

### COURSE INFORMATION SHEET

<b>Program :</b> Diploma in engineering	
<b>Course Code :</b> 2004	<b>Course Title :</b> ENGINEERING CHEMISTRY II
<b>Semester :</b> 2	<b>Credits :</b> 3
<b>Course Category :</b> F	
<b>Periods per week :</b> 3	<b>Periods per semester :</b> 45

#### Course Objectives:

At the end of the course student will be able:

1. Provide the basic concepts of atom model and theoretical concepts of orbitals and also to develop the skill of writing electronic configuration of atoms.
2. Introduce the concept of Chemical bonding and distinguish different types of Chemical bond.
3. Impart knowledge to distinguish and justify different materials based on conductivity in Science and Technology and to explain the mechanism of electrolysis and to apply the concept of fuel cell in modern technology.
4. Explain the concept of corrosion and its after effects, solve the practical problems related to it
5. To impart knowledge about the fundamental ideas of organic chemistry and different types of refractories and glasses and extend the concept of polymers and polymerisation with examples.
6. Provide knowledge about the concepts of fuels and to identify and relate the impact of environmental pollution in daily life and to point out the remedial steps for it..

#### Syllabus:

<b>Module</b>	<b>Topics</b>	<b>Hours</b>
1	<b>Module - I Atomic structure and chemical bonding</b>	11+1
2	<b>Module - II Electrochemistry and Corrosion</b>	12+1
3	<b>Module - III Basic Organic chemistry and Polymers</b>	9+1
4	<b>Module - IV Fuels and Environmental chemistry</b>	9+1
	<b>Total Theory Hours</b>	41
	<b>Test</b>	4
	<b>Total Hours</b>	45

**Text / Reference:**

<b>T/R</b>	<b>Book Title/Author</b>
R	Jain and Jain - Engineering Chemistry - Dhanpat Rai and Sons
R	S. S. Dara- Engineering Chemistry - S. Chand Publication
R	B. K Sharma - Industrial Chemistry- Geol Publication
R	S. S. Dara – Environmental chemistry and pollution control - S. Chand Publication

**Course Pre-requisites:**

<b>Topic</b>	<b>Course code</b>	<b>Course name</b>	<b>Semester</b>	<b>Description</b>
Basic chemistry				Entry Level

**Course Outcome**

On completion of the course student will be able to :

<b>CO No:</b>	<b>Description</b>
CO No: 1	Understand the basic concepts of atom model and theoretical concepts of orbitals also developed the skill of writing electronic configuration of atoms.
CO No: 2	Understand the concept of Chemical bonding and distinguish different types of Chemical bond.
CO No: 3	Able to distinguish and justify different materials based on conductivity in Science and Technology and understand the mechanism of electrolysis with examples and to solve the problems related to electrolysis and to apply the concept of fuel cell in modern technology.
CO No: 4	Understand the concept of corrosion and its after effects, solve the practical problems related to it
CO No: 5	Understand the fundamental ideas of organic chemistry and different types of refractories and glasses and its application in industrial field and to compare ,differentiate, explain, relate and extend the concept of polymers and polymerisation with examples
CO No: 6	Provide knowledge to list and differentiate the concepts of fuels and to identify and relate the impact of environmental pollution in daily life and to point out the remedial steps for it.

## Syllabus

<u>Module</u>	<u>Topic</u>	<u>Hours</u>
I	<p><b><u>Atomic Structure II and Chemical Bonding</u></b></p> <p>Bohr Model of atom – Postulates, Merits and Demerits - Dual nature of matter – de Broglie relation – Uncertainty Principle – Concept of Orbit and Orbital – Quantum numbers – Sub energy levels (s,p,d,f) - shape of s and p orbitals.</p> <p>Electronic Configuration of atom – Aufbau principle, Pauli's exclusion principle, Hund's rule of maximum multiplicity – electronic configuration of elements upto atomic number 20.</p> <p>Chemical bonding – Octet rule – Electro negativity- Types of Chemical bonds - Ionic (Electrovalent) bond – Covalent bond, Coordinate bond and hydrogen bonding – Definition with two examples for each.</p>	12
II	<p><b><u>Electrochemistry and Corrosion</u></b></p> <p>Classification of materials based on conduction – conductors, Semiconductors and Insulators – Definition with two examples each – Types of Conductors – Metallic and electrolytic conductors – Any four differences.</p> <p>Electrolytes and Non - electrolytes – Definition with two examples – Strong and Weak Electrolytes – Definition with two examples -</p> <p>Electrolysis – Definition – Electrolysis of molten NaCl and aqueous NaCl solution using Pt electrodes – Faraday's laws of electrolysis (Qualitative and Quantitative Statements only). Applications of electrolysis – Electroplating and Anodising – Any two differences – Electroplating of Nickel on mild steel – Anode, Cathode, electrolyte and half cell reactions – Electrochemical cell – Daniel cell – Representation of the cell – half cell and over all cell reactions – Primary and Secondary cells – definition and examples only – fuel cell – H<sub>2</sub>-O<sub>2</sub> fuel cell – Cell reactions, advantages and applications – Electrode potential – standard electrode potential – EMF of cell – Electrochemical Series and its applications.</p> <p>Corrosion – Definition and examples – rusting of iron Factors affecting rusting - conditions of rusting – Mechanism of rusting – Electrochemical theory – Types</p>	13

	of Corrosion – Chemical and Electro chemical Corrosion – Prevention of Corrosion – Barrier Protection, Sacrificial Protection, Cathodic protection and Anti rust solutions.	
III	<p><b><u>Chemistry of Materials and Polymers</u></b></p> <p>Introduction to organic chemistry – Differences between organic and inorganic compounds – Uniqueness of Carbon – Saturated and Unsaturated hydrocarbons –concept of functional group.</p> <p>Refractories – Classification and properties – Glasses – General properties and types of glasses– Soda glass, Borosilicate glass, Safety glass and Insulating glass – Content and uses – Uses and advantages of Optical Fibres.</p> <p>Polymers – definition – Classification of Polymers based on nature of monomers origin(source), structure, mode of synthesis and magnitude of intermolecular forces with two examples each – Natural rubber – Vulcanisation – Properties and merits – Common Polymers - monomers and uses – Polythene, Polypropene, Polystyrene, PVC, Neoprene, Teflon, Buna – S, Buna – N, Nylon-6, Nylon-66 and Bakelite.</p>	10
IV	<p><b><u>Fuels and Environmental Chemistry</u></b></p> <p>Fuel - Definition – Calorific value – Qualities of a good fuel – classification of fuels – solid, Liquid, gaseous and nuclear fuels with three examples each – water gas and Producer gas – Preparation and Properties –Cracking – Thermal and Catalytic Cracking.</p> <p>Environmental Chemistry - Regions of atmosphere – Pollutant and Pollution – Definition – Types of pollution – Air pollution, water pollution and Soil Pollution – Mention only major pollutants – Impact of Air Pollution – Ozone depletion, green house effect, acid rain and smog – Types of smog – Elementary ideas of green Chemistry.</p>	10

**Student Learning Outcome and Development of Course Outcomes:**

On completion of the course student will be able to:

CO No.	Description	Topic from syllabus	SLO No.	Description	Suggested Learning Activities	Duration (Hours)	Blooms Taxonomy Level
CO1	Understand the basic concepts of atom model and theoretical concepts of orbitals also developed the skill of writing electronic configuration of atoms.	The basic concepts of atom model	SLO1	Explain the postulates of Bohr Model of atom	Active Lecturing	165 Min	II Understand
			SLO 2	Discuss the reason why Bohr's orbits are also known as stationary states.	Lecturing		II Understand
			SLO 3	List the merits and demerits of Bohr Model of atom	Interactive lecture		I Remember
			SLO 4	Explain the dual nature of matter	Interactive lecture		II Understand
			SLO 5	Discuss the significance of de Broglie relation.	Lecturing		II Understand
			SLO 6	Solve problems based on De Broglie relation.	Practise exercise		II Understand
			SLO 7	State Heisenberg's Uncertainty Principle	Lecturing		II Understand
			SLO 8	Solve problems based on Uncertainty Principle	Practise exercise		II Understand
		The basic theoretical concepts of orbitals and facts related to it	SLO 9	Define orbit.	Lecturing	110 Min	I Remember
			SLO10	Define Orbital.	Lecturing		I Remember
			SLO11	Differentiate between orbit and orbital.	Lecturing		II Understand
			SLO12	Explain the concept of quantum numbers needed to specify an electron in an atom.	Interactive lecture		I Remember
			SLO13	Explain the importance of various Sub energy levels (s,p,d,f)	Active Lecturing		II Understand
			SLO14	Discuss the shapes of s and p orbitals	Active Lecturing		II Understand

		Develop the skill of writing electronic configuration of atoms.	SLO15	Recall atomic number and mass number	Questioning techniques	165 Min	I Remember
			SLO16	State and explain Aufbau principle	Interactive lecture		I Remember
			SLO17	State and explain Pauli's exclusion principle	Interactive lecture		I Remember
			SLO18	Illustrate Hund's rule of maximum multiplicity using suitable examples	Interactive lecture		II Understand
			SLO 19	Illustrate the electronic configuration of elements upto atomic number 20.	Interactive lecture		II Understand
C02	Understand the concept of Chemical bonding and distinguish different types of Chemical bond.	The concept of Chemical bonding and distinguish different types of Chemical bond.	SLO 20	Explain chemical bonding using octet rule	Lecturing	165 Min	II Understand
			SLO 21	State Octet rule	Lecturing		I Remember
			SLO 22	Define electro negativity.	Lecturing		I Remember
			SLO 23	Discuss the significance of Lewis symbols	Lecturing		II Understand
			SLO 24	Explain different types of chemical bonds with two examples each.	Interactive lecture		II Understand
			SLO 25	Illustrate ionic bond using the formation of NaCl and CaF <sub>2</sub>	Lecturing		II Understand
			SLO 26	Illustrate covalent bond using the formation of chlorine molecule.	Lecturing		II Understand
			SLO 27	Illustrate coordinate bond or dative bond using the formation of following molecules. a) NH <sub>3</sub> b) SO <sub>2</sub> c) Ammonium ion d) H <sub>3</sub> O <sup>+</sup>	Lecturing		II Understand
			SLO 28	Define hydrogen bonding with example	Lecturing		I Remember

CO3	Able to distinguish and justify different materials based on conductivity in Science and Technology and understand the mechanism of electrolysis with examples and to solve the problems related to electrolysis and to apply the concept of fuel cell in modern technology.	Distinguish and justify different materials based on conductivity in Science and Technology	SLO 29	Classify materials based on conduction with two examples each	Chalk and talk	110 Min	II Understand
			SLO 30	Define conductors with examples.	Interactive lecture		I Remember
			SLO 31	Define semiconductors with examples.	Interactive lecture		I Remember
			SLO 32	Define insulators with examples.	Interactive lecture		I Remember
			SLO 33	Distinguish between Conductors and Insulators	Interactive lecture		IV Analyze
			SLO 34	Explain two types of Conductors.	Lecturing		II Understand
			SLO 35	Distinguish between Metallic and electrolytic conductors.	Interactive lecture		IV Analyze
			SLO 36	Distinguish between electronic conduction and electrolytic conduction.	Interactive lecture		IV Analyze
			SLO 37	Mention the effect of temperature on electrical conduction of metals and electrolytes.	Lecturing		II Understand
	Explain the mechanism of electrolysis with examples and to solve the problems related to electrolysis	SLO 38	Define Electrolytes and Non - electrolytes with two examples.	Lecturing	110 Min	I Remember	
		SLO 39	Explain Strong and Weak Electrolytes with two examples.	Lecturing		II Understand	
		SLO 40	Distinguish between Strong and Weak Electrolytes.	Interactive lecture		IV Analyze	
		SLO 41	Define electrolysis.	Chalk and talk		I Remember	
SLO 42		List any five applications of electrolysis.	Class discussion	I Remember			
SLO 43		Illustrate electrolysis taking molten NaCl and aqueous NaCl solution using Pt electrodes	Active lecturing	II Understand			

			SLO 44	Explain qualitative and quantitative statement of Faradays laws of electrolysis.	Interactive lecture		II Understand
			SLO 45	Explain the following applications of electrolysis a) electroplating b) anodizing	Active lecturing		II Understand
			SLO 46	Mention the difference between electroplating and anodising.	Active lecturing		II Understand
			SLO 47	Explain the electroplating of Nickel on mild steel.	Interactive lecture		II Understand
		Apply the concept of fuel cell in modern technology.	SLO 48	Illustrate representation of the cell.	Interactive lecture	110 Min	II Understand
			SLO 49	Explain Anode, Cathode, electrolyte and half cell reactions.	Lecturing		II Understand
			SLO 50	Explain electrochemical cell	Lecturing		II Understand
			SLO 51	Define salt bridge and mention its functions.	Interactive lecture		I Remember
			SLO 52	Outline schematic representation of galvanic cell	Active lecturing		II Understand
			SLO 53	Discuss the classification of galvanic cell as primary, secondary and fuel cells.	Interactive lecture		II Understand
			SLO 54	Distinguish between primary cell and secondary cell.	Lecturing		IV Analyze
			SLO 55	List two examples each for primary cell and secondary cell and nuclear cell.	Class discussion		I Remember
			SLO 56	Illustrate primary cell with Daniel Cell as example.	Interactive lecture		II Understand
			SLO 57	Distinguish between electrolytic cell and galvanic cell.	Interactive lecture		IV Analyze
			SLO 58	Define electrode potential.	Lecturing		I Remember



			SLO 59	Define oxidation potential.	Lecturing	110Min	I Remember
			SLO 60	Define reduction potential.	Lecturing		I Remember
			SLO 61	Solve problems based on electrode potential.	Practise exercise		II Understand
			SLO 62	Define EMF of a cell.	Lecturing		I Remember
			SLO 63	Solve problems based on EMF of a cell.	Practise exercise		II Understand
			SLO 64	Explain electrochemical series and its applications	Lecturing		II Understand
			SLO 65	Define fuel cell	Lecturing		I Remember
			SLO 66	Explain the working of fuel cell taking H <sub>2</sub> -O <sub>2</sub> fuel cell with the help of diagram.	Interactive Lecture		II Understand
			SLO 67	List the advantages of H <sub>2</sub> -O <sub>2</sub> fuel cell	Class Discussions		I Remember
			SLO 68	List the applications of H <sub>2</sub> -O <sub>2</sub> fuel cell	Class Discussions		I Remember
<b>CO4</b>	Understand the concept of corrosion and its after effects, solve the practical problems related to it	The concept of corrosion and its after effects, solve the practical problems related to it	SLO 69	Define Corrosion	Class Discussion	110 Min	I Remember
			SLO 70	Explain rusting of Iron and mention the conditions of rusting.	Interactive Lecture		II Understand
			SLO 71	Discuss the various factors affecting corrosion	Interactive Lecture		II Understand
			SLO 72	Explain electrochemical theory of corrosion	Lecturing		II Understand
			SLO 73	Explain the following types of Corrosion a) Chemical corrosion b) Electro chemical Corrosion	Interactive Lecture		II Understand

			SLO 74	Distinguish between chemical and electrochemical corrosion.	Interactive Lecture	110 Min	IV Analyze
			SLO 75	Describe the following methods for prevention of corrosion a) Barrier Protection b) Sacrificial Protection c) Cathodic Protection d) Antirust Solutions	Interactive Lecture		II Understand
			SLO 76	Explain the method used to protect underground iron pipes protected from corrosion.	Lecturing		II Understand
			SLO 77	Explain galvanisation	Lecturing		II Understand
<b>CO 5</b>	Understand the fundamental ideas of organic chemistry and different types of refractories and glasses and its application in industrial field and to compare	Fundamental ideas of organic chemistry	SLO 78	Distinguish between Organic and Inorganic Compounds	Class Discussion	55 Min	IV Analyze
			SLO 79	Describe the uniqueness of Carbon atom	Lecturing		II Understand
			SLO 80	Distinguish between Saturated and Unsaturated Compounds	Chalk and talk		IV Analyze
			SLO 81	Define functional group	Lecturing		I Remember
			SLO 82	List the functional group present in the following organic compounds. a) Alkenes			

	,differentiate, explain, relate and extend the concept of polymers and polymerisation with examples			<ul style="list-style-type: none"> <li>b) Alkyne</li> <li>c) Alcohols</li> <li>d) Aldehydes/ Ketones</li> <li>e) Acids</li> <li>f) Ethers</li> <li>g) Amines</li> <li>h) Esters</li> </ul>			
		Distinguish different types of refractories and glasses and apply this in industrial field	SLO 83	Explain refractories.	Interactive Lecture	55 Min	II Understand
			SLO 84	Explain the classification and properties of refractories	Interactive Lecture		II Understand
			SLO 85	Explain general properties and types of glasses	Interactive Lecture		II Understand
			SLO 86	Describe the following types of glasses with their contents and uses <ul style="list-style-type: none"> <li>a) soda glass</li> <li>b) Borosilicate glass</li> <li>c) safety glass</li> <li>d) Insulating glass</li> </ul>	Interactive Lecture		II Understand
			SLO 87	List the advantages of optical fibres	Lecturing		I Remember
			SLO 88	List the uses of optical fibres	Lecturing		I Remember
		Compare ,differentiate, explain, relate and extend the concept of polymers and polymerisation with examples	SLO 89	Define polymer.	Lecturing	55 Min	I Remember
			SLO 90	Define polymerization.	Lecturing		I Remember
			SLO 91	Explain the following types of polymers based on nature of monomers with examples. <ul style="list-style-type: none"> <li>a) Homopolymer</li> <li>b) Copolymer</li> </ul>	Interactive Lecture		II Understand

			SLO 92	<p>Explain the following types of polymers based on origin with examples.</p> <ul style="list-style-type: none"> <li>a) Natural polymer</li> <li>b) Semi- synthetic polymer</li> <li>c) Synthetic polymer</li> </ul>	Interactive Lecture	165 Min	II Understand
			SLO 93	<p>Explain the following types of polymers based on structure with examples.</p> <ul style="list-style-type: none"> <li>a) Linear polymers</li> <li>b) Branched chain polymers</li> <li>c) Three dimensional network polymers</li> </ul>	Lecturing		I Remember
			SLO 94	<p>Explain the following types of polymers based on mode of synthesis with examples.</p> <ul style="list-style-type: none"> <li>a) addition polymerisation</li> <li>b) condensation polymerisation</li> </ul>	Interactive Lecture		II Understand
			SLO 95	Distinguish between addition polymerisation and condensation polymerisation	Interactive Lecture		IV Analyze
			SLO 96	<p>Explain the following types of polymers based on magnitude of intermolecular forces with examples.</p> <ul style="list-style-type: none"> <li>a) Elastomers</li> <li>b) Fibers</li> <li>c) Thermoplastics</li> <li>d) Thermosetting plastics</li> </ul>	Interactive Lecture		II Understand

			SLO 97	Distinguish between thermoplastics and thermosetting plastics.	Lecturing	165 Min	IV Analyze
			SLO 98	Define natural rubber	Lecturing		I Remember
			SLO 99	Define synthetic rubber	Lecturing		I Remember
			SLO 100	Distinguish between Natural and Synthetic rubber	Interactive Lecture		IV Analyze
			SLO 101	List any two synthetic rubber and their monomers.	Lecturing		I Remember
			SLO 102	Explain Vulcanisation and its merits	Interactive Lecture		II Understand
			SLO 103	Explain the role of sulphur in vulcanisation of rubber.	Interactive Lecture		II Understand
			SLO 104	Explain the following common polymers with their monomers and uses. a) Polythene b) Polypropene c) Polystyrene d) PVC e) Neoprene f) Teflon g) Buna - S h) Buna - N i) Nylon-6 j) Nylon-66 k) Bakelite.	Interactive Lecture		II Understand

CO 6	Provide knowledge to list and differentiate the concepts of fuels and to identify and relate the impact of environmental pollution in daily life and to point out the remedial steps for it.	List and differentiate the concepts of fuels	SLO 105	Define the term fuel	Lecturing	220 Min	I Remember
			SLO 106	Define calorific value of a fuel.	Lecturing		I Remember
			SLO 107	List the characteristics of a good fuel	Lecturing		I Remember
			SLO 108	Explain the following classification of fuels based on physical state with examples a) Solid fuel b) Liquid fuel c) Gaseous fuel d) Nuclear fuel	Interactive Lecture		II Understand
			SLO 109	Compare solid, liquid and gaseous fuels.	Lecturing		I Remember
			SLO 110	Explain the preparation and properties of the following gaseous fuels. a) Water gas b) Producer gas. c) Gobar gas d) LPG	Interactive Lecture		II Understand
			SLO 111	List the constituents of the following gaseous fuel. a) Water gas b) Producer gas. c) Gobar gas d) LPG	Lecturing		II Understand
			SLO 112	Define cracking.	Active Lecturing		I Remember
			SLO 113	Distinguish between thermal and catalytic cracking.	Active Lecturing		IV Analyze
			SLO 114	List the advantages of catalytic cracking over thermal cracking.	Lecturing		II Understand

		SLO 115	Explain the method to convert higher hydrocarbons into petrol.	Lecturing	220 Min	II Understand
	The impact of environmental pollution in daily life and the remedial steps for it.	SLO 116	Explain the various regions of atmosphere	Lecturing		II Understand
		SLO 117	Define pollution.	Lecturing		I Remember
		SLO 118	Define the term pollutant.	Lecturing		I Remember
		SLO 119	Explain the major causes and effects of following types of pollution. a) Air pollution b) Water pollution c) Soil Pollution	Interactive Lecture		II Understand
		SLO 120	List the sources of major pollutants in Air, water and soil.	Class Discussion		I Remember
		SLO 121	Explain the various methods to control air pollution.	Class Discussion		II Understand
		SLO 122	Explain the various methods to control water pollution	Class Discussion		II Understand
		SLO 123	Explain the various methods to control soil pollution	Class Discussion		II Understand
		SLO 124	Discuss the causes and effects of ozone layer depletion.	Class discussion		II Understand
		SLO 125	Explain green house effect and global warming	Class discussion		II Understand
		SLO 126	Discuss the sources and effects of acid rain.	Class discussion		II Understand
		SLO 127	Explain the formation of smog.	Interactive Lecture		II Understand
	SLO 128	Explain different types of smog.	Interactive Lecture	II Understand		

			SLO 129	Distinguish between classical smog and photochemical smog.	Interactive Lecture		IV Analyze
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			SLO 130	Explain the importance of green chemistry in the present scenario.	Interactive Lecture	55 Min	II Understand
			SLO 131	Mention the principles of green chemistry in day to day life	Interactive Lecture		II Understand
			SLO 132	Mention the applications of green chemistry in day to day life	Interactive Lecture		II Understand

**Mapping of CO to PO and PSO**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
C01	3											
C02	3	2	3									
C03	3	2	2									
C04	3	2		3								
C05	1	2	3									
C06	3	2			3	3						

3-Strongly mapped

2-Moderately mapped

1-Weakly mapped

### **Justification for CO-PO and CO-PSO mapping**

CO	Description	Mapped POs	Level of mapping	Justification
CO1	Provide the basic concepts of atom model and explain the basic theoretical concepts of orbitals and facts related to it and also to develop the skill of writing electronic configuration of atoms.	PO 1	3	Fundamental Knowledge in basic science helps to analyze the engineering problems.
CO2	Introduce the concept of Chemical bonding and distinguish different types of Chemical bond.	PO 1	3	Knowledge about various bonds helps to model various problems in the engineering field.
		PO 2	2	Gives an ability to apply this knowledge in the chemical engineering field.
		PO 3	3	Able to plan and perform experiments in the engineering field.
CO3	Impart knowledge to distinguish and justify different materials based on conductivity in Science and Technology and to explain the mechanism of electrolysis with examples and to solve the problems related to electrolysis and to apply the concept of fuel cell in modern technology.	PO 1	3	Knowledge about material conductance are used for engineering problems.
		PO 2	2	Able to apply the principles of electrolysis in the engineering field .
		PO 3	2	Knowledge about various conductors help to perform experiments in the engineering field.

CO4	Explain the concept of corrosion and its after effects, solve the practical problems related to it	PO 1	3	Knowledge of corrosion and its prevention methods helps to solve the practical problems related to engineering.
		PO 2	2	Knowledge about different types of corrosion helps to understand problems encountered in professional practices.
		PO 4	3	Gives knowledge about the various methods used to prevent corrosion of metals used in the engineering field..
CO5	To impart knowledge about the fundamental ideas of organic chemistry and to distinguish different types of refractories and glasses and apply this in industrial field and to compare ,differentiate, explain, relate and extend the concept of polymers and polymerisation with examples	PO 1	1	Knowledge about the concepts of organic chemistry helps to solve the engineering field.
		PO 2	2	Knowledge about the applications of various materials such as refractories and glasses help in the industrial field.
		PO 3	3	Able to plan and perform experiments in the engineering field by understanding the basic concepts of organic chemistry and polymers and polymerization reactions.

CO6	Provide knowledge to understand, list and differentiate the concepts of fuels and to identify and relate the impact of environmental pollution in daily life and to point out the remedial steps for it.	U	PO1	3	Students will able to know the qualities of fuel and its calorific value helps to solve engineering problems.
			PO 2	2	Knowledge about different types of fuels and its uses in the engineering field.
			PO 5	3	Helps student to demonstrate knowledge to access societal and health issues and the consequent responsibilities.
			PO 6	3	Knowledge about various environmental pollution helps to understand the impact of the engineering solutions in societal and environmental contexts.

**Web Source Reference: (atleast 5 website links)**

Sl No	Website Link
1	<a href="http://www.chemistryexplained.com">www.chemistryexplained.com</a>
2	<a href="http://chem.libretexts.org">http://chem.libretexts.org</a>
3	<a href="http://commonorganicchemistry.com/index.htm">commonorganicchemistry.com/index.htm</a>
4	<a href="http://www.rsc.org/learn-chemistry/">www.rsc.org/learn-chemistry/#!</a>
5	<a href="http://www.sparknotes.com/chemistry">www.sparknotes.com/chemistry</a>
6	<a href="https://www.reddit.com/r/chemistry">reddit.com/r/chemistry</a>

**Assessment Methodologies - Direct:**

<input checked="" type="checkbox"/> ASSIGNMENTS	<input checked="" type="checkbox"/> SERIES TEST	<input checked="" type="checkbox"/> MODEL EXAM	<input checked="" type="checkbox"/> END SEMESTER EXAM	<input type="checkbox"/> LAB PRACTICE
<input type="checkbox"/> STUDENT VIVA	<input type="checkbox"/> COURSE PROJECT	<input type="checkbox"/> CERTIFICATION	<input type="checkbox"/> ADD-ON COURSES	<input type="checkbox"/> OTHERS

**Assessment Methodologies - In Direct:**

<input checked="" type="checkbox"/> ASSESSMENT OF COURSE OUTCOMES BASED ON END OF COURSE SURVEY
<input checked="" type="checkbox"/> STUDENT FEEDBACK ON FACULTY

