

CHEMISTRY OF MATERIALS

Course Code	20BS1105	Year	I	Semester	I
Course Category	Basic Science	Branch	ME	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	Nil
Continuous Internal Evaluation	30	Semester End Evaluation	70	Total Marks	100

Course Outcomes: Upon successful completion of the course, the student will be able to

CO	Statement	Skill	BTL	Units
CO1	Understand the basic principles related to water, energy sources, corrosion and engineering materials.	Understand	L2	1,2,3,4,5
CO2	Apply the knowledge of water treatment methods, corrosion technology and electrochemical energy systems to describe the functioning of water purifiers, methods for corrosion control and cells.	Apply	L3	1,2,3
CO3	Apply suitable methods and techniques for the characterization and manufacturing of various materials.	Apply	L3	4,5
CO4	Analyse the characteristics and performance of water, energy conversion systems, corrosion and materials in their respective applications.	Analyze	L4	1,2,3,4,5
CO5	Make an effective report on various concepts and technologies related to chemistry of materials.	Analyze	L4	1,2,3,4,5

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3: High, 2: Medium, 1: Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	3						1					1	1	
CO3	3						1					1	1	
CO4	3						1					1	1	
CO5	3						1			2		1	1	

Syllabus

UNIT	Contents	Mapped COs
I	WATER TECHNOLOGY: Introduction –Hard and Soft water, Estimation of hardness by EDTA Method - Boiler troubles- scale and sludge-priming and foaming, specifications for drinking water, Industrial water treatment – zeolite and ion- exchange processes- desalination of brackish water, reverse osmosis (RO) and electro dialysis.	CO1 CO2 CO4 CO5
II	ENERGY SOURCES AND APPLICATIONS: Electrode potential, determination of single electrode potential –Nernst's equation, reference electrodes, hydrogen and calomel electrodes – electrochemical series and its applications – primary cell, dry or Leclanche cell – secondary cell, lead acid storage cell – lithium batteries (Lithium-MnO ₂) – fuel cell, hydrogen-oxygen fuel cell, Solar energy- photovoltaic cell and applications.	CO1 CO2 CO4 CO5

III	CORROSION ENGINEERING: Corrosion: Definition – theories of corrosion, dry corrosion and electrochemical corrosion – factors affecting corrosion, nature of the metal and nature of the environment. Corrosion controlling methods: Sacrificial and Impressed current cathodic protection, Metallic coatings, anodic coatings, cathodic coating, galvanizing and tinning, anodic inhibitors and cathodic inhibitors – organic coatings, paints and varnishes (constituents and their functions).	CO1 CO2 CO4 CO5
IV	ENGINEERING MATERIALS AND POLYMERS Steel – Types of Steel, chemical composition – applications of alloy steels Cement: Portland cement, constituents, Manufacture of Portland Cement, chemistry of setting and hardening of cement (hydration, hydrolysis, equations). Polymers: Introduction, differences between thermoplastic and thermo setting resins, Preparation, properties and uses of polystyrene and poly phosphazines.	CO1 CO3 CO4 CO5
V	NANO AND SMART MATERIALS: Introduction to Nano materials, chemical synthesis of nanomaterials: Sol-gel method, characterization of nano materials by TEM (includes basic principle of TEM), Applications of nanomaterials in waste water treatment, lubricants and engines. Smart Materials: Introduction -Types of smart materials- self healing materials , Shape memory alloys and Uses of smart materials	CO1 CO3 CO4 CO5

Learning Resources

Text Books

1. P.C. Jain and M. Jain, Engineering Chemistry, 15/e, DhanapatRai& Sons,(2014).
2. B.K. Sharma, Engineering Chemistry, Krishna Prakasham,(2014).

Reference Books

1. SashiChawla, A Textbook of Engineering Chemistry, Dhanapath Rai and sons,(2003)
2. B.S Murthy and P. Shankar, A Text Book of Nano Science and Nano Technology, University Press(2013).
3. S.S. Dara, A Textbook of Engineering Chemistry, S. Chand& Co,(2010)
4. V.Raghavan, A Material Science and Engineering, Prentice-Hall India Ltd,(2004).
5. N.Krishna Murthy and Anuradha, A text book of Engineering Chemistry, Murthy Publications(2014).
6. K. Sesha Maheshwaramma and Mridula Chugh, Engineering Chemistry, Pearson India Edn services,(2016).

e- Resources & other digital material

1. <https://nptel.ac.in/courses/105105178/>
2. <http://202.53.81.118/course/view.php?id=82>