BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

Engineering Chemistry (R24 Regulations)
(Common to all branches)
I B. Tech. – Semester-I: CE, ME, AIML, ECE, EEE (Code: 24CE/ME/CM/EC/EE102)
Semester-II: CSE, DS, CB, IT (Code: 24CS/DS/CB/IT202)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Evaluation			40	Semester End Examination			60

Pre-Requisite: None.

Course Outcomes: At the end of this course, Students will be able to

CO1	Explain the preparation, properties, and applications of plastics, elastomers, and biodegradable polymers, and the calorific value, characteristics, and applications of conventional and alternative fuels.
CO2	Apply electrochemical principles to electrodes, electrochemical energy systems, corrosion mechanisms, and corrosion protection methods.
CO3	Analyse water-treatment processes and instrumental methods of analysis used for industrial, potable, and analytical applications.
CO4	Demonstrate knowledge of computational chemistry and advanced materials relevant to engineering applications.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	2			2					2			
CO2	3	3	2			2					2			
CO3	3	3	2	2		2					3			
CO4	3	3	2	3	3						2			

UNIT-1: POLYMERS AND FUEL CHEMISTRY — 12 Hours

Introduction to polymers, functionality of monomers. Thermoplastics and Thermo-setting plastics- Preparation, properties and applications of PVC and Bakelite.
Biodegradable polymers- Preparation, properties and applications of PHB and PHBV
Elastomers-Preparation, properties and applications of Buna S and Buna N
Fuels-Types of fuels, calorific value of fuels-determination by Bomb calorimeter, Liquid Fuels-refining of petroleum, Knocking, Octane and Cetane number, Flue gas analysis by Orsat's apparatus, Introduction to alternative fuels-methanol, ethanol and bio fuel-bio diesel (preparation and applications).

UNIT-2: ELECTROCHEMICAL CELLS AND CORROSION — 12 Hours

Single electrode potential, Reference electrodes- construction and working of standard hydrogen

electrode and calomel electrode; Batteries (Li ion battery and zinc air cells), fuel cells (H_2-O_2, and molten carbonate). Electrochemical sensors-potentiometric sensors and amperometric sensors with examples.

Corrosion-Definition, theories of corrosion (chemical and electrochemical), Types of corrosion-galvanic corrosion, differential aeration corrosion, stress corrosion, factors influencing rate of corrosion, corrosion control (cathodic protection), Protective coatings-electroplating (Gold) and electroless plating (nickel).

UNIT-3: WATER TECHNOLOGY AND INSTRUMENTAL METHODS OF ANALYSIS	12 Hours

WATER TECHNOLOGY: Soft and hard water, Estimation of hardness of water by EDTA Method-numerical problems, Boiler troubles-Priming, foaming**,** scale and sludge, Caustic embrittlement, Specifications for drinking water- World health organization (WHO) standards, Industrial water treatment- Ion-exchange process, desalination of brackish water by reverse osmosis (RO) and electro dialysis.

INSTRUMENTAL METHODS OF ANALYSIS: Electromagnetic spectrum-UV (Principle, instrumentation, and applications), FT-IR (Principle, instrumentation, and applications), magnetic resonance imaging and CT scan (procedure and applications).

UNIT-4: ADVANCED CONCEPTS/MATERIALS IN ENGINEERING CHEMISTRY	12 Hours

Computational chemistry: Introduction to computational chemistry, and docking studies

Semiconductors-Introduction, basic concept, Types-Intrinsic & Extrinsic Semiconductors, applications.

Nano materials: Introduction, classification of nano materials, engineering applications, properties and applications of Carbon nano tubes and Graphenes nanoparticles.

Liquid crystals: Introduction, liquid crystalline displays (LCD)-applications. Polymers for light emitting diodes (LEDs)-Introduction, classification of polymer LEDs, Organic LEDs-their commercial uses.

Text Books :	1. P.C. Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., New Delhi 17th edition (2017). 2. Seshi Chawla, "Engineering Chemistry" DhanpatRai Pub, Co LTD, New Delhi 13 th edition, 2013. 3. S.S. Dara, "A Textbook of Engineering Chemistry", S.Chand & Co, (2010).
References :	1. Engineering Chemistry by K. Maheswaramma, Pearson publishers 2015. 2. Textbook of Polymer Science, Fred W. Billmayer Jr, 3rd Edition 3. B. S. Murthy, P. Shankar and others, "Textbook of Nanoscience and Nanotechnology", University press (latest edition) 4. CNR Rao and JM Honig (Eds) "Preparation and characterization of materials" Academic press, New York (latest edition)

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ENGINEERING CHEMISTRY LAB
(Common to All Branches)
I B. Tech. – Semester-I: CE, ME, AIML, ECE, EEE (Code: 24CEL/MEL/CML/ECL/EEL102)
Semester-II: CSE, DS, CB, IT (Code: 24CSL/DSL/CBL/ITL202)

Lectures	0	Tutorial	0	Practical	2	Credits	1
Continuous Internal Evaluation			40	Semester End Examination			60

Pre-Requisite: None.

Course Objectives: Students will be able

- To familiarize students with practical chemical analysis techniques for determining key water quality parameters.
- To provide hands-on experience in performing volumetric and instrumental titrations to understand their chemical principles and applications.
- To develop proficiency in using laboratory equipment, following safety protocols, and accurately conducting experiments.
- To teach students the synthesis of common organic compounds and their characterization techniques.

Course Outcomes: After the completion of the course students will be able to

CO-1	Determine water quality parameters such as alkalinity and hardness.
CO-2	Conduct volumetric titrations to estimate the concentration of chemical substances.
CO-3	Apply instrumental methods such as pH metry and conductometry for titration experiments and colorimetry for verification of Beers law.
CO-4	Synthesize and characterize common organic compounds like soap, resins, and aspirin.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

COs	**POs**											**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	1	2	3
CO-1	3	3	2	3		3					2			
CO-2	3	3	2	2		3					2			
CO-3	3	3	2	3	3						2			
CO-4	2			3		2								

LIST OF EXPERIMENTS

1. Determination of Alkalinity of Tap water.
2. Determination of Total Hardness of ground water sample by EDTA method
3. Estimation of Mohr's salt by Permanganometry.
4. Estimation of Active Chlorine Content in Bleaching Powder
5. pH metric titration between strong acid and strong base.
6. Conductometric Titrations between Strong acid and strong base.
7. Verification of Beers Law using potassium permanganate by colorimetry.
8. Preparation of Soap.
9. Preparation of Urea-formaldehyde resin
10. Preparation of Aspirin.

Text Books :

1. Practical Engineering Chemistry by K.Mukkanti, Etal, B.S. Publicaitons,Hyderabad, 2009.
2. Inorganic quantitative analysis, Vogel, 5th edition, Longman group Ltd.London, 1979.

References :

1. Text Book of engineering chemistry by R.n. Goyal and Harrmendra Goel.
2. A text book on experiments and calculations- Engineering Chemistry. S.S. Dara.
3. Instrumental methods of chemical analysis, Chatwal, Anand, HimalayaPublications.