Chemistry of Materials

Course Code	19BS1102	Year	I	Semester	I
Course Category	Basic Sciences	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	
CO1	List the difference between temporary and permanent hardness of water.
CO2	Know the principles and applications of solar and wind energy.
CO3	Identify different organic coatings.
CO4	Analyze the importance of nano and smart materials.
CO5	Distinguish the principles of BET and TEM.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (H:High, M: Medium, L:Low)														
CO1	H													L
CO2	H		M											L
CO3	H													L
CO4	H	M												L
CO5	H													L

Syllabus		
Unit No.	Contents	Mapped CO
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, Bureau of Indian Standards (BIS) and World health organization (WHO) standards, Industrial water treatment – zeolite and ion- exchange processes- desalination of brackish water, reverse osmosis (RO) and electro dialysis.	CO1
II	ENERGY SOURCES AND APPLICATIONS: Electrode potential, determination of single electrode potential –Nernst's equation, reference electrodes, Weston Cd Cell, hydrogen and calomel electrodes – electrochemical series and its applications – primary cell, dry or Leclanche cell – secondary cell, lead acid storage cell, nickel- cadmium cell – lithium batteries (Lithium-MnO2) – fuel cell, hydrogen-oxygen fuel cell, Solar energy, photovoltaic cell and applications	CO2
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	CO3

	coatings, paints and varnishes (constituents and their functions).	
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 polyphosphazines.	CO4
V	NANO AND SMART MATERIALS: Introduction to Nano materials, chemical synthesis of nanomaterials: Sol-gel method, Reverse micellar method, Characterization of nanoparticles by BET method, characterization of nano mateirals by TEM (includes basic principle of TEM), Applications of nanomaterials in waste water treatment, lubricants and engines. **Smart Materials:** Introduction Typesof smart materials self healing materials Shape memory alloys and Uses of smart materials	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
https://nptel.ac.in/courses/105105178/ http://202.53.81.118/course/view.php?id=82