Visvesvaraya Technological University, Belagavi.

A blow-up of the syllabus for Chemistry for

Computer Science and Engineering and allied branches (CSE/ISE and BT) (Chemistry group)

MODULE 1: Sensors and Energy Systems (8hr)		
Sl No	Details	Duration
1.	Sensors: Introduction - Definition and terminologies of Transducer Actuators and Sensors. Working principle and any four applications of Electrochemical sensors,	1 hr
2.	Working principle and any four applications of Conductometric sensors (conductometry), and Optical sensors (colorimetry),	1 hr
3.	Electrochemical Sensor for the measurement of Dissolved Oxygen (DO); With brief introduction to different sensors, explain the principle, experimental procedure with electrode reactions.	1 hr
4.	Electrochemical Sensor for pharmaceuticals; example-Diclofenac, and hydrocarbons; example-1-hydroxypyrene (explain with electrochemical oxidation reactions)	1 hr
5.	Electrochemical gas sensors for SOx and NOx; Working principle with electrode reactions	1 hr
6.	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)	1 hr
7.	Energy Systems: Introduction to batteries, construction, working and applications of Lithium-ion and Sodium-ion batteries	1 hr
8.	Quantum Dot Sensitized Solar Cells (QDSSC's)- Principle, Properties and Applications (any four).	1 hr
MODULE 2: Materials for Memory and Display Systems (8hr)		
1.	Memory Devices: Introduction, Basic concepts of electronic memory, History of organic/polymer electronic memory devices,	1 hr
2.	Classification of electronic memory devices (Transistor-Type, Capacitor-Type, Resistor-Type and Charge transfer type Electronic Memory devices),	1 hr
3.	types of organic memory devices; Organic molecules (p-type semiconductor – ex., Pentacene; n-type ex., Perfluoropentacene used as memory materials)	1hr
4.	types of organic memory devices; polymeric material (Polyimide as an example with Donor-Triphenylamine; Acceptor–phthalimide)	1hr
5.	Display Systems: Photoactive and electroactive materials - Definition and principle for photoactive and electroactive. Optoelectronic devices:	1hr

	Definition, working principle.	
6.	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.	1hr
7.	Liquid crystals (LC's) - Introduction, classification properties and application in Liquid Crystal Displays (LCD's)	1hr
8.	Organic Light Emitting Diodes (OLED's) and Quantum Light Emitting Diodes (QLED's) – Mention any four Properties and applications.	1hr
MODULE 3: Corrosion and Electrode System (8hr)		
1.	Corrosion Chemistry: Introduction (ill effects, global losses), electrochemical theory of corrosion (principle, reactions under different conditions and diagram taking iron as an example)	1hr
2.	Types of corrosion: Differential metal - Definition, Principle, Process and application), Differential aeration – (Water line) – principle and explanation,	1hr
3.	Corrosion control – Introduction (Definition, Principle and application) galvanization, Anodization and sacrificial anode method (explain with neat diagrams and reactions wherever applicable)	1hr
4.	Corrosion Penetration Rate (CPR)- Introduction - (Definition, formula and importance), Numerical problems	1hr
5.	Electrode System: Introduction, types of electrodes; Ion selective electrode – definition, construction, working and applications of the glass electrode.	1hr
6.	Determination of pH using glass electrode, Reference electrode: Introduction - (Definition and role of reference electrode); Calomel electrode – Construction, working and applications of calomel electrode	1hr
7.	Concentration cell – Definition, construction, working and Numerical problems.	1hr
8.	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.	1hr
MODULE 4: Polymers and Green Fuels (8hr)		
1.	Polymers: Introduction, Molecular weight - Number average, weight average and numerical problems.	1hr
2.	Conducting polymers – Synthesis and conducting mechanism of polyacetylene and commercial applications	1hr
3.	Preparation, properties, and commercial applications of graphene oxide and Kevlar Note: in the syllabus it is mention only graphene oxide, in order to avoid confusion and also content of the Module-4 is less, it is decided and inform you all to teach both graphene oxide and Kevlar	1hr
4.	Green Fuels: Introduction to different types of fuels, past and future perspective of green fuels.	1hr

5.	construction and working of solar photovoltaic cell, advantages, and disadvantages	1hr
6.	Green hydrogen: Introduction to properties of hydrogen pertaining to fuel. Introduction to electrolysis of water.	1hr
7.	Generation of hydrogen by electrolysis of water: Alkaline water electrolysis (Explain the electrolysis of water with diagram and electrode reactions) and mention any 4 advantages	1hr
8.	Electrolysis of water – Proton Exchange Membrane Electrolysis (Explain the electrolysis of water with diagram and electrode reactions) and mention any 4 advantages	1hr
MODULE 5: E-Waste Management (8hr)		
1.	E-Waste: Introduction, sources of e-waste, Composition and Characteristics,	1hr
2.	Need for e-waste management concerning global perspective	1hr
3.	Toxic materials used in manufacturing electronic and electrical products; health hazards due to exposure to e-waste.	1hr
4.	Recycling and Recovery: Different approaches of recycling (separation, thermal treatments),	1hr
5.	hydrometallurgical extraction, pyrometallurgical methods and direct recycling.	1hr
6.	Extraction of gold from e-waste (Explain the Principle and experimental procedure)	1hr
7.	Role of stakeholders in the environmental management of e-waste: Who are called stakeholders – a local and global perspective	1hr
8.	Role of stakeholders - producers, consumers, recyclers, and statutory bodies.	1hr

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Model Question Paper for Chemistry for

Computer Science and Engineering and allied branches (CSE/ISE and BT) (Chemistry group)

First/Second Semester B.E. Degree Examination Engineering Chemistry (21CHE12/22)					
Time	**3Hr**	**Note: Answer FIVE full questions, choosing one full question from each module**	**Max. Marks** **Blooms Level**	**Course outcomes**	**100** **Marks**
MODULE 1					
1	a	Explain the working principle of Conductometric sensors (conductometry), and Optical sensors (colorimetry)	L1, L2	CO1	7
	b	What are Electrochemical Sensors? Explain its application in the measurement of Dissolved Oxygen (DO)	L3	CO2	7
	c	Describe the construction, working and applications of Lithium-ion batteries and mention any four applications	L4	CO3	6
OR					
2	a	Explain the working principle of Electrochemical sensors, and mention its applications	L3	CO4	6
	b	Describe the application of Electrochemical gas sensors in sensing SOx and NOx	L3	CO5	7
	c	What are Quantum Dot Sensitized Solar Cells (QDSSC's)? Explain the working Principle, Properties and Applications.	L2	CO3	7
MODULE 2					
3	a	Explain the types of organic memory devices by taking p-type and n-type semiconductor materials	L2	CO2	7
	b	What are photoactive and electroactive materials and explain their working principle in display system	L2	CO2	6
	c	What are nanomaterials? Explain any four properties of Polythiophenes (P3HT) suitable for optoelectronic devices.	L2	CO4	7
OR					
4	a	What are Memory Devices? Explain the Classification of electronic memory devices with examples	L1	CO2	6

	b	Mention any four properties and applications of LC-displays	L2	CO3	7
	c	Mention any four properties and applications of QLED	L2	CO3	7
MODULE 3					
5	a	Define metallic corrosion? Describe the electrochemical theory of corrosion taking iron as an example.	L3	CO2	7
	b	Explain: (i) Differential metal corrosion & (ii) Water-line corrosion	L2	CO2	6
	c	Describe galvanizing and mention its applications.	L2	CO3	7
OR					
6	a	What are concentration cell. Explain the construction and working of concentration cell.	L2	CO1	6
	b	Explain the construction and working of Calomel electrode	L2	CO2	7
	c	What is CPR? A thick brass sheet of area 400 inch^2 is exposed to moist air. After 2 years of period, it was found to experience a weight loss 375 g due to corrosion. If the density of brass is 8.73 g/cm^3. Calculate CPR in mpy and mmpy.	L3	CO4	7
MODULE 4					
7	a	A polydisperse sample of polystyrene is prepared by mixing three monodisperse samples in the following proportions. 1g of 10000 molecular weight, 2g of 50000 molecular weight and 2g of 100000 molecular weight. Determine number average and weight average molecular weight. Find the index of polydispersity.	L3	CO4	7
	b	Explain the synthesis of Polyacetylene and mention its applications	L2	CO2	7
	c	Explain the generation of hydrogen by Alkaline water electrolysis	L2	CO3	6
OR					
8	a	Describe the hydrogen production by photo catalytic water splitting method.	L2	CO2	7
	b	Preparation, properties, and commercial applications of graphene oxide.	L2	CO2	7
	c	Explain the construction and working of photovoltaic cells.	L2	CO2	6
MODULE 5					
9	a	Mention the sources of e-waste and explain the need for e-waste management	L2	CO1	7
	b	Explain the recycling of e-waste	L2	CO2	7
	c	Explain the extraction of gold from e-waste	L2	CO3	6
OR					
10	a	Explain the ill effects of toxic materials used in manufacturing electrical and electronic products	L2	CO1	7
	b	Explain the pyrometallurgical and direct recycling methods.	L2	CO2	6
	c	Write a brief note on role of stakeholders for example; producers, consumers, recyclers, and statutory bodies.	L2	CO1	7