

DEPARTMENT OF CHEMISTRY				CLASS: II B. Sc. Mathematics & II B. Sc. Physics				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
IV	Part-III Allied	20U4CAC2	Allied Chemistry – II	4	4	25	75	100

Nature of Course			
Knowledge and skill	✓		Employability oriented
Skill oriented			Entrepreneurship oriented

**Course Objectives:** *The objectives of this course are to make the student*

- (i) *To understand the modern concepts of acids and bases*
- (ii) *To study the classification and properties of sachharides*
- (iii) *To recognize about the basic ideas of amino acid and proteins*
- (iv) *To learn the different types of fertilizers used for plant growth*
- (v) *To know about polymers, corrosion and its prevention*

Unit	Description	Hours	K-Level	CLO
I	<b>ACIDS AND BASES</b> Modern concepts of acids and bases – Arrhenius concept, Bronsted-Lowery concept- Lewis concept – relative strength of acids- relative strength bases –concept of pH - buffer solutions – definition - theory of buffer action and applications – Henderson’s Equation - strength of solutions – normality-molarity – molality .	12	K4	CLO1
II	<b>CARBOHYDRATES</b> Monosaccharides: Definition – classification of carbohydrate – monosaccharides – properties and uses of glucose and fructose – configuration of glucose – mutarotation Disaccharides: Sucrose – manufacture – properties and uses – distinction between sucrose, glucose and fructose. Polysaccharides: Starch – Structure, properties and uses.	12	K3	CLO2
III	<b>AMINO ACIDS AND VITAMINS</b> Amino acids – Definition, general methods of preparation, properties and uses of Glycine. Proteins – Definition, classification, general properties – colour reactions (Xanthoproteic test, Ninhydrin test and Millon’s test) and relationship of amino acid with proteins. Vitamins: Definition, classification, sources, function, deficiency of fat soluble vitamins A & D and water soluble vitamins B1 and C (structure and synthesis not expected).	12	K3	CLO3

IV	<p><b>INDUSTRIAL CHEMISTRY</b>  <b>(i) POLYMERS AND CORROSION</b>  Introduction: Definition of monomer and polymers – classification of polymers based on micro structures (chemical). General methods of preparation, properties and uses of the following polymers: Thermoplastics- polyethylene and thermosetting plastic - phenol-formaldehyde resins (Bakelite).  Definition of corrosion – types of corrosion – factors affecting corrosion process- <b>nature of metal</b> (position in galvanic series, purity of the metal, nature of surface film, volatility of corrosion product)- <b>nature of environment</b> (temperature, humidity, impurity, pH) – corrosion control - cathodic protection – sacrificial anodic protection.</p>	12	K3	CLO4
V	<p><b>FERTILIZERS</b>  Plant Nutrient – Macro and micro nutrients - role of various elements in plant growth-classification – natural fertilizer and chemical fertilizer – nitrogenous, phosphatic and potash fertilizers – functions of the following:  Nitrogenous fertilizers: ammonium sulphate, urea.  Phosphatic fertilizers: super phosphate of lime, triple super phosphate of lime.  Potash fertilizers: potassium sulphate, potassium nitrate.</p>	12	K2	CLO5

**Books for study:**

1. Puri, B.R., Sharma, L.R. and Pathania, M.S., 2004 (41<sup>st</sup>Edn.), Principles of Physical Chemistry, S.N. Chand and Co., New Delhi.
2. Bhal, B.S. and Arun Bahl, 2004, Advanced Organic Chemistry, S. Chand and Co. Ltd., New Delhi.
3. N. Krishnamurthy, P. Vallinayagam, D. Madhavan, Engineering Chemistry, 2009, 2<sup>nd</sup> Edition, PHI Learning New Delhi.

**Books for reference:**

1. Morrison, R.T., and Boyd, R.N., 1999, Organic Chemistry, Prentice-Hall of India, Pvt. Ltd., New Delhi.
2. Sharma, B.K., 1989, Polymer Chemistry, Goel Publishing House, Meerut.
3. Mukhopathyay, R and Datta, S, Engineering Chemistry, New Age international PVL, Publishers, New Delhi.
4. Puri, B.R., Sharma, L.R., 1989, Principles of Inorganic Chemistry, S. N. Chand and Co., Jalandar.
5. Sharma, B. K., Industrial chemistry, Goel Publishing House, 1994

**Web resources:**

1. <https://byjus.com/chemistry/acids-and-bases/#:~:text=contains%20lactic%20acid,-,What%20are%20Acids%20and%20Bases%3F,identified%20by%20their%20sour%20taste.>
2. <https://byjus.com/biology/carbohydrates/>
3. <https://byjus.com/biology/amino-acids/>

4. <https://kidshealth.org/en/teens/vitamins-minerals.html> )
5. <https://byjus.com/jee/polymers/>
6. <https://byjus.com/jee/corrosion/>
7. <https://byjus.com/biology/fertilizers/>

#### **Rationale for Nature of the course**

This course should enable the students to understand the modern concepts of acids & bases and their comparative strength, study the classification preparation and properties of saccharides to structural arrangement of atoms, recognize about the basic concepts of amino acid and proteins, learn the different types of fertilizers used for plant growth, and know the applicability of polymers in our day today life, corrosion and its prevention methods.

#### **Activities having direct bearing on Skill development**

The basic study of acids and bases helps the students to understand the strengths and pH of solutions. The ability to predict the nature and compare the strength of acid and bases. To know about the classification of reducing and non-reducing sugars. Through the study and the analysis of amino acid and proteins student able to testing of protein samples and comprehend the properties of amino acids. To familiarise usage, utility and classification of polymers in our day today life. Student able to know the types of corrosion and its inhibitors. To know the plant nutrients and applicability of fertilizers in agriculture.

#### **Pedagogy**

- Chalk-Talk class room activities
- Group Discussion
- Seminar /Assignment/Quiz through ICT- Mode

### Lecture Schedule

Unit	Topics	Hours	Mode
	<b>ACIDS AND BASES</b>		
<b>I</b>	Modern concepts of acids and bases – Arrhenius concept, Bronsted-Lowery concept	2	PPT, Chalk and talk, Quiz and Group discussion
	Lewis concept – Relative strength of acids- Relative strength bases	3	
	Concept of pH – pOH -pH scale	2	
	Buffer solutions – definition - theory of buffer action and applications – Henderson’s Equation	3	
	Strength of solutions – normality- molarity – molality	2	
	<b>CARBOHYDRATES</b>		
<b>II</b>	Monosaccharides : Definition – classification of carbohydrate –	2	PPT, Chalk and talk, Quiz and Group discussion
	Monosaccharides – properties and uses of glucose and fructose – configuration of glucose – Mutarotation	3	
	Disaccharides: Sucrose – manufacture – properties and uses – distinction between sucrose, glucose and fructose	3	
	Polysaccharides: Starch: Structure, properties and uses	4	
	<b>AMINO ACIDS AND VITAMINS</b>		
<b>III</b>	Amino acids – Definition, general methods of preparation, properties and uses – Glycine.	3	PPT, Chalk and talk, Quiz and Group discussion
	Proteins – Definition, Classification, general properties – colour reactions (Xanthoproteic test, Ninhydrin test and Millon’s test) and relationship of amino acid with proteins.	3	
	Vitamins: Definition, classification, sources, function and deficiency of fat soluble vitamins A & D	3	
	Definition, classification, sources, function and deficiency of water soluble vitamins B1 and C	3	
	<b>INDUSTRIAL CHEMISTRY</b>		
<b>IV</b>	Introduction: Definition of monomer and polymers - classification of polymers based on micro structures (Chemical).	2	PPT, Chalk and talk, Quiz and Group discussion
	General methods of preparation, properties and uses of the following polymers: thermoplastic polyethylene and thermosetting phenol-formaldehyde resins (Bakelite).	3	
	Definition – Types of corrosion – Factors affecting corrosion process- nature of metal (position in galvanic series, purity of the metal, nature of surface film, volatility of corrosion product)	3	
	nature of environment (temperature, humidity, impurity, pH)	2	
	Corrosion control - cathodic protection – sacrificial anodic protection	2	
	<b>FERTILIZERS</b>		
<b>V</b>	Plant Nutrient – Macro and micro nutrients - role of various elements in plant growth	3	PPT, Chalk and talk, Quiz, and Assignment
	Classification: natural fertilizer and chemical fertilizer – Nitrogenous, Phosphatic and Potash fertilizers -	2	
	Functions of the following: Nitrogenous fertilizers: ammonium Sulphate, urea.	2	
	Phosphatic fertilizers: super phosphate of lime, triple super phosphate of lime.	2	
	Potashfertilizers: potassium Sulphate, potassium nitrate.	3	
<b>Total Hours</b>		60	

### Courselearning Outcomes

On the successful completion of the course, students will be able to

CLOs	Course learning Outcomes	Knowledge level
CLO-1	To analyse the relative strength acids and bases and buffer action	UptoK4
CLO-2	To indicate structure of carbohydrates and figure out the configuration of glucose	UptoK3
CLO-3	To classify proteins, vitamins and to explain the sources, functions and deficiency of vitamins A, D, & B, C and illustrate the preparation, properties and uses of glycine	UptoK3
CLO-4	To illustrate types of the polymers and to indicate types of the corrosion and its control measures	UptoK3
CLO-5	To understand the role of various elements in plant growth and to classify the fertilizers	UptoK2

### POs and CLOs Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5
CLO1	3	2	1	-	-
CLO2	3	2	1	-	-
CLO3	3	2	1	-	-
CLO4	3	2	1	-	-
CLO5	3	2	1	-	-

### PLOs and CLOs Mapping (Department of Mathematics)

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8
CLO1	1	2	3	2	-	-	-	-
CLO2	1	-	3	-	-	-	-	-
CLO3	1	-	3	-	-	-	-	-
CLO4	1	-	3	-	-	-	-	-
CLO5	1	-	3	-	-	-	-	-

3-Advance application;

2-Intermediate level;

1-Basic level

**PLOs and CLOs Mapping (Department of Physics)**

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7
<b>CLO1</b>	1	1	2	1	-	-	-
<b>CLO2</b>	1	-	-	-	-	-	-
<b>CLO3</b>	1	-	-	-	-	-	-
<b>CLO4</b>	1	-	-	-	-	1	1
<b>CLO5</b>	1	-	-	-	-	1	1

3-Advance application;

2-Intermediate level;

1-Basic level

**Learning Outcome Based Education (LOBE) & Assessment**

**Formative Examinations I & II – Blue Print**

**Articulation Mapping-K Levels with Courses Learning Outcomes (CLOs)**

Sl. No	CLOs	K-Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)	Total
			MCQs		Short Answers				
			No. of Questions	K- Level	No. of Questions	K- Level			
1	CLO <sub>x</sub>	Up to K2/K3	2	K1& K2	2	K2	2 (K3&K3)	1(K4)	
2	CLO <sub>y</sub>	Up to K3/K4	2	K1& K2	1	K1	2 (K2&K2)	2(K2/K3)	
No. of Questions to be asked			4		3		4	3	14
No. of Questions to be answered			4		3		2	2	11
Marks for each question			1		2		5	10	
Total Marks for each section			4		6		10	20	40

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

**Learning Outcome Based Education(LOBE) & Assessment**  
**Summative Examination -Blue Print**  
**Articulation Mapping - K Levels with Course Outcomes (CLOs)**

S. No.	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K- Level	No. of Questions	K- Level		
1	CLO 1	Up to K 4	2	K1 & K2	1	K2	2 (K4&K4)	1(K4)
2	CLO 2	Up to K 3	2	K1 & K2	1	K1	2 (K2&K2)	1(K3)
3	CLO 3	Up to K 3	2	K1 & K2	1	K1	2 (K3&K3)	1(K3)
4	CLO 4	Up to K 3	2	K1 & K2	1	K2	2 (K3&K3)	1(K3)
5	CLO 5	Up to K 2	2	K1 & K2	1	K2	2 (K1&K1)	1(K2)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
<b>Total Marks for each section</b>			<b>10</b>		<b>10</b>		<b>25</b>	<b>30</b>

- K1- Remembering and recalling facts with specific answers  
K2- Basic understanding of facts and stating main ideas with general answers  
K3- Application oriented- Solving Problems  
K4- Examining, analyzing, presentation and make inferences with evidences

**Distribution of Section-wise Marks with K Levels**

K Levels	Section A and B (No Choice)	Section C (Either / or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
<b>K1</b>	9	10	--	<b>19</b>	15.83	<b>42%</b>
<b>K2</b>	11	10	10	<b>31</b>	25.83	
<b>K3</b>	-	20	30	<b>50</b>	41.67	<b>42%</b>
<b>K4</b>	-	10	10	<b>20</b>	16.67	<b>16%</b>
<b>Total marks</b>	20	50	50	<b>120</b>	100.00	<b>100%</b>

**Name of the Course Designer**

- Dr. M. Boominathan