

EVALUATION METHOD TO BE USED:

Sl. no	Category of Courses	Continuous Assessment	Mid –Semester Assessment	End Semester
1.	Theory	40	20	40

CY6251	ENGINEERING CHEMISTRY				L	T	P	EL	CREDITS
					3	0	2	3	5
OBJECTIVES: <ul style="list-style-type: none"> To develop an understanding about fundamentals of polymer chemistry, preparation and properties of polymers To acquire knowledge in photochemistry and spectroscopy To understand the concepts of surface chemistry and catalysis. To impart basic knowledge on chemical thermodynamics. To get acquainted with the basic concepts of nano chemistry. To understand the chemistry of the fabrication of integrated circuits To know the types of specialty materials used in the electronics/electrical industry. 									
MODULE I :					L	T	P	EL	
					3	0	2	3	
Polymer Chemistry: Introduction: Functionality; Classification of Polymers- Natural and Synthetic, Thermoplastic and Thermosetting. Types and Mechanism of Polymerization: Addition (Free Radical, Cationic, Anionic and Living); Condensation and Copolymerization. Piezo and pyro electric polymers; Photoresists – Positive and negative.									
SUGGESTED ACTIVITIES : <ul style="list-style-type: none"> In Class activity for Functionality and Mechanism of polymerisation Practical – Thermal free radical polymerisation of styrene/MMA 									
SUGGESTED EVALUATION METHODS: <ul style="list-style-type: none"> Tutorial : Deduce type of polymer from monomers with different functionalities Assignment : Predicting mechanism of polymerization for few important monomers Quizzes 									
MODULE II :					L	T	P	EL	
					3	0	2	3	
Properties of Polymers: T _g , Tacticity, Degree of Polymerization & Molecular Weight - Weight Average, Number Average and Polydispersity Index. Techniques of Polymerization: Bulk, Emulsion, Solution and Suspension									
SUGGESTED ACTIVITIES : <ul style="list-style-type: none"> Flipped classroom and activity Proofs and Simplification in class Practical – Determination of molecular weight of PVA using Ostwald viscometer 									

SUGGESTED EVALUATION METHODS:

- Tutorial problems
- Assignment problems
- Quizzes

MODULE III :

L	T	P	EL
3	0	2	3

Photochemistry: Electromagnetic Radiation - Laws of Photochemistry - Grotthuss-Draper Law, Stark-Einstein Law and Lambert-Beer Law. Photo Processes - Internal Conversion, Inter-System Crossing, Fluorescence, Phosphorescence, Chemiluminescence and Photo-Sensitization.

SUGGESTED ACTIVITIES :

- Evaluate quantum efficiency for different systems
- Photo Processes – in class and EL based on that
- Practical – Estimation of sodium in water sample by flame photometry

SUGGESTED EVALUATION METHODS:

- Tutorial problems
- Assignment problems
- Quizzes

MODULE IV :

L	T	P	EL
3	0	2	3

Spectroscopy: Absorption of Radiation-Electronic, Vibrational and Rotational Transitions. Width and Intensities of Spectral Lines. Spectrophotometric Estimation Of Iron. UV-Vis and IR Spectroscopy-Principles, Instrumentation (Block Diagram) and Applications

SUGGESTED ACTIVITIES :

- Flipped Class room
- Types of electronic/vibrational transitions for different molecules – in class and EL based on that
- Practical – Estimation of iron in water sample by spectrophotometry

SUGGESTED EVALUATION METHODS:

- Tutorial problems
- Assignment problems
- Quizzes

MODULE V :

L	T	P	EL
3	0	2	3

Adsorption-Types of Adsorption-Adsorption of Gases on Solids- Adsorption from Solutions- Types of Isotherms – Freundlich Adsorption Isotherm, Langmuir Adsorption Isotherm. Industrial Applications of Adsorption.

SUGGESTED ACTIVITIES :

- Industrial applications in class
- EL – Adsorption of gases on solids
- Practical – Adsorption of acetic acid/oxalic acid on charcoal – verification of Freundlich's adsorption isotherm.

SUGGESTED EVALUATION METHODS:				
<ul style="list-style-type: none"> • Tutorial problems • Assignment • Quizzes 				
MODULE VI:	L	T	P	EL
	3	0	2	3
Catalysis: Characteristics and Types of Catalysts-Homogeneous and Heterogeneous, Auto Catalysis. Enzyme Catalysis - Factors Affecting Enzyme Catalysis, Michaelis - Menton Equation. Industrial Applications of Catalysts				
SUGGESTED ACTIVITIES :				
<ul style="list-style-type: none"> • Introduction in class • Analysis in Class • Flipped Classroom for further study • Practical – Determination of rate constant of acid catalysed hydrolysis of an ester 				
SUGGESTED EVALUATION METHODS:				
<ul style="list-style-type: none"> • Tutorial problems • Assignment • Quizzes 				
MODULE VII:	L	T	P	EL
	3	0	2	3
Second Law: Entropy-Entropy of Phase Transitions; Free Energy- Gibbs-Helmholtz Equation; Clausius Clapeyron Equation; Van't Hoff Isotherm and Isochore. Chemical Potential; Gibbs-Duhem Equation- Variation of Chemical Potential with Temperature and Pressure.				
SUGGESTED ACTIVITIES :				
<ul style="list-style-type: none"> • Combinations of in Class & Flipped class rooms • Practical – Phase change in a solid. • EL - HDL descriptions 				
SUGGESTED EVALUATION METHODS:				
<ul style="list-style-type: none"> • Tutorial problems • Assignment problems • Quizzes 				
MODULE VIII:	L	T	P	EL
	3	0	2	3
Nano chemistry - Basics-Distinction between Molecules, Nanoparticles and Bulk Materials; Size-Dependent Properties. Preparation of Nanoparticles – Sol-Gel and Solvo - thermal. Preparation of Carbon Nanotube by Chemical Vapour Deposition and Laser Ablation. Preparation of Nanowires by Electrochemical Deposition and Electro Spinning. Properties and Uses of Nanoparticles, Nanoclusters, Nanorods, Nanotubes and Nanowires.				
SUGGESTED ACTIVITIES :				
<ul style="list-style-type: none"> • Combinations of in Class & Flipped class rooms • EL – Properties and uses of Nanowires, nanoclusters, nanorods, nanowires • Practical - Preparation of nano wire by electrospinning 				

SUGGESTED EVALUATION METHODS:				
<ul style="list-style-type: none"> • Tutorial • Assignment • Quizzes 				
MODULE IX:	L	T	P	EL
	3	0	2	3
Fabrication of integrated circuits: Introduction – Fabrication – MOS – NMOS, PMOS, CMOS, Ga-As Technologies, Printed circuit boards-Fabrication (Single layer only) – Lamination, printing (photo and screen printing) and mechanical operation.				
SUGGESTED ACTIVITIES :				
<ul style="list-style-type: none"> • Mostly in Class • EL - Mini project for Lamination by Hand lay up Technique • Practical – Determination of total, temporary and permanent hardness of water by EDTA method 				
SUGGESTED EVALUATION METHODS:				
<ul style="list-style-type: none"> • Assignment problems • Project demonstration and presentation 				
MODULE X:	L	T	P	EL
	3	0	2	3
Specialty Materials: Dielectrics & insulating materials – Characteristics; Ceramics – Mica and glass; Magnetic materials – basis of magnetism – Soft and hard magnetic materials; Composites : Classification – Particulate, fibrous and laminated composites – Hybrid composites – Application of composites in electrical and electronic components; Semiconductors – Extensive and intensive; Metallic solids –Characteristics.				
SUGGESTED ACTIVITIES :				
Combination of in class & Flipped				
SUGGESTED EVALUATION METHODS:				
<ul style="list-style-type: none"> • Tutorial • Assignment • Quizzes 				

PREREQUISITES FOR THE COURSE:

Laboratory facilities to carry out the experiments mentioned in each of the modules – Thermal free radical polymerisation of styrene/MMA, Determination of molecular weight of PVA using Ostwald viscometer, Estimation of sodium in water sample by flame photometry, Estimation of iron in water sample by spectrophotometry, Adsorption of acetic acid/oxalic acid on charcoal – verification of Freundlich's adsorption isotherm, Determination of rate constant of acid catalysed hydrolysis of an ester, Phase change in solid, Electrospinning, Total and temporary hardness.

OUTCOMES

Upon completion of the course, the students will be able to:

- Identify the different types of polymers, polymerisation processes and some special properties and applications of polymers.
- Identify suitable adsorbents/ adsorption process and catalysts for pollution abatement and other industrial processes.
- Discuss the concepts involved in the absorption of radiation by materials and various photophysical processes, polymer chemistry, surface chemistry and catalysis.
- Point out the spectral techniques for qualitative and quantitative analysis & thermodynamics of various processes.
- Discuss the importance of the nano materials (and their superiority over conventional materials), feasibility of their preparation and uses
- Elaborate on various technologies for the fabrication of integrated circuits & specialty materials in the electronics/electrical industry

TEXT BOOKS:

1. Jain P.C and Monika Jain, "Engineering Chemistry", Dhanpet Rai Publishing Company (P) Ltd., New Delhi, 2013.
2. Wong M.N., "Polymer for electronics and photonic applications", John Wiley, New York, 2006.

REFERENCES:

1. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2012
2. Vairam S., Kalyani P., Suba Ramesh., "Engineering Chemistry", Wiley India Pvt Ltd., New Delhi., 2011.
3. Khanna O.P., "Material Science" NIH Publications, 2007.

EVALUATION METHOD TO BE USED:

Continuous assessment	Mid term	End Semester
15(T) + 25 (P)	20	40

MA6251	DISCRETE MATHEMATICS	L	T	P	EL	CREDITS
		3	1	0	3	5
MODULE I	LOGIC	L	T	P	EL	
		3	1	0	3	
Propositional Logic – Propositional equivalences - Predicates and Quantifiers – Nested Quantifiers						
SUGGESTED ACTIVITIES :						
<ul style="list-style-type: none"> • Problem Solving sessions 						
SUGGESTED EVALUATION METHODS:						
<ul style="list-style-type: none"> • Tutorial problems • Assignment problems 						