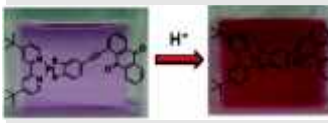
19HS117 ENGINEERING CHEMISTRY (A)



Source: Koya Prabhakara Rao. et al., ***Chem. Commun.***, **2011**,**47**, 2330-2332 80

Hours Per Week :

L	T	P	C
2	-	-	2

Total Hours :

L	T	P
30	-	-

CS	WA/RA	SSH	SA	S	BS
-	15	10	-	-	05

Course Description and Objectives :

The course aims to cover the importance of Chemistry and its applications in engineering disciplines among the students by imparting knowledge on the basic concepts of bonding, water technology, electrochemistry and construction of a battery etc. Besides, it also generates awareness on some contemporary advanced topics such as nanomaterials and their characterization using advanced instrumental techniques.

Course Outcomes:

Upon completion of the course, student will able to achieve the following outcomes:

COs	Course Outcomes	POs
1	Apply the molecular orbital theory for various types of chemical compounds.	1,2
2	Analyze the quality of the water and design a suitable water purification mechanism.	1,2,3
3	Apply the principle of electrochemistry for designing various batteries and fuel cells.	2,3,4
4	Apply the electromagnetic radiation to the spectroscopic methods for the analysis of engineering materials.	3,4,5
5	Evaluate the concept of “Nano materials” to the applications of electronic engineering.	2,3

SKILLS:

- ✓ *Analyze the total hardness of water sample.*
- ✓ *Construction and working of reference electrodes.*
- ✓ *Characterize chemical compound by using UV and IR spectroscopic techniques.*
- ✓ *Synthesize nanomaterials like carbon nanotubes, fullerenes.*

UNIT – I **L-6**

CHEMICAL BONDING AND WATER TECHNOLOGY:

Chemical Bonding - Crystal field splitting of octahedral and tetrahedral complexes; Molecular orbital theory of diatomic molecules (O_2 and CO), Molecular orbital energy diagram of octahedral complex, Ex: Hexamine Cobalt (II) complex.

Water Technology - Hardness of water, Determination of hardness by EDTA method and numerical problems; Softening of water by ion-exchange process.

UNIT - II **L-6**

ELECTRO CHEMISTRY: Redox reactions, Electrode potential, EMF of an electrochemical cell, Electrochemical series; Nernst equation; Reference electrodes - standard hydrogen electrode, calomel electrode; pHmetric and potentiometric titrations.

UNIT – III **L-6**

BATTERIES: Primary cell and secondary cells, Construction, Working and applications of lead-acid storage cell, Nickel-cadmium batteries, lithium ion battery; Fuel cells – construction, working and applications of methanol-oxygen and hydrogen-oxygen fuel cell.

UNIT - IV **L-6**

INSTRUMENTAL TECHNIQUES:

Electronic Spectroscopy - Beer-Lambert's law and its derivation, Applications of Beer-Lambert's law, instrumentation of UV-visible spectrophotometer.

IR Spectroscopy - Types of vibrations, Instrumentation of IR spectrophotometer and the applications.

UNIT – V **L-6**

NANO MATERIALS: Introduction, Classification, Properties, Synthesis - top down and bottom up; Synthesis, Properties & potential applications of carbon nanotubes, Fullerenes and graphene.

TEXT BOOKS:

1. Shashi Chawala, "A Text book of Engineering Chemistry Engineering Materials and Applications", 3rd edition, Dhanpat Rai Publications, 2015.
2. P.C Jain and Monica Jain, "Engineering Chemistry", 17th edition, Dhanpat Rai Publications, 2010.
3. K.S. Maheswaramma and Mridula chugh, "Engineering Chemistry", 1st edition, Pearson publication, 2015.

REFERENCE BOOKS:

1. H. W. Wilard and Demerit, "Instrumental methods of Analysis", 7th edition, CBS Publications, 1986.
2. Gurudeep Raj and Chatwal Anand, "Instrumental Methods of Analysis", 5th edition, Himalaya Publications, 2007.
3. T. Pradeep, "Nano:The Essentials; understanding of Nano Science and Technology" Tata McGraw-Hill, 2012.
4. Shikha Agarwal, "Engineering Chemistry: Fundamentals and Applications", 2nd edition, Cambridge Publications, 2019.