

BLOW UP SYLLABUS
First/Second Semester B.E.
Chemistry for Computer Science Engineering Stream(22CHES12/22)
(Effective from the academic year 2022-23)

Topics	Topics To Be Covered	Hours
Module-I: Sensors and Energy Systems		
Metals and Alloys: Sensors:	Sensors: Introduction - Definition and terminologies of Transducer Actuators and Sensors. Working principle and any four applications of Electrochemical sensors, and Thermometric Sensor (Flame photometer) Working principle and any four applications of Conductometric sensors (conductometry), and Optical sensors (colorimetry), Electrochemical Sensor for the measurement of Dissolved Oxygen (DO); With brief introduction to different sensors, explain the principle, experimental procedure with electrode reactions. Electrochemical gas sensors for SO _x and NO _x ; Working principle with electrode reactions Disposable sensors (DS); Definition, advantages of DS over Classical sensors. Detection of biomolecules; Example-Ascorbic acid (AA) explain with Oxidation of AA to Dehydroascorbic acid, Pesticides; example-Glyphosate (explain with electrochemical oxidation)	5L
Energy Systems:	Energy Systems: Introduction to batteries, construction, working and applications of Lithium-ion and Sodium-ion batteries Quantum Dot Sensitized Solar Cells (QDSSC's)- Principle, Properties and Applications (any four).	2L
Tutorials	i) Involvement of faculty and students in identifying the problems & solutions. ii) PPT presentations by the students/faculty about the applications of the different materials used in Computer Science Engineering iii) Guidance to the students for self-study topics through illustrative examples.	2T
Self-learning: Types of electrochemical sensor, Gas sensor - O ₂ sensor, Biosensor - Glucose sensors.	1. No Question is to be set for SEE 2. 20% weightage may be given to CIE from self-study topics	
(RBT Levels: L1, L2 & L3)		Total
		8
Module-II: Materials for Memory and Display Systems		
Memory Devices:	Memory Devices: Introduction, Basic concepts of electronic memory, History of organic/polymer electronic memory devices Classification of electronic memory devices (Transistor-Type, Capacitor-Type, Resistor-Type and Charge transfer type Electronic Memory devices), types of organic memory devices; Organic molecules (p-type semiconductor-ex., Pentacene; n-type ex., Perfluoropentacene used as memory materials) types of organic memory devices; polymeric material (Polyimide as an example with Donor-Triphenylamine; Acceptor-phthalimide)	3L

Display Systems:	<p>Display Systems: Photoactive and electroactive materials - Definition and principle for photoactive and electroactive. Optoelectronic devices: Definition, working principle.</p> <p>Nanomaterials (Silicon Nanocrystals) and organic materials [Light absorbing materials - Polythiophenes (P3HT), Light emitting materials - Poly[9-vinylcarbazole] (PVK)] Explain any four properties why they are used in optoelectronic devices.</p> <p>Liquid crystals (LC's) - Introduction, classification properties and application in Liquid Crystal Displays (LCD's)</p> <p>Organic Light Emitting Diodes (OLED's) and Quantum Light Emitting Diodes (QLED's) – Mention any four Properties and applications.</p>	4L
Tutorials	<p>i) Involvement of faculty and students in identifying the problems & solutions.</p> <p>ii) PPT presentations by the students/faculty about the different other energy display systems & memory devices</p> <p>iii) Guidance to the students for self-study topics through illustrative examples.</p>	2T
Self-learning: Properties and functions of Silicon (Si), Germanium (Ge), Copper (Cu), Aluminium (Al), and Brominated flame retardants in computers.	<p>1. No Question is to be set for SEE.</p> <p>2. 20% weightage may be given to CIE from self-study topics</p>	
(RBT Levels: L1, L2 & L3)	Total	8

Module-III: Corrosion and Electrode System

Corrosion Chemistry:	<p>Corrosion Chemistry: Introduction (ill effects, global losses), electrochemical theory of corrosion (principle, reactions under different conditions and diagram taking iron as an example)</p> <p>Types of corrosion: Differential metal - Definition, Principle, Process and application), Differential aeration – (Water line) – principle and explanation,</p>	4L
Corrosion control	<p>Corrosion control – Introduction (Definition, Principle and application) galvanization, Anodization and sacrificial anode method (explain with neat diagrams and reactions wherever applicable)</p> <p>Corrosion Penetration Rate (CPR)- Introduction- (Definition, formula and importance), Numerical problems</p>	
Corrosion Penetration Rate (CPR)		
Electrode System:	<p>Electrode System: Introduction, types of electrodes; Ion selective electrode – definition, construction, working and applications of the glass electrode.</p> <p>Determination of pH using glass electrode, Reference electrode: Introduction -(Definition and role of reference electrode);Calomel electrode – Construction, working and applications of calomel electrode</p> <p>Concentration cell – Definition, construction, working and Numerical problems.</p> <p>Analytical Techniques: Introduction, principle, and instrumentation of Conductometry; its application in the estimation of a weak acid. Potentiometry; its application in the estimation of iron.</p>	3L

Tutorials	<p>i) Involvement of faculty and students in identifying the problems & solutions.</p> <p>ii) PPT presentations by the students/faculty about the different Analytical technology</p> <p>iii) Guidance to the students for self-study topics through illustrative examples</p>	2T
Self-learning: IR and UV-Visible spectroscopy	<p>1. No Question is to be set for SEE.</p> <p>2. 20% weightage may be given to CIE from self-study topics.</p>	
(RBT Levels: L1, L2 & L3)	Total	8
Module-IV: Polymer and Green Fuels		
Polymer:	<p>Polymers: Introduction, Molecular weight - Number average, weight average and numerical problems.</p> <p>Conducting polymers – Synthesis and conducting mechanism of polyacetylene and commercial applications</p> <p>Preparation, properties, and commercial applications of Kevlar</p>	3L
Green Fuels:	<p>Green Fuels: Introduction to different types of fuels, past and future perspective of green fuels.</p> <p>construction and working of solar photovoltaic cell, advantages, and disadvantages, Green hydrogen: Introduction to properties of hydrogen pertaining to fuel. Introduction to electrolysis of water. Generation of hydrogen by electrolysis of water, (Explain the electrolysis of water with diagram and electrode reactions) and mention any 4 advantages</p>	4L
Tutorials	<p>i) Involvement of faculty and students in identifying the problems & solutions.</p> <p>ii) PPT presentations by the students/faculty about the different developments in polymer technology</p> <p>iii) Guidance to the students for self-study topics through illustrative examples</p>	2T
Self-learning: Regenerative fuel cells	<p>1. No Question is to be set for SEE.</p> <p>2. 20% weightage may be given to CIE from self-study topics.</p>	
(RBT Levels: L1, L2 & L3)	Total	8
Module-V: E-Waste Management		
E-Waste	<p>E-Waste: Introduction, sources of e-waste, Composition and Characteristics, Need for e-waste management concerning global perspective</p> <p>Toxic materials used in manufacturing electronic and electrical products; health hazards due to exposure to e-waste.</p> <p>Recycling and Recovery: Different approaches of recycling (separation, thermal treatments), hydrometallurgical extraction, pyrometallurgical methods and direct recycling.</p> <p>Extraction of gold from e-waste (Explain the Principle and experimental procedure)</p> <p>Role of stakeholders in the environmental management of e-waste:</p>	7L

	Who are called stakeholders – a local and global perspective Role of stakeholders - producers, consumers, recyclers, and statutory bodies.	
Tutorials	i) Involvement of faculty and students in identifying the problems & solutions. ii) PPT presentations by the students/faculty about the different advanced E-waste management techniques iii) Guidance to the students for self-study topics through illustrative examples	2T
Self-learning: Impact of heavy metals on environment and human health.	1. No Question is to be set for SEE. 2. 20% weightage may be given to CIE from self-study topics.	
(RBT Levels: L1, L2 & L3)		Total
		8

NOTE: Wherever the contact hours is not sufficient, tutorial hour can be converted to theory hours

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

1. Wiley Engineering Chemistry, Wiley India Pvt. Ltd. New Delhi, 2013- 2nd Edition.
2. Engineering Chemistry, Satyaprakash& Manisha Agrawal, Khanna Book Publishing, Delhi
3. A Text Book of Engg. Chemistry, Shashi Chawla, Dhanpat Rai & Co. (P) Ltd.
4. Essentials of Physical Chemistry, Bahl&Tuli, S.Chand Publishing
5. Applied Chemistry, Sunita Rattan, Kataria 5. Engineering Chemistry, Baskar, Wiley
6. Engineering Chemistry – I, D. Groukrishana, Vikas Publishing
7. A Text book of Engineering Chemistry, SS Dara & Dr. SS Umare, S Chand & Company Ltd., 12th Edition, 2011.
8. A Text Book of Engineering Chemistry, R.V. Gadag and Nityananda Shetty, I. K. International Publishing house. 2nd Edition, 2016.
9. Text Book of Polymer Science, F.W. Billmeyer, John Wiley & Sons, 4th Edition, 1999.
10. Nanotechnology A Chemical Approach to Nanomaterials, G.A. Ozin& A.C. Arsenault, RSCPublishing, 2005.
11. Corrosion Engineering, M. G. Fontana, N. D. Greene, McGraw Hill Publications, New York, 3rd Edition, 1996.
12. Linden's Handbook of Batteries, Kirby W. Beard, Fifth Edition, McGraw Hill, 2019.
13. OLED Display Fundamentals and Applications, TakatoshiTsujiMura, Wiley–Blackwell , 2012
14. Supercapacitors: Materials, Systems, and Applications, Max Lu, Francois Beguin, ElzbietaFrackowiak, Wiley-VCH; 1st edition, 2013.
15. “Handbook on Electroplating with Manufacture of Electrochemicals”, ASIA PACIFIC BUSINESSPRESS Inc., 2017. Dr. H. Panda,
16. Expanding the Vision of Sensor Materials. National Research Council 1995, Washington, DC: TheNational Academies Press. doi: 10.17226/4782.
17. Engineering Chemistry, Edited by Dr. Mahesh B and Dr. Roopashree B, Sunstar Publisher, Bengaluru, ISBN 978-93-85155-70-3, 2022
18. High Performance Metallic Materials for Cost Sensitive Applications, F. H. Froes, et al. John Wiley& Sons, 2010
19. Instrumental Methods of Analysis, Dr. K. R. Mahadik and Dr. L. Sathiyarayanan, NiraliPrakashan, 2020
20. Principles of Instrumental Analysis, Douglas A. Skoog, F. James Holler, Stanley R. Crouch SeventhEdition, Cengage Learning, 2020
21. Polymer Science, V R Gowariker, N V Viswanathan, Jayadev, Sreedhar, Newage Int. Publishers, 4th Edition, 2021
22. Engineering Chemistry, P C Jain & Monica Jain, Dhanpat Rai Publication, 2015-16th Edition.

23. Nanostructured materials and nanotechnology, Hari Singh, Nalwa, academic press, 1st Edition, 2002.
24. Nanotechnology Principles and Practices, Sulabha K Kulkarni, Capital Publishing Company, 3rd Edition 2014
25. Principles of nanotechnology, Phanikumar, Scitech publications, 2nd Edition, 2010.
26. Chemistry for Engineering Students, B. S. Jai Prakash, R. Venugopal, Sivakumaraiah & PushpaIyengar., Subash Publications, 5th Edition, 2014
27. “Engineering Chemistry”, O. G. Palanna, Tata McGraw Hill Education Pvt. Ltd. New Delhi, Fourth Reprint, 2015.
28. Chemistry of Engineering materials, Malini S, K S Anantha Raju, CBS publishers Pvt Ltd.,
29. Laboratory Manual Engg. Chemistry, Anupma Rajput, Dhanpat Rai & Co.

Web links and Video Lectures:

- <http://libgen.rs/>
- <https://nptel.ac.in/downloads/122101001/>
- <https://nptel.ac.in/courses/104/103/104103019/>
- <https://ndl.iitkgp.ac.in/>
- <https://www.youtube.com/watch?v=faESCxAWR9k>
- <https://www.youtube.com/watch?v=TBqXMWaxZYM&list=PLyhmwFtznRhuz8L1bb3X-9IbHrDMjHWWh>
- <https://www.youtube.com/watch?v=j5Hml6KN4TI>
- <https://www.youtube.com/watch?v=X9GHBdyYcyo>
- <https://www.youtube.com/watch?v=1xWBPZnEJk8>
- <https://www.youtube.com/watch?v=wRAo-M8xBHM>