	<a href="https://www.youtube.com/watch?v=R9J7pOU5FSg">https://www.youtube.com/watch?v=R9J7pOU5FSg</a>	
4	<a href="https://webstor.srmist.edu.in/web_assets/srm_mainsite/files/2017/Oils-Fats-Waxes-Notes.pdf">https://webstor.srmist.edu.in/web_assets/srm_mainsite/files/2017/Oils-Fats-Waxes-Notes.pdf</a>	
<b>Course Designed By: Dr. S.P. Rajasingh and Dr. M. Sivakumar</b>		

Mapping with Programme Outcomes							
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	M	S	M	S
CO2	S	M	M	S	S	S	S
CO3	S	M	S	M	S	S	S
CO4	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S

\*S-Strong; M-Medium; L-Low

Course code	PHARMACEUTICAL CHEMISTRY		L	T	P	C
<b>ELECTIVE</b>	Elective I(C)		4	-	-	3
<b>Pre-requisite</b>	<b>Basic Knowledge in Chemistry and Biology</b>		<b>Syllabus Version</b>		<b>2010-2011</b>	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
<ol style="list-style-type: none"> <li>1. Give an overview on pharmaceutical chemistry and terminologies used in.</li> <li>2. Outline the structure and properties of molecules in biological systems</li> <li>3. Impart knowledge about medically important compounds</li> <li>4. Describe the role of various drugs in cardiovascular</li> </ol>						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	Have knowledge on terminologies used in pharmaceuticals and their clinical chemistry				<b>K1, K2</b>	
2	Understand the chemistry and uses of alkaloids, analgesics, antibiotics and sulfonamides				<b>K1, K2, K3, K4</b>	
3	Understand how molecules play important roles as medicine				<b>K2, K3, K4,</b>	
4	Have knowledge on bioinorganic chemistry and their role in various diseases				<b>K2, K3, K4, K5</b>	
5	Outline the importance of drugs with special emphasis on cardiovascular related diseases				<b>K1, K2, K4</b>	
<b>K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create</b>						
<b>Unit:1</b>	<b>Introduction to Pharmaceutical Chemistry</b>				<b>12 hours</b>	
<ol style="list-style-type: none"> <li>1. Important terminologies used in pharmaceutical chemistry-Definition of the following terms- drug, pharmacology, pharmacognosy, pharmacy, therapeutics, toxicology, chemotherapy, pharmacopoeia (BP, IP, USP), National formulary, pharmacophore, bacteria, virus, vaccines, toxoids, primary immunization, additive effect, synergism, antagonism, plauso, LD50, ED50 and therapeutic index</li> <li>2. Routes of drug administration-local, enema, oral external, parental- advantages and disadvantages of oral and parental routes- inhalation, intradermal, subcutaneous, intramuscular, intravenous-intrathecal-intraarticular-transcutaneous-transmucosal.</li> <li>3. Clinical chemistry-A Diagnostic test and one method of estimation bilirubin and cholesterol in serum or plasma or urine. Biuret test for urea.</li> <li>4. First aid to prevent bleeding and maintain breathing</li> <li>5. Causes and symptoms of food poisoning, botulism-mushroom and plant poisoning-first aid.</li> <li>6. Causes, symptoms and treatment of anemia, diabetes, tuberculosis, asthma, jaundice, piles, leprosy, typhoid, malaria, cholera and filarial.</li> <li>7. Indian medicinal plants and their importance. Spices and their medicinal uses.</li> </ol>						

Unit:2	Alkaloids,Analgesics,AntibioticsandSulfonamides	12hours
<p>1. Alkaloids-definition-generalmethodsof isolation-colourtestsfor identification-source,isolation, structure and use of atropine-source, extraction, structure, SAR and uses of morphineandquinine.</p> <p>2. Analgesics-definition different types of pain (superficial, deep non visceral, visceral, referredand pshycogenic), classification – morphine and its derivatives. Synthesis assay and uses ofpethidineandmethadone-antipyreticanalgesics-salicylicacidderivatives-paracetamol,phenacetin-propanoic acid derivative-Ibuprofen.</p> <p>3. Antibiotics: definition –microbial synthesis structure, assay and uses of chloramphenicol andpencilin-structureand useof streptomycin and tetracyclines.</p> <p>4. Sulphanamides: Definition-mechanism of action-classification-SAR- synthesis and use ofsulpha acetamide, sulphathiazole, phthalylsulphathiazole- sulphadiazine and sulpha pyridine-assay.</p>		
Unit:3	MoleculestoMedicine	12hours
<p>1. Antisepticsanddisinfectants:Definitionanddistinction-phenolcoefficient-examples-phenolic compounds, dyes, cationic surfacts and chloro compounds. Tranquilizers-definition andexamples.PsychedelicdrugsLSD and marijuana.</p> <p>2. Anaesthetics–Definition–Classification–volatileanaesthetics(N<sub>2</sub>O,ethers,halohydrocarbons,chloroform,haloethane)-fergusonprinciple–intravenousanaesthetics-structure of thiopental sodium-local anaesthetic cocaine-source and structure – preparation andusesofprocaine orthocaineand benzocaine.</p> <p>3. Vitamins-Definition-classification,sourcesanddeficiencydiseasesofvitaminsA,B,C,D,EandK.Importanceof vitamin A in vision(rhodopsin cycle).</p> <p>4. Definition of cancer and antineoplastic drugs-examples antimetabolite, natural substancesharmones,alkylatingagents,inorganiccomplexesandothercompounds-definitionofhypoglycemicdrugs-typesandcause fordiabetics-examples(Sulphonylureasandbiguanides)</p>		
Unit:4	MedicinallyImportantCompounds	12hours
<p>1. Medicinally important compounds of Al<sub>2</sub>P<sub>2</sub>As, Hg and Fe. Uses of the following MgSO<sub>4</sub>7H<sub>2</sub>O, milk of magnesia, magnesium trisilicate-Aluminium hydroxide gel, dihydroxy aluminiumaminoacetate,Aluminiumacetateandaluminiummonostearate-paroxon-phosphorine,cyclophosphomide-tricyclophos-preparationanduseofthiotepa-sodiumandcoppercacodylates-preparation and uses of aromatic aresericals (carbosone, triparasomide, acetarsonide,neoarsphenamine, oxophenarisince)- HgCl<sub>2</sub>, Hgl<sub>2</sub> and Hg(CN)<sub>2</sub> as disinfectations-importance oforganicmercurycompounds-structureandusesofthiomersal,netromersalmerbromineandmersalyl acid-Ferous gluconate, FeSO<sub>4</sub>, scale preparation (ferric ammonium acetate), ferrous fumarate, ferrous succinate and ferrous chlorinate.</p> <p>2. Organic pharmaceutical aids-Definition-agents for kidney function (aminophippuric acid)-liverfunction(sulphobrophthaleinsodium,roseBengal)-cornealulcerdetection(Fluoescinsodium)-Blood volume determination (Evans Blue) pituitary function (metyrapone)-ointmentbases-preservatives-antioxidants-sequeshants,colouring,sweetening,flavouring,emulsifyingandstabilizingagents.</p> <p>3. AIDS-causeHIV-prepagation-preventionandtreatment.</p>		

Unit:5	Cardiovascularandrelateddrugs	12hours
1. Blood-composition-grouping-Rh factor-buffers in blood-Functions of plasma proteins-clottingmechanism-bloodpressure.2.Coagulantsandanticoagulants-definitionsandexamples.3.Antianemic drugs (iron, vitamin B12, folic acid). 4. Cardiovascular drugs : definition and namesofdrugsforeachofthefollowing-antiarrythmicdrugs-antihypertensivedrugs-antianginal agents-vasodilators-lipid loweringagents-sclerosingagents		
<b>TotalLecturehours</b>		<b>60hours</b>
<b>TextBook(s)</b>		
1	PharmaceuticalChemistrybyS.Lakshmi, SultanChand & Sons, 2nd ed (1998).	
2	Pharmacolgyandpharmatherapeutics, Vol. 1&2, R.S.SatoskarandS.D.Bhandarkar 11thEd, Popularprakashan, Mumbai, 1989.	
3	Bentleys, Textbookofpharmacutics, 8thEd. E.A.Raubins, 1992, AllIndiatravelerbooksellers, Delhi.	
4	MedicinalChemistry, Ashutoshkar, NewAgeInternational, 1992.	
5	Atextbookofpharmaceuticalchemistry, Jayashree ghosh, S.Chand, 1997.	
<b>ReferenceBook(s)</b>		
1	Frommoleculestomedicines-J.L.Sussman, P.Spaddon, Springer; 2009 <sup>th</sup> edition.	
2	Organicmedicinalandpharmaceuticalchemistry-J.M.Beale, J.H.Block, WoltersKluwer IndiaPvt.Ltd.; 12 <sup>th</sup> edition 2010.	
<b>RelatedOnlineContents[MOOC, SWAYAM, NPTEL, Websitesetc.]</b>		
1	<a href="https://www.youtube.com/watch?v=jN34FZJ_--U">https://www.youtube.com/watch?v=jN34FZJ_--U</a>	
2	<a href="https://www.youtube.com/watch?v=Wn33DQhmLbg">https://www.youtube.com/watch?v=Wn33DQhmLbg</a>	
3	<a href="https://www.youtube.com/watch?v=9xSqeZCMHnw">https://www.youtube.com/watch?v=9xSqeZCMHnw</a>	
<b>CourseDesignedBy: Dr. M.Padmapriya</b>		

MappingwithProgrammeOutcomes							
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	M	S	M	M	S	M	S
CO2	M	M	S	M	M	S	S
CO3	S	M	S	L	S	M	M
CO4	S	M	M	M	M	M	L
CO5	M	S	M	L	M	M	M

Course code	LEATHER CHEMISTRY			L	T	P	C
<b>ELECTIVE</b>	Elective II(A)			4	-	-	3
<b>Pre-requisite</b>	Higher Secondary Level Chemistry			<b>Syllabus Version</b>		<b>2010-2011</b>	
<b>Course Objectives:</b>							
The main objectives of this course are to:							
<ol style="list-style-type: none"> <li>1. To understand the basics of skins, leather and their composition.</li> <li>2. Impart the principle involved in pre-tanning and structure and process of various tannings</li> <li>3. Inculcate the methods of curing hides and skins and process of dyeing leather</li> <li>4. Knowledge on the water pollution by tannery industry and its effluent treatment</li> </ol>							
<b>Expected Course Outcomes:</b>							
On the successful completion of the course, student will be able to:							
1	Understand the structure and composition of hides and skins and principle involved in pre-tanning					<b>K1-K3</b>	
2	Have knowledge on various types of tanning and their physico-chemical properties					<b>K2, K3</b>	
3	Interpret the chemistry behind the chromotanning process					<b>K2-K4</b>	
4	Analyze the process involved in curing of hides and skin and their preservation					<b>K1-K4</b>	
5	Have clear idea on sources of tannery effluents and their treatment					<b>K2, K3</b>	
<b>K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create</b>							
<b>Unit:1</b>	<b>Hides, Skins and Leather</b>					<b>12 hours</b>	
<ol style="list-style-type: none"> <li>1. Hides, Skins, Leather - An elementary knowledge of the structure and composition of hides and skins. Proteins and their characteristics, Anatomy and histology of protein constituents of leather (an elementary concept).</li> <li>2. Basic principle involved in pre-tanning such as soaking, liming, deliming, bating, pickling involved in pre-tannings such as soaking, liming, deliming, bating, pickling and de-pickling.</li> </ol>							
<b>Unit:2</b>	<b>Types of Natural and Synthetic Tannings</b>					<b>12 hours</b>	
<ol style="list-style-type: none"> <li>1. Types of tanning - vegetable and mineral tanning, Different types of vegetable tanning - materials classification and chemistry of vegetable tanning. Factors and Physico-chemical principle involved in vegetable tanning, Fixation of vegetable tanning.</li> <li>2. Synthetic tannings - their classifications, general methods of manufacture and use.</li> </ol>							
<b>Unit:3</b>	<b>Chemistry of Chrome Tanning</b>					<b>12 hours</b>	
<ol style="list-style-type: none"> <li>1. The preparation and chemistry of chromotanning liquids, Oxidation, Oxolation and hydrolysis of chrome liquids. Effect of adding tanning agents - Role of pH in the reaction of chromium complexes with hide proteins. Factors governing chrome tanning - chemistry of neutralization process. A brief survey of chemistry of other tanning like Al, Zr and Te salts and their relative merit in contrast with chromotanning.</li> <li>2. Chemistry of combination of tannages involving vegetable tanning aldehydes, chrome and other mineral tanning agents.</li> </ol>							

<b>Unit:4</b>	<b>PreservationofHidesandSkinsandLeatherDyeing</b>	<b>12hours</b>
<p>1. Chemicalmethodsofcuringandpreservationofhidesandskinsinacidandalkalinesolution. 2. Principlesofanalyticalmethodsemployedincuring,liming,deliming,bating,pickling.Analy sisof vegetabletanningmaterials and extract. 3. Processofdyeingleather- Useofmordants,dyeingauxilliariessuchasleveling,wettinganddispersingagents-Dyefixations.</p>		
<b>Unit:5</b>	<b>SourceandTreatmentofTanneryEffluents</b>	<b>12hours</b>
<p>1. Animalbye-products- theircollection,handingandpreservationmethods(suchashair,blood,bones,glands, Kerationus materials and theirutilization). 2. Tannery effluents and treatment: Types of water pollution-physical, chemical, physiologicalandbiological.Differenttypesoftanneryeffluentsandwastes-beam-housewaste-liquors-tanningandfinishingyard waste liquors,solid waste-originand disposal.</p>		
<b>TotalLecturehours</b>		<b>60hours</b>
<b>ReferenceBook(s)</b>		
1	TanningChemistry:The Scienceof Leather-A.D.Covington,W.R.Wise,RoyalSocietyof Chemistry,2019.	
2	Tanningprocesses-A.C. Orthmann,ReadBooksPublishers,2011.	
3	TheChemistryofLeathermanufacture- G.D.Mclaughlin,ReadBooks,2011.	
4	Vegetabletanningmaterials-F.N.Howes,ButterworthsScientificPublications,2007.	
<b>RelatedOnlineContents[MOOC,SWAYAM, NPTEL, Websitesetc.]</b>		
1	<a href="https://blog.walnutstudiolo.com/2019/04/25/kinds-of-leather-by-tanning-process-veg-tan-vs-chrome-tan/">https://blog.walnutstudiolo.com/2019/04/25/kinds-of-leather-by-tanning-process-veg-tan-vs-chrome-tan/</a>	
2	<a href="https://www.lowimpact.org/lowimpact-topic/skins-hides/">https://www.lowimpact.org/lowimpact-topic/skins-hides/</a>	
3	<a href="https://envibrary.com/wastes-from-tannery-industries/">https://envibrary.com/wastes-from-tannery-industries/</a>	
<b>CourseDesigned By: Mr. C.Sudhakar</b>		

<b>MappingwithProgrammeOutcomes</b>							
<b>Cos</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	M	M	S	M	S	M	S
<b>CO2</b>	S	S	M	L	M	S	M
<b>CO3</b>	M	L	S	M	M	L	M
<b>CO4</b>	L	M	M	L	M	M	S
<b>CO5</b>	M	M	S	L	M	M	S

\*S-Strong;M-Medium;L-Low

Course code	CHEMISTRY OF PLANT BASED PRODUCTS			L	T	P	C
<b>ELECTIVE</b>	Elective II(B)			4	-	-	3
<b>Pre-requisite</b>	<b>Basic Knowledge about Starch, Cellulose and Protein</b>			<b>Syllabus Version</b>		<b>2010-2011</b>	
<b>Course Objectives:</b>							
The main objectives of this course are to:							
<ol style="list-style-type: none"> <li>To impart the knowledge about structure and properties of starch, cellulose and proteins</li> <li>To describe to the students the process involved in the manufacture of them and their applications</li> <li>To inculcate the chemistry of various cellulose derivatives and their application in paper industry</li> </ol>							
<b>Expected Course Outcomes:</b>							
On the successful completion of the course, student will be able to:							
1	Understand the structure, physical and chemical properties and manufacture of starch and their applications					<b>K1-K5</b>	
2	Identify the sources, structure, properties and reactions of cellulose					<b>K1, K2, K4</b>	
3	Describe the structure, Properties, manufacture and uses of proteins					<b>K1-K5</b>	
4	Give the structure of derivatives of cellulose					<b>K1-K3</b>	
5	Outline the chemistry behind paper industry with special emphasis on cellulose					<b>K1-K6</b>	
<b>K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create</b>							
<b>Unit:1</b>	<b>Chemistry of Starch</b>					<b>12 hours</b>	
Structure, physical and chemical properties. Manufacture and uses of unmodified and modified starch, dextrin, sugar syrup, hydrolysis of starch to edible and industrial glucose applications of starch in textiles, sizing and in fermentation industries.							
<b>Unit:2</b>	<b>Chemistry of Cellulose</b>					<b>12 hours</b>	
Structure physical and chemical properties general reactions, major sources and uses of cellulose, chemical and enzymatic hydrolysis of cellulose. Statistics and economics and cellulose. Chemistry of minor products of wood like lignin, pentosans, resin etc, laboratory preparation, manufacture and uses of chemical cellulose.							
<b>Unit:3</b>	<b>Chemistry of proteins</b>					<b>12 hours</b>	
Structure, Properties, Major sources, technological uses, hydrolysis of proteins and protein isolates. Manufacture, Properties and uses of gelatin, casein, collagen, protein isolates.							
<b>Unit:4</b>	<b>Cellulose Derivatives</b>					<b>12 hours</b>	
Cellulose nitrate, cellulose acetate, ethyl and methyl cellulose, sodium cellulose sulphate, sodium, carboxy, hydroxyl, methyl, cellulose, regenerated cellulose, major cellulose-plastics- sodium carboxymethyl cellulose.							

<b>Unit:5</b>	<b>ApplicationofCellulose</b>	<b>12hours</b>
Different methods of pulping, manufacture and uses of different quality of paper products likecard-board, newsprint, writing paper, tissue piper and filter paper. A short discussion of thepollutionproblemsandby-productsutilizationofindustriesbasedonstarchcelluloseand proteins.		
<b>TotalLecturehours</b>		<b>60hours</b>
<b>TextBook(s)</b>		
1	Fundamentals of Biochemistry-J.L.Jain,S.Jain, N.Jain,S.Chand;Seventh edition,2016.	
2	Cellulose Derivatives: Synthesis, Structure, and Properties – T. Heinze, O. A. El Seoud, A. Koschella, Springer International Publishing, 2018.	
<b>ReferenceBook(s)</b>		
1	Starch: Chemistry and Technology-J.N.BeMiller,R. L. Whistler, Academic Press; 3 <sup>rd</sup> edition, 2009.	
2	Cellulose chemistry and its application-T.P.Nevell, Halsted Press, 1985.	
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>		
1	<a href="https://starch.eu/starch/">https://starch.eu/starch/</a>	
2	<a href="https://en.wikipedia.org/wiki/Cellulose">https://en.wikipedia.org/wiki/Cellulose</a>	
3	<a href="https://www.youtube.com/watch?v=gDJ0QvtGjVE">https://www.youtube.com/watch?v=gDJ0QvtGjVE</a>	
<b>Course Designed By: Dr. M.Sivakumar and Mr. C.Shudhakar</b>		

Mapping with Programme Outcomes							
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	M	M	S	S	M	S
CO2	S	S	M	M	S	S	S
CO3	M	M	M	M	S	M	S
CO4	S	S	S	S	M	S	S
CO5	S	M	S	S	S	S	S



Course code	6EC	DYECHEMISTRY	L	T	P	C
<b>ELECTIVE</b>		Elective II(C)	4	-	-	3
<b>Pre-requisite</b>		<b>Knowledge on Structure of Organic Molecules</b>	<b>Syllabus Version</b>		<b>2019-2020</b>	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
<ol style="list-style-type: none"> <li>1. Outline the fundamentals of volumetric estimations</li> <li>2. Explain electrophilic and nucleophilic substitution reactions</li> <li>3. Describe the application of boron and silicate chemistry</li> <li>4. Discuss thermodynamics and solid state chemistry</li> </ol>						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	Understand the principles of colour and its relation with compound's structure					<b>K1- K5</b>
2	Analyze and classify dyes based on their chemical structure and applications					<b>K1- K3</b>
3	Describe the synthesis of di and triphenyl methane dyes and their applications					<b>K2, K3,</b>
4	Understand chemistry of nitrogen containing dyes and their applications					<b>K2, K3</b>
5	Outline the importance of pigments in various fields					<b>K1- K4</b>
<b>K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create</b>						
<b>Unit:1</b>	<b>Chemistry and Theory of Colours</b>					<b>12hours</b>
Colour and constitution-Relationship of colour observed-to wavelength of light absorbed-Terms used in colour chemistry-Chromophores, Auxochromes, Bathochromic shift, Hypsochromic shift. Colour of a substance-Quinonoid theory and molecular orbital approach.						
<b>Unit:2</b>	<b>Classification of Dyes</b>					<b>12hours</b>
Classification of Dyes-chemical classification-classification according to their applications-Acid dyes-Basic dyes. Azoic dyes, mordant dyes, vat dyes, Sulphur dyes, Disperse dyes, Nitro dyes-and Nitroso dyes process of dyeing (simple treatment).						
Azo dyes-Principles governing azo coupling-mechanism of diazotization-Coupling with amines, coupling with phenols Classification according to the number of azo group & application-Tautomerism in azo dyes.						
<b>Unit:3</b>	<b>Synthesis and Applications of Dyes-I</b>					<b>12hours</b>
Synthesis, reactions and applications of Di and Triphenyl methane dyes-phthalein dyes-Xanthene dyes-acridine dyes-sulphur dyes. Phthalocyanines-Cyanine dyes. Malachite green, Para-rosaniline, crystal violet.						

<b>Unit:4</b>	<b>Synthesis and Applications of Dyes-II</b>	<b>12hours</b>
Azine, Oxazine and Triazine Dyes. Synthesis and applications of quinonoid dyes including vat dyes based on anthraquinone.		
<b>Unit:5</b>	<b>Pigments and Their Applications</b>	<b>12hours</b>
Requirements of a pigment: Typical Organic and Inorganic pigments-application and their uses in paints. Reaction of dyes with fibres and water-Fluorescent Brightening agents. Application of dyes in other areas- medicine, chemical analysis, cosmetics, colouring agents, food and beverages.		
<b>Total Lecture hours</b>		<b>60hours</b>
<b>Text Book(s)</b>		
1	Synthetic Dyes – G.R. Chatwal, Himalaya Publishing House, 2009.	
2	The chemistry of synthetic dyes Vol. I, II, III & IV - K. Venkataraman, Academic Press N.Y., 1949.	
3	The Hand book of Synthetic Dyes and Pigments – K.M. Shah, Publisher Edutech, 2013.	
<b>Reference Books</b>		
1	The chemistry of synthetic dyes and pigments - H.A. Lubs, New York, Hafner Pub. Co., 1965.	
2	Organic chemistry Vol. I - I.L. Finar, Pearson India, 6 <sup>th</sup> edition, 2012.	
3	Dyes and Pigments: New Research – A.R. Lang, Nova Science Publishers, Inc.; UK ed. Edition, 2013.	
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>		
1	<a href="https://nptel.ac.in/courses/116/104/116104046/">https://nptel.ac.in/courses/116/104/116104046/</a>	
2	<a href="https://www.internetchemistry.com/chemistry/dye-chemistry.php">https://www.internetchemistry.com/chemistry/dye-chemistry.php</a>	
<b>Course Designed By: Dr.S.P. Rajasingh</b>		

<b>Mapping with Programme Outcomes</b>							
<b>Cos</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	S	S	S	S	S	S	S
<b>CO2</b>	S	M	M	M	S	S	M
<b>CO3</b>	S	M	M	M	S	M	M
<b>CO4</b>	S	M	M	M	S	M	S
<b>CO5</b>	S	S	S	S	S	S	S

\*S-Strong; M-Medium; L-Low

Course code	ANALYTICAL CHEMISTRY II- LABTECHNIQUES		L	T	P	C
<b>ELECTIVE</b>	ElectiveIII(GroupA)		4	-	-	3
<b>Pre-requisite</b>	<b>HigherSecondaryLevelChemistry</b>		<b>Syllabus Version</b>		<b>2010-2011</b>	
<b>CourseObjectives:</b>						
Themain objectives ofthis courseareto:						
<ol style="list-style-type: none"> <li>1. Thestudentsunderstandthe basicprinciplesandcomponentsofchromatography</li> <li>2. Toinculcatethe theory,instrumentationand applicationsofvarious spectrophotometry</li> <li>3. Introduce the theory, techniquesand applicationsofpolarimetryandelectrochemicalMethods</li> <li>4. Giveaninsightintosynthesisandpurificationof someorganicandinorganiccompounds</li> </ol>						
<b>ExpectedCourseOutcomes:</b>						
Onthesuccessfulcompletion ofthe course, studentwill beable to:						
1	Describetheprinciplesofvariouschromatography				<b>K1-K4</b>	
2	UnderstandthetheorybehindUV,IRand NMRspectrophotometryand theirapplications.				<b>K1-K3</b>	
3	Describetheinstrumentationofpolarimetry				<b>K2,K3</b>	
4	Knowthevarious electrochemicalmethodsof analysisandtheir applications				<b>K2-K4</b>	
5	Outlinethesynthesisand purificationsteps ofsomeoforganicand inorganiccompouds				<b>K2, K3</b>	
<b>K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate;K6-Create</b>						
<b>Unit:1</b>	<b>Chromatography</b>				<b>12hours</b>	
Classificationofthechromatographicmethods,principlesofdifferentialmigration,Adsorptionphenomenon,natureoftheadorbent,solventsystems.Rf.Values.Columnchromatography, Partitionchromatography, paperchromatography,TLC, -theoryandtechniques.						
<b>Unit:2</b>	<b>Spectroscopy</b>				<b>12hours</b>	
Theory,instrumentationandapplicationof(i)UVandvisiblespectrophotometry(ii)IR spectrophotometry(iii) Flame Photometry(iv)NMR spectroscopy						
<b>Unit:3</b>	<b>Polarimetry</b>				<b>12hours</b>	
Theory,instrumentation, experimentalprocedureandapplication.						
<b>Unit:4</b>	<b>ElectrochemicalMethodsofAnalysis</b>				<b>12hours</b>	
Polarography,cyclicvoltametry,differentialpulsepolarographyandcalorimetry:Theory, techniquesandapplications.						
<b>Unit:5</b>	<b>PreparationandPurificationofCompounds</b>				<b>12hours</b>	
Preparationandpurificationoforganicandinorganiccompoundsslike,(i)Aspirinfromsalicylicacid(ii) Acetanilidefromaniline(iii)Benzanilidefromaniline(iv)iodoformfrommethanol/and (v)Metadinitrobenzeneacetone(vi)Methylorange/methylred(vii)preparationofNylon66						

(viii) Caffeine from tea leaves (ix) Caesin and lactose from milk (x) Nicotine and Nicotinesulphate (xi) Bakelite from phenol and From tobacco waste formaldehyde (xii) $As_2O_3$ Sol, $Fe(OH)_3$ Sol (xiii) Tetrammine-coppersulphate (xiv) Tetrammine Cobalt carbonate (xv) Sodium thiosulphate and (xvi) Cuprous chloridedithionate	
	<b>Total Lecture hours</b>
	<b>60 hours</b>
<b>Text Book(s)</b>	
1	Vogel's Text Book of Quantitative Chemical Analysis – J. Mendham, R. C. Denney, J. D. Barnes, M. Thomas, B. Sivasankar, Pearson Publishers 6 <sup>th</sup> edition 2009.
<b>Reference Book(s)</b>	
1	Physical methods for chemistry - R. S. Drago, W B Saunders Co Ltd; 2nd Revised edition, 1992.
2	Spectroscopy in Inorganic chemistry - C. N. R. Rao and J. R. Ferraro Academic Press Inc, 1971.
3	Fundamentals of Analytical Chemistry - D. A. Skoog, D. M. West, S. Jose, F. J. Holler Cengage Learning, 2004
4	Instrumental methods of Chemical Analysis - B. K. Sharma Krishna Prakashan Media (P) Ltd. 2014.
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>	
1	<a href="https://www.youtube.com/watch?v=Zp-BHsdqsRw">https://www.youtube.com/watch?v=Zp-BHsdqsRw</a>
2	<a href="https://nptel.ac.in/courses/104/106/104106122/">https://nptel.ac.in/courses/104/106/104106122/</a>
3	<a href="https://www.slideshare.net/SihamAbdallaha/electrochemical-method-of-analysis-31352857">https://www.slideshare.net/SihamAbdallaha/electrochemical-method-of-analysis-31352857</a>
4	<a href="https://gtu.ge/Agro-Lib/Vogels%20TEXTBOOK%20OF%20QUANTITATIVE%20CHEMICAL%20ANALYSIS%205th%20ed-G%20H%20Jeffery.MsuCity.pdf">https://gtu.ge/Agro-Lib/Vogels TEXTBOOK OF QUANTITATIVE CHEMICAL ANALYSIS 5th ed- G H Jeffery.MsuCity.pdf</a>
<b>Course Designed By: Dr. M. Sivakumar and Dr. A. Thirumoorthi</b>	

Mapping with Programme Outcomes							
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	M	S	S	M	M	M	M
CO2	S	S	S	M	M	M	M
CO3	S	M	M	M	M	L	M
CO4	L	S	M	L	L	M	M
CO5	M	M	L	M	L	M	M

\*S-Strong; M-Medium; L-Low

<b>Course code</b>	<b>6EE</b>	<b>ENVIRONMENTAL CHEMISTRY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>ELECTIVE</b>	Elective III(B)		<b>4</b>	<b>-</b>	<b>-</b>	<b>3</b>
<b>Pre-requisite</b>	<b>Basics of Environment Science</b>		<b>Syllabus Version</b>		<b>2019-2020</b>	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
<ol style="list-style-type: none"> <li>1. Explain clearly Environmental segments and composition of atmosphere</li> <li>2. Understand the Natural Cycles of the environment</li> <li>3. Detailed explanation of the different types of pollution</li> </ol>						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	Understand the concepts, environmental segments and composition of the atmosphere				<b>K1, K2</b>	
2	Know about the environment cycles and their significance				<b>K1</b>	
3	Discuss the water pollution, sewage and Industrial wastewater treatment				<b>K1, K2</b>	
4	Describe the reactions in air pollution, particulates and analysis of pollutants				<b>K2, K4</b>	
5	Explain the thermal, noise and radioactive pollution and their effects and methods of control				<b>K1-K3</b>	
<b>K1-Remember; K2-Understand; K3 -Apply; K4-Analyze; K5-Evaluate; K6-Create</b>						
<b>Unit:1</b>	<b>Chemistry of Environment and Atmosphere</b>				<b>12 hours</b>	
<p>Concept and scope of environmental chemistry-Nomenclature: Pollutant, contaminant, receptor, sink, pathways of a pollutant, speciation, dissolved oxygen, chemical oxygen demand (COD), biochemical oxygen demand (BOD)-Environmental segments.</p> <p>Composition of the atmosphere-atmospheric structure-earth's radiation balance – particles, ions and radicals in the atmosphere-formation of inorganic particulate matter- formation of organic particulate matter-ions and radicals-photo chemical reactions in the atmosphere-formation of NO<sub>2</sub>, SO<sub>2</sub>, organic compounds, green house effect.</p>						
<b>Unit:2</b>	<b>Cycles of Environment</b>				<b>12 hours</b>	
<p>Biological cycles &amp; their significance- Gaseous and sedimentary cycles. (a)Oxygen cycle and ozone chemistry (b)Carbon cycle (c)Nitrogen cycle (d)Sulphur cycle (e)Phosphorus cycle</p>						
<b>Unit:3</b>	<b>Water Pollution and Treatment</b>				<b>12 hours</b>	
<p>Water pollution: Hydrological cycle –aquatic environment-classification of water pollution – organic pollutants, inorganic pollutants, sediments, radioactive materials, thermal pollution, BOD &amp; COD –signification-experimental determination. Trace elements in water. Chemical species of copper, lead and mercury. Eutrophication-sewage treatment- primary and secondary treatments. Industrial waste water treatment by 1)activated charcoal /synthetic resins 2)membrane techniques.</p>						

<b>Unit:4</b>	<b>Air Pollution</b>	<b>12hours</b>
<p>1. Airpollutants- primarypollutants- sources of carbonmonoxide ,nitrogenoxides, sulphurdioxide; sink and control. Hydrocarbons,photochemical smog, acidrain.</p> <p>2. Particulates:sources-inorganic and organic particulate matters-effects on human beings, materials, climate control of particulate emission- of atmospheric pollution, corrosion of metals- indoorreactions of air pollutants-sinks of atmospheric gases.</p> <p>Air quality standards: Monitoring –Analysis of carbon monoxide-nitrogen oxides-sulphurdioxides-hydrocarbons.</p>		
<b>Unit:5</b>	<b>Thermal and Electro magnetic Pollution</b>	<b>12hours</b>
<p>1. Thermal pollution-definition,sources-environmental effects- control and prevention. Solar energy as alternative source of energy, strategies for energy conservation.</p> <p>2. Noise pollution:Sources and effects of noisepollution-control and prevention - solutions to abuse. Supersonic jets and its effects.</p> <p>3. Radio active pollution: Sources of radioactive pollution-environmental threat of Nuclear reactors-breeder reactors-environmental conflicts between nuclear powers Methods of control and prevention.</p>		
<b>TotalLecturehours</b>		<b>60hours</b>
<b>TextBook(s)</b>		
1	EnvironmentalChemistry-A.K.De, NewAgeInternational(P) Ltd.,NewDelhi(2010).	
2	EnvironmentalChemistry-V.K.Ahluwalia,AneBooks India.,NewDelhi(2013).	
3	Sodhi,G.S.,FundamantalConcepts ofEnvironmentalChemistry,NarosaPublishingHouse Pvt. Ltd.,NewDelhi,ThirdEdition,(2009).	
<b>ReferenceBooks</b>		
1	AtextbookofEnvironmentalChemistry-Krishnan&Kannan,AnmolPublications,New Delhi(1992).	
2	Environmentalchemistry&pollution control–Dhar,S.Chand&Co.,New Delhi(1995).	
<b>RelatedOnlineContents[MOOC,SWAYAM, NPTEL, Websitesetc.]</b>		
1	<a href="https://nptel.ac.in/courses/122/106/122106030/">https://nptel.ac.in/courses/122/106/122106030/</a>	
2	<a href="https://nptel.ac.in/noc/courses/noc20/SEM2/noc20-ce57/">https://nptel.ac.in/noc/courses/noc20/SEM2/noc20-ce57/</a>	
3	<a href="https://nptel.ac.in/content/storage2/courses/105101010/downloads/Lecture27.pdf">https://nptel.ac.in/content/storage2/courses/105101010/downloads/Lecture27.pdf</a>	
<b>CourseDesignedBy:Dr.T.Selvaraju andMr.C.Sudhakar</b>		

<b>MappingwithProgrammeOutcomes</b>							
<b>Cos</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	S	M	L	S	S	S	M
<b>CO2</b>	S	M	M	S	S	M	S
<b>CO3</b>	M	M	S	S	S	M	S
<b>CO4</b>	S	S	S	M	S	M	S
<b>CO5</b>	S	M	L	M	S	S	S

\*S-Strong;M-Medium;L-Low

Course code	TEXTILE CHEMISTRY			L	T	P	C
<b>ELECTIVE</b>	Elective III (C)			4	-	-	3
<b>Pre-requisite</b>	Higher Secondary Level Chemistry			<b>Syllabus Version</b>		<b>2010-2011</b>	
<b>Course Objectives:</b>							
The main objectives of this course are to:							
1. Make the student to understand the structure, Properties and uses of natural and synthetic fibers.							
2. Outline the impurities present in cotton and silks and the way to remove them.							
3. Impart the knowledge about various dyes and dyeing of wools and silks							
<b>Expected Course Outcomes:</b>							
On the successful completion of the course, student will be able to:							
1	Understand the structure, production, properties and uses of natural fibers					<b>K1-K3</b>	
2	Understand the structure, production, properties and uses of synthetic fibers					<b>K2-K5</b>	
3	Identify the impurities present in cotton and silk and know the processes to remove them					<b>K2, K3</b>	
4	Describe the various dyeing methods and natural dyes used for cotton fiber					<b>K1-K6</b>	
5	Outline different methods available for dyeing wools and silks					<b>K2-K6</b>	
<b>K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create</b>							
<b>Unit:1</b>	<b>Classification and Structure of Natural Fibers</b>					<b>12 hours</b>	
1. Fibre theory – polymers and polymerization- Morphology of fibres – Molecular arrangements in fibres.							
2. General classification of fibres-chemical structure, production, properties and uses of the following natural fibres (a) natural cellulosic fibres (cotton and jute) (b) natural protein fibre (wool and silk).							
<b>Unit:2</b>	<b>Properties and Uses of Synthetic Fibers</b>					<b>12 hours</b>	
Chemical structure, production, properties and uses of the following synthetic fibres. (i) Manmade cellulosic fibres (Rayon, modified cellulosic fibres) (ii) Manmade protein fibres (Azions) (iii) Polyamide fibres (different types of nylons) (iv) Polyester fibres (v) Acrylic fibres and (vi) Olefin fibres.							
<b>Unit:3</b>	<b>Impurities in fibers and their removal</b>					<b>12 hours</b>	
Impurities in raw cotton and grey cloth, wool and silk- general principles of the removal – Scouring – bleaching – Desizing – Kier boiling – Chemicking – Chemical and machinery use – Degumming and Bleaching of silk Scouring and Bleaching of wool.							
<b>Unit:4</b>	<b>Classification of Dyes</b>					<b>12 hours</b>	
Dyeing – Classification of dyes and their properties- applications – direct, basic, sulphur and azoic dyes on cotton. Application of Vat and solubilised vat dyes on cotton and viscose. Mordant mineral colours and black. Application of vegetable and other colour to cotton.							

<b>Unit:5</b>	<b>Dyeing of Fibers</b>	<b>12hours</b>
1. Dyeing of wool and silk –Fastnerss properties of dyed materials –dyeing of nylon, terylene and other synthetics. 2. Finishes given to fabrics- Mechanical finishes on cotton,woolandsilk,methodusedprocessofmercerizing–Anti-creaseand Anti-shrinkfinishes – Waterproofing.		
<b>TotalLecturehours</b>		<b>60hours</b>
<b>TextBooks(s)</b>		
1	TextBookofAppliedChemistry-M.A.Islam,SonaliPublications;1 <sup>st</sup> edition,2011.	
2	Chemistryofdyes&PrinciplesofDyeing-V.A.Shenai,SevakPublications, 1983.	
<b>ReferenceBook(s)</b>		
1	TheIdentification ofTextileFibres–BrunoLuniak,IsaacPitman &Sons,Limited,1953.	
2	DyeingandchemicalTechnologyof Textilefibres-5thEdition,E.R.Trotman, CharlesGriffin& CoLtd, 1970. (Digitalized 2010).	
3	ChemicalTechnologyof fibrousMaterials– F.I.Sadov,M.V.HorchaginandA.Matetsky, MirPublishers,1978.(Digitalized2008).	
4	TextileScouringand BleachingE.R.Trotman,Charles Griffin &CoLtd.1968.	
<b>RelatedOnlineContents[MOOC,SWAYAM,NPTEL,Websitesetc.]</b>		
1	<a href="https://blogionik.org/blog/2017/04/02/natural-synthetic-fiber/">https://blogionik.org/blog/2017/04/02/natural-synthetic-fiber/</a>	
2	<a href="https://www.assignmentpoint.com/science/textile/textile-fiber.html">https://www.assignmentpoint.com/science/textile/textile-fiber.html</a>	
<b>CourseDesignedBy:Dr.S.P. Rajasingh</b>		

<b>MappingwithProgrammeOutcomes</b>							
<b>Cos</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	S	S	M	M	M	M	S
<b>CO2</b>	M	S	S	M	S	L	M
<b>CO3</b>	M	S	S	S	M	M	L
<b>CO4</b>	S	S	S	M	S	S	M
<b>CO5</b>	S	M	S	S	S	S	M