

SEMESTER S1

CHEMISTRY FOR PHYSICAL SCIENCE

CourseCode	CHYBC102	CIE Marks	40
Teaching Hours/Week (L:T:P:R)	3:0:2:0	ESE Marks	60
Credits	4	ExamHours	2Hrs.30 Min.
Prerequisites(if any)	None	CourseType	Theory+Lab

Course Objectives:

1. To equip students with a thorough understanding of chemistry concepts relevant to engineering applications.
2. To familiarize students with applied topics such as spectroscopy, electrochemistry, and instrumental methods.
3. To raise awareness among students about environmental issues, including climate change, pollution, and waste management, and their impact on quality of life.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Engineering Materials Fuels: Calorific value – HCV and LCV – Experimental determination of calorific value of solid fuels. Analysis of	9

	<p>coal – Proximate analysis - Octane & Cetane Number. Biofuels - Biodiesel- Green Hydrogen.</p> <p>Lubricants: Classification - Solid, Semisolid and Liquid lubricants. Properties of lubricants - Viscosity Index, Flash point, Fire point, Cloud Point, Pour Point & Aniline Point.</p> <p>Cement: Manufacture of Portland cement – Theory of setting and hardening of cement.</p> <p>Nanomaterials: Classification based on Dimension & Materials Synthesis – Sol gel & Chemical Reduction - Applications of nanomaterials – Supercapacitor Materials - Carbon Nanotubes, Fullerenes & Graphene – structure, properties & application.</p> <p>Polymers: ABS & Kevlar - Synthesis, properties and applications. Conducting Polymers- Classification – Application.</p>	
2	<p>Electrochemistry and Corrosion Science</p> <p>Electrochemical Cell-Electrode potential-Nernst equation for single electrode and cell (Numerical problems)- Reference electrodes – SHE & Calomel electrode – Construction and Working - Electrochemical series - Applications – Glass Electrode & pH Measurement - Conductivity- Measurement using Digital conductivity meter. Li-ion battery & H₂-O₂ fuel cell (acid electrolyte only) construction and working.</p> <p>Corrosion – Electrochemical corrosion mechanism (acidic & alkaline medium). - Galvanic series - Corrosion control methods - Cathodic Protection - Sacrificial anodic protection and impressed current cathodic protection – Electroplating of copper - Electroless plating of Copper</p>	9
3	Instrumental Methods of Analysis	9

	<p>Molecular Spectroscopy: Types of spectra- Molecular energy levels-Beer Lambert's law-Numerical problems- Electronic Spectroscopy – Principle, Types of electronic transitions –Role of Conjugation in absorption maxima - Instrumentation-Applications – Vibrational spectroscopy – Principle-Number of vibrational modes-Vibrational modes of CO₂ and H₂O – Applications</p> <p>Thermal analysis: –TGA- Principle, instrumentation (block diagram) and applications–TGA of CaC₂O₄.H₂O and polymers.DTA-Principle, instrumentation (block diagram) and applications - DTA of CaC₂O₄.H₂O.</p> <p>Chromatography-Gas-Chromatography-Principle Instrumentation-Application– Analysis of chemical composition of exhaust gases.</p> <p>Electron Microscopic Techniques:SEM-Principle, instrumentation and Applications.</p>	
4	<p>Environmental Chemistry</p> <p>Water characteristics - Hardness - Types of hardness- Temporary and Permanent - Disadvantages of hard water - Degree of hardness (Numericals) Water softening methods- Ion exchange process-Principle, procedure and advantages. Reverse osmosis – principle, process and advantages. – Water disinfection methods – chlorination-Break point chlorination, ozone and UV irradiation. Dissolved oxygen (DO), BOD and COD- Definition & Significance</p> <p>Waste Management: Air Pollution- Sources & Effects- Greenhouse Gases- Ozone depletion. Control methods. Sewage water treatment-Primary, Secondary and Tertiary - Flow diagram -Trickling filter and UASB process. Solid waste-disposal methods- Composting, Landfill & Incineration.</p>	9

Course Assessment Method

(CIE:40marks,ESE:60marks)

ContinuousInternalEvaluationMarks (CIE):

Attendance	Continuous Assessment	Internal Examination-1 (Written)	Internal Examination-2 (Written)	Internal Examination-3 (Lab Examination)	Total
5	10	10	10	5	40

EndSemesterExaminationMarks (ESE)

InPartA,allquestionsneedtobeansweredandinPartB,eachstudentcanchooseanyone full question out of two questions

PartA	PartB	Total
<ul style="list-style-type: none">• 2Questionsfromeach module.• Totalof8Questions,each carrying 3 marks	<ul style="list-style-type: none">• Eachquestioncarries 9 marks.• Twoquestionswillbe given from each module, out of which 1 question should be answered.• Each question can haveamaximumof 3 sub divisions. <p>(4 x 9 = 36 marks)</p>	60

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Describe the use of various engineering materials in different industries.	K2
CO2	Explain the Basic Concepts of Electrochemistry and Corrosion to Explore the Possible Applications in Various Engineering Fields	K2
CO3	Apply appropriate analytical techniques for the synthesis and characterization of various engineering materials.	K3
CO4	Outline various water treatment and waste management methods.	K2

Note: K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2									2
CO2	3	3									2
CO3	3	3	2	2	2						2
CO4	3	3				2	3				2

Note: 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation

Text Books				
Sl No.	Title of the book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Engineering Chemistry	B.L.Tembe, Kamaluddin, M.S.Krishnan	NPTEL Web-book	2018
2	Physical Chemistry	P.W. Atkins	Oxford university	International Edition-2018

			press	
3	Instrumental Methods of Analysis	H.H.Willard, L.L.Merritt	CBS Publishers	7th Edition-2005
4	Engineering Chemistry	Jain&Jain	Dhanpath Rai Publishing Company	17th Edition- 2015

Reference Books				
Sl No.	Title of the book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Fundamentals of Molecular Spectroscopy	C. N. Banwell	McGraw-Hill	4th edn., 1995
2	Principles of Physical Chemistry	B.R.Puri, L.R. Sharma, M.S.Pathania	Vishal Publishing Co	47th Edition, 2017
3	Introduction to Spectroscopy	Donald L. Pavia	Cengage Learning India Pvt. Ltd	2015
4	Polymer Chemistry: An Introduction	Raymond B. Seymour, Charles E. Carraher	Marcel Dekker Inc	4th Revised Edition, 1996
5	The Chemistry of Nano materials: Synthesis, Properties and Applications.	Prof. Dr. C.N.R. Rao, Prof. Dr. H.c. mult. Achim Müller, Prof. Dr. A.K. Cheetham	Wiley-VCH Verlag GmbH & Co. KGaA	2014
6	Organic Electronics Materials and Devices	Shuichiro Ogawa	Springer Tokyo	2024
7	Principles and Applications of Thermal Analysis	Gabbot, P	Oxford: Blackwell Publishing	2008

VideoLinks(NPTEL, SWAYAM...)	
ModuleNo.	Linkid
1	https://archive.nptel.ac.in/courses/104/106/104106137/ https://archive.nptel.ac.in/courses/113/105/113105102/ https://archive.nptel.ac.in/courses/113/104/113104082/ https://www.youtube.com/watch?v=BeSxFLvk1h0
	https://archive.nptel.ac.in/courses/113/104/113104102/ https://archive.nptel.ac.in/courses/104/105/104105124/ https://archive.nptel.ac.in/courses/105/104/105104157/

