

**UNIVERSITY OF MADRAS**  
**B.Sc. DEGREE PROGRAMME IN PHYSICS**  
 SYLLABUS WITH EFFECT FROM 2023-2024

<b>Title of the Course</b>	<b>CHEMISTRY FOR PHYSICAL SCIENCES-II (FOR MATHEMATICS &amp; PHYSICS STUDENTS)</b>						
<b>Paper No.</b>	<b>Generic Elective II</b>						
<b>Category</b>	<b>Generic Elective</b>	<b>Year Semester</b>	I/II II/IV	<b>Credits</b>	2	<b>Course Code</b>	237E4A
<b>Instructional hours per week</b>	<b>Lecture</b>	<b>Tutorial</b>	<b>Lab Practice</b>		<b>Total</b>		
	2	-	-		2		
<b>Prerequisites</b>	Chemistry for physical sciences -I						
<b>Objectives of the course</b>	This course aims at providing knowledge on the Co-ordination Chemistry and Water Technology Carbohydrates and Amino acids basics and applications of electrochemistry basics and applications of kinetics and catalysis Various photochemical phenomenon						
<b>Course Outline</b>	<p><b>UNIT I - Co-ordination Chemistry and Water Technology</b></p> <p>Co-ordination Chemistry: Definition of terms-IUPAC Nomenclature - Werner's theory - EAN rule - Pauling's theory – Postulates - Applications to <math>[\text{Ni}(\text{CO})_4]</math>, <math>[\text{Ni}(\text{CN})_4]^{2-}</math>, <math>[\text{Co}(\text{CN})_6]^{3-}</math> Chelation - Biological role of Haemoglobin and Chlorophyll (elementary idea) – Applications in qualitative and quantitative analysis.</p> <p>Water Technology: Hardness of water, determination of hardness of water using EDTA method, zeolite method-Purification techniques- BOD, COD.</p> <p><b>Unit II - Carbohydrates and Amino acids</b></p> <p>Carbohydrates: Classification, preparation and properties of glucose, fructose and sucrose. Discussion of open chain ring structures of glucose and fructose. Glucose –fructose inter conversion. Properties of starch and cellulose.</p> <p>Amino acids: Classification - preparation and properties of alanine, preparation of dipeptides using Bergmann method. RNA and DNA (elementary idea only).</p> <p><b>UNIT III - Electrochemistry</b></p> <p>Galvanic cells - Standard hydrogen electrode - calomel electrode - standard electrode potentials -electrochemical series. Strong and weak electrolytes - ionic product of water -pH, pKa, pKb. Conductometric titrations - pH determination by colorimetric method – buffer solutions and its biological applications - electroplating - Nickel and chrome plating – Types of cells -fuel cells-corrosion and its prevention.</p>						

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	<p><b>UNIT IV - Kinetics and Catalysis</b></p> <p>Order and molecularity. Integrated rate expression for I and II (2A → Products) order reactions. Pseudo first order reaction, methods of determining order of a reaction – Half-life period – Catalysis - homogeneous and heterogeneous, catalyst used in Contact and Haber's processes. Concept of energy of activation and Arrhenius equation.</p> <p><b>UNIT V - Photochemistry</b></p> <p>Grothus-Draper's law and Stark-Einstein's law of photochemical equivalence, Quantum yield - Hydrogen-chloride reaction. Phosphorescence, fluorescence, chemiluminescence and photosensitization and photosynthesis (definition with examples).</p>
<p>Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)</p>	<p>Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved          (To be discussed during the Tutorial hours)</p>
<p>Skills acquired from this course</p>	<p>Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.</p>
<p><b>Recommended Text</b></p>	<ol style="list-style-type: none"> <li>1. A. Rajendran, Text book of Allied chemistry Vol-I &amp; II, Dhanam publications, Chennai, First edition, 2018.</li> <li>2. V.Veeraiyan, Textbook of Ancillary Chemistry; High mount publishing house, Chennai, first edition, 2009.</li> <li>3. S.Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur, 2006.</li> <li>4. Arun Bahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand and Company, New Delhi, twenty third edition, 2012.</li> <li>5. P.L.Soni, H.M.Chawla, Text Book of Organic Chemistry; Sultan Chand &amp; sons, New Delhi, twenty ninth edition, 2007.</li> </ol>
<p><b>Reference Books</b></p>	<ol style="list-style-type: none"> <li>1. P.L.Soni, Mohan Katyal, Text book of Inorganic chemistry; Sultan Chand and Company, New Delhi, twentieth edition, 2007.</li> <li>2. R.Puri, L.R.Sharma, M.S.Pathania, Text book Physical Chemistry; Vishal Publishing Co., New Delhi, forty seventh edition, 2018.</li> <li>3. B.K, Sharma, Industrial Chemistry; GOEL publishing house, Meerut,</li> </ol>

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	sixteenth edition, 2014.
<b>Website and e-learning source</b>	
<p><b>Course Learning Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to</b></p> <p>write the IUPAC name for complex, different theories to explain the bonding in coordination compounds and water technology</p> <p><b>CO 2:</b> explain the preparation and property of carbohydrate, amino acids and nucleic acids.</p> <p>apply/demonstrate the electrochemistry principles in corrosion, electroplating and fuel cells.</p> <p>identify the reaction rate, order for chemical reaction and explain the purpose of a catalyst.</p> <p><b>CO 5:</b> outline the various type of photochemical process.</p>	

**CO-PO Mapping (Course Articulation Matrix)**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
<b>CO1</b>	S	S	S	S	S	S	S	M	S	M
<b>CO2</b>	M	S	S	S	M	S	S	M	M	M
<b>CO3</b>	S	S	S	M	S	S	S	M	S	M
<b>CO4</b>	S	S	S	S	S	S	S	M	M	M
<b>CO5</b>	S	M	S	S	S	S	S	M	M	S

**Level of Correlation between PO's and CO's**

CO /PO	PO1	PO2	PO3	PO4	PO5
<b>CO1</b>	3	3	3	3	3
<b>CO2</b>	3	3	3	3	3
<b>CO3</b>	3	3	3	3	3
<b>CO4</b>	3	3	3	3	3
<b>CO5</b>	3	3	3	3	3
<b>Weightage</b>	15	15	15	15	15
<b>Weighted percentage of Course Contribution to POs</b>	3.0	3.0	3.0	3.0	3.0