



GAYATRI VIDYA PARISHAD INSTITUTE OF HIGHER LEARNING AND RESEARCH

(Deemed to be University under Distinct Category under Section 3 of the UGC Act,
1956)

B.Tech (ECE, ECE (VLSI), EEE, EEE (EV)); I Semester ENERGY SYSTEMS AND ADVANCED MATERIALS

Lecture plan

Unit	Lecture No.	Topic / Sub-topic	CO
Unit I Electrochemical Energy devices	1	Introduction to electrochemical cells; electrode potential; cell notation	CO1
	2	Nernst equation for single-electrode potential; significance and applications, calculation and interpretation	
	3	Calomel electrode: construction, working and applications Silver/silver chloride electrode: construction, working and applications	
	4	Basic concepts of batteries, classification with examples, Primary battery- Zn–MnO ₂ alkaline cell: construction, working, reactions and applications	
	5	Secondary batteries- EV batteries: lithium-ion battery	
	6	Sodium-ion battery- principle, construction, working, advantages and applications	
	7	Fuel cells introduction, classification, merits and demerits, AFC and PEMFC	
	8	Hydrogen as fuel of future, types, storage and transportation challenges	
	9	Revision lecture/ Test/ Tutorial	
Unit II Electrochemical Sensors	10	Introduction; working principle and components of electrochemical sensors	CO2
	11	Principle and working of potentiometric sensors	
	12	Construction, working and applications of pH electrode	
	13	Principle, working and applications of fluoride ion sensor	
	14	Principle and components; applications of amperometric sensor	
	15	Working principle of Clark Oxygen Sensor	
	16	Working principle, construction and applications nitric oxide sensor	
	17	Conductometric sensors – Working principle and components of Urea sensor	
	18	Revision lecture/ Test/ Tutorial	
Unit III Engineering Materials	19	Definition, classification of polymers	CO3
	20	Polymerization types: addition polymerization, condensation polymerization with examples	
	21	Copolymerization with examples	
	22	Effect of polymer structure on properties; effect of heat on polymers	
	23	Thermoplastics and thermosetting plastics; recyclable/non-recyclable nature, Plastic waste management; plastics in	

		construction and composite materials, Plastic-to-fuel conversion	
	24	Conducting Polymers: Preparation, properties, and applications of polyacetylene and polyaniline.	
	25	Smart Materials: Introduction, types, characteristics, and applications of piezoelectric materials	
	26	Shape memory alloys (SMAs), Electrochromic, and Photochromic materials.	
	27	Revision lecture/ Test/ Tutorial	
UNIT- IV Green Chemistry and Sustainable Engineering	28	Introduction to Green chemistry, Importance of green chemistry; sustainable chemical processes and materials	CO4
	29	Twelve Principles of Green Chemistry – Part I	
	30	Twelve Principles of Green Chemistry – Part II; engineering relevance	
	31	Concept, calculation and applications of atom economy and E-factor	
	32	CO ₂ utilization and carbon capture; sustainable engineering perspective	
	33	Conversion of CO ₂ into methanol, methane and formic acid	
	34	E-waste generation, environmental impact, management, recycling and recovery	
	35	Hydrothermal method for recycling/recovery of electronic waste; unit review	
	36	Revision lecture/ Test/ Tutorial	
Unit V Biomaterials & Medical Imaging	37	Introduction; properties and biocompatibility of biomaterials	CO5
	38	Testing and biomedical applications of metals; artificial joints and dental implants, and heart valves.	
	39	Ceramics: properties, biocompatibility, testing and biomedical applications, Polymers and composites; applications including dental implants and heart valves	
	40	Biomedical Instrumentation: Basic principles of biomedical sensors, transducers and signal acquisition used for monitoring physiological parameters.	
	41	Signal acquisition used for monitoring physiological parameters such as Temperature, blood pressure and glucose monitoring systems	
	42	Cardiac activity monitoring; sensors, transducers and signal acquisition	
	43	Basic principles and applications of X-ray, CT, MRI and ultrasound	
	44	PET/SPECT; image enhancement, segmentation and 3D visualization for healthcare applications.	
	45	Revision lecture/ Test/ Tutorial	