

SubjectName/Code: ENGINEERING CHEMISTRY (CH1001)

Detailed Syllabus:

Module#	Topics	Hours
Module-1	Water Treatments: Types of hardness-Units, Alkalinity of water and its significance, Softening methods and Numerical problems based on these methods, Membrane-based processes, Dissolved Oxygen, Problems with Boiler feed water and its Treatments.	9
Module-2	Corrosion Science: Definition and scope of corrosion, Dry and wet corrosion, Direct chemical corrosion, Electro-chemical corrosion and its mechanisms, Types of electro-chemical corrosion (Differential aeration, Galvanic, Concentration cell), Typical Electro-chemical corrosion like Pitting, Soil, Waterline, Factors affecting corrosion, Protection from corrosion.	8
Module-3	Instrumental Techniques: Fundamentals of Spectroscopy, Principles and applications of molecular spectroscopy such as UV-visible, IR, Elementary idea about XRD, SEM & TEM	8
Module-4	Energy Sciences: Types of fuels, Calorific value, Determination of calorific value, Combustion and its calculations, Solid fuel – Coal analysis (Proximate and ultimate analysis), Liquid fuels – Concept of knocking, Anti-knocking, Octane and Cetane Nos, Battery Technology – Fundamentals of primary & secondary cells, Rechargeable batteries – Lead acid storage battery, Lithium ion battery, Fuel cells – Principles, Applications, Solar PV Cells.	9
Module-5	Nanochemistry: Nanomaterials, Classification of nanomaterials, Synthesis and characterization of noble metal nanoparticles (Gold and oxide-based nanoparticles) using Green Synthetic route, Stabilization of nanoparticles using capping agents, Applications of nanomaterials, Carbon based nanomaterials and Their applications, Brief idea on Graphene and Fullerene.	8
Total		42 Hours

Text Book

Engineering Chemistry, Jain & Jain, Dhanpat Rai Publishing Company Engineering Chemistry,  
Wiley-India Editorial Team, Wiley India  
Fundamentals of Molecular Spectroscopy, C.N. Banwell, McGraw-Hill Education

Reference Book

Nanochemistry-A Chemical Approach to Nanomaterials, G.A. Ozin & A.C. Arsenault, RSC Publishing Concepts of Nanochemistry,  
J. M. Lehn, L. Cademartiri, Wiley-VCH  
Engineering Chemistry, S. S. Dara, 12th Ed  
Elementary Organic Spectroscopy, Y.R. Sharma, S Chand & Co Ltd



Outcome:

<b>CO1</b>	Determinethehardnessofwaterandapplydifferenceprocessestosoftenhardwater
<b>CO2</b>	Utilizetheknowledgeofelectro-chemistryandcorrosionscienceforpreventionofcorrosion
<b>CO3</b>	Applymolecularspectroscopytoanalyzeorganiccompoundsusingspectrophotometer.
<b>CO4</b>	Classifyvariousfuelsbasedoncombustionparametersandunderstandtheworkingprinciplesof various batteries and solar photovoltaic cells.
<b>CO5</b>	Exploresynthesis&characterizationofnanoparticlesthroughgreensynthetic route.

ProgramOutcomesRelevanttotheCourse:

<b>PO1</b>	Engineeringknowledge: Applytheknowledgeofmathematics,science,engineeringfundamentals, and an engineering specialization to the solution of complex engineering problems
<b>PO2</b>	Problemanalysis: Identify, formulate, reviewresearchliterature, andanalyze complexengineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO3</b>	Design/development of solutions: Design solutions for complex engineering problems and design systemcomponentsorprocessesthatmeetthespecifiedneeds with appropriate considerationfor the public health and safety, and the cultural, societal, and environmental considerations.
<b>PO4</b>	Conductinvestigationsof complexproblems: Useresearch-basedknowledgeandresearchmethods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO5</b>	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineeringandITtoolsincludingpredictionandmodelingto complexengineeringactivities with an understanding of the limitations.
<b>PO6</b>	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal,health,safety,legalandculturalissuesandtheconsequentresponsibilitiesrelevanttothe professional engineering practice.
<b>PO7</b>	Environmentandsustainability: Understandtheimpactoftheprofessionalengineeringsolutionsin societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO8</b>	Ethics: Applyethicalprinciplesandcommittoprofessiona lethicsandresponsibilitiesandnormsof the engineering practice.
<b>PO9</b>	Individualandteamwork: Functioneffectivelyasanindividual, andasamemberorleaderin diverse teams, and in multidisciplinary settings.
<b>PO10</b>	Communication: Communicate effectively on complex engineering activities with the engineering communityandwithsocietyatlarge, suchas, beingabletocomprehendandwriteeffectivereports and design documentation, make effective presentations, and give and receive clear instructions.
<b>PO11</b>	Project management and finance: Demonstrate knowledge and understanding of the engineering andmanagementprinciplesandapplythesetoone's ownwork, asamemberandleaderinateam, to manage projects and in multidisciplinary environments.

<b>PO12</b>	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
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Mapping of CO's to PO's: (1:Low, 2:Medium, 3:High)

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>
<b>CO1</b>	2	2	1	1	1	2	1	1	
<b>CO2</b>	3	2	1	1	1	2	1		1
<b>CO3</b>	2	2	1	1	1	3	1	1	1
<b>CO4</b>	2	2	1	1	2	2	1	1	1
<b>CO5</b>	2	2		1	1	1	1		