**ANNEXURE – I**

**STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU**

**DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS**

**N - SCHEME**

(Implements from the Academic year 2019-2020 onwards)

Course Name : All branches of Diploma in Engineering and Technology and Special

Programmes except DMOP, HMCT and film & TV.

Subject Code : 40024

Semester : II Semester

Subject Title : **ENGINEERING CHEMISTRY – II**

**TEACHING AND SCHEME OF EXAMINATION**

Number of weeks per semester: 15 weeks

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| --- | --- | --- | --- | --- | --- | --- |
| Subject | Instructions | | Examination | | | |
| ENGINEERING CHEMISTRY-II | Hours / Week | Hours / Semester | Marks | | | Duration |
| 4 Hrs. | 60 Hrs. | Internal Assessment | Board Examination | Total |
| 25 | 100 \* | 100 | 3 Hrs. |

\* Examination will be conducted for 100 Marks and it will be reduced to 75 Marks.

**Topics and Allocation of Hours:**

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| --- | --- | --- |
| **UNIT** | **Topic** | **Time** |
| 1 | Environmental Chemistry Air Pollution, Water Pollution, Solid Waste Management. | 10 Hrs. |
| 2 | Fuels, Combustion, Rocket Propellants | 10 Hrs. |
| 3 | Polymer, Abrasives, Composite Materials | 10 Hrs. |
| 4 | Electro Chemistry, Energy Sources, Chemical Separation Techniques | 10 Hrs. |
| 5 | Corrosion Methods of Prevention of Corrosion, Organic Coatings | 10 Hrs. |
|  | REVISION, ASSESMENT TEST AND MODEL EXAM | 10 Hrs. |
|  | **Total** | **60 Hrs.** |

**RATIONALE**

Modern development of industries requires more understanding of materials required for Engineering and industrial purposes. This part of chemistry explains various aspects with regard to environment, fuels and polymers. This subject will develop basic understanding about electro chemistry, energy resources, chemical separation techniques, corrosion and prevention.

**OBJECTIVES**

1. The objective of this Course is to make the student:
2. To acquire knowledge about Environmental Chemistry.
3. To acquire knowledge about fuels, combustion of fuels and rocket propellants.
4. To know about engineering materials like plastics rubber and composites.
5. To acquire knowledge about electro chemistry, electro chemical cell and separation techniques in chemistry.
6. To know about corrosion and prevention.

**40024 ENGINEERING CHEMISTRY – II**

**DETAILED SYLLABUS**

**Contents: Theory**

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| --- | --- | --- |
| **Unit** | **Name of the Topic** | **Hours** |
| I | **ENVIRONMENTAL CHEMISTRY**  **1.1 Air Pollution**  Pollution and Air pollution – Definition – Air pollutants (SO2, H2S, HF, CO and Dust) – Sources and Harmful effects – smog – Formation of Acid Rain – Harmful effects – Green House Effect – Causes – Global warming – Harmful effects – Ozone Layer – Importance – Causes for Depletion of Ozone Layer (No equations) – Harmful effects of Ozone Layer Depletion – Control of Air Pollution.  **1.2 Water Pollution**  Causes of Water Pollution – Sewage, Effluents, Algae and Microorganisms – Harmful effects – Definition – Sewage – Sewerage – Disposal – Industrial Effluents – Harmful effects of Effluents Treatment of Effluents – Eutrophication – definition – harmful effects.  **1.3 Solid Waste Management**  Solid Waste – Definition – Problems – Types of Solid Waste – Methods of disposal – Land fill and Incineration – Recycling –Definition – Examples – Advantages of Recycling (Basic ideas**)** Green ChemistryDefinition – Goals of Green Chemistry (Basic ideas) | 4 Hrs.  3 Hrs.  3 Hrs. |
| II | **2.1 Fuels**  Fuel – Definition – Calorific value – calorie – Liquid fuels – liquid hydrogen – power alcohol – uses – Refining of Petroleum – Fractional distillation – Cracking (Concept only) – Gaseous fuels – Preparation, composition and specific uses of Producer gas and Water gas – Composition and uses of CNG and LPG – advantages of gaseous fuels.  **2.2 Combustion**  Definition – Combustion calculation by mass (for solid and liquid fuels) – Stoichiometric calculations – Volume of air required – Definition of Flue gas – Flue gas Analysis – Orsat Apparatus – Simple numerical problems.  **2.3 Rocket Propellants**  Definition – characteristics – Classification of propellants – brief idea of solid and liquid propellants. | 4 Hrs.  4 Hrs.  2 Hrs. |
| III | **3.1 Polymer**  Definition – Natural polymer – Rubber – Defects of natural rubber – Compounding of rubber – Ingredients and their functions – Vulcanization – Plastics – types – Thermoplastics and Thermo set plastics – Differences – Mechanical properties of plastics – Polymers in Surgery – Biomaterials – Definition – Biomedical uses of Polyurethane, PVC, Polypropylene and Polyethylene.  **3.2** **Abrasives**  Definition – classification – hardness in Moh's scale – Natural abrasives – Diamond, Corundum, Emery, and Garnet. – Synthetic abrasives – Carborundum – Boron carbide manufacture – properties and uses.  **3.3** **Composite Materials**  Definition – examples – Classification of composites – Advantages over metals and polymers – General application. | 5 Hrs.  3 Hrs.  2 Hrs. |
| IV | **4.1 Electro Chemistry**  Electrolysis – Definition – Mechanism – Industrial applications of Electrolysis – Electroplating – Process – Chrome plating – Electrochemical cell – Definition Galvanic cell – Formation of Daniel cell – Electrochemical series – Definition – significance*–*  **4.2** **Energy Sources**  Primary Battery – Secondary Battery – Definition and example – cell – Construction, Working principle and Uses of Lead – acid Storage battery – Non – conventional Energy Sources – Solar Cell – fuel cell –Definition – working principle.  **4.3 Chemical Separation Techniques**  (simple description only) – Filtration – crystallization – simple distillation – fractional distillation – Chromatography – definition and principle – Column chromatography only. | 4 Hrs.  3 Hrs.  3 Hrs. |
| V | **5.1 Corrosion**  Definition – types of corrosion – theories of corrosion – galvanic cell formation theory – differential aeration theory – factors influencing rate of corrosion.  **5.2 Methods of Prevention of Corrosion**  Galvanization – tinning – anodisation – cathodic protection – sacrificial anode method and impressed voltage method.  **5.3 Organic Coatings**  Paint – definition – Components of paints – Varnish – definition –Preparation of oil varnish – differences between paint and varnish – Special Paints – Luminescent paint, fire retardant paint, Aluminum paint and distemper. | 4 Hrs.  3 Hrs.  3 Hrs. |

**Text Book:**

1. Engineering Chemistry – I Tamil Nadu Text Book Corporation

2. Engineering Chemistry – Jain & Jain – Dhanpat Rai & Sons.

3. A Text Book of Engineering Chemistry – S.S. Dara – S. Chand Publication.

**Reference Book:**

1. Chemistry of Engineering Material – C.V. Agarwal, Andranaidu C. Parameswara Moorthy – B.S. Publications.

2. Engineering Chemistry – Uppal – Khanna Publishers.

3. A Text Book of Inorganic Chemistry – P.L. Soni – S. Chand Publication

4. Environmental Chemistry – V P Kudesia – Pragati Publishers.

5. A Text Book of Environmental Chemistry and Pollution Control S.S. Dara – S. Chand Publication.

**ENGINEERING CHEMISTRY – II**

**Learning Structure**

**Application:**

Apply the knowledge to control environmental pollution and selecting fuels free from pollution and to use the materials like rubber, polymer, abrasives and composite materials. Apply the knowledge the electro chemistry to prevent corrosion leading to green environment.

**Procedure:**

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| Defining various kinds of pollution and disposing them. | Defining fuels combustion and rocket propellants. | Defining natural and manmade polymer and gain knowledge about abrasives and composite materials. | Defining electro chemical principles energy resources and chemical separation technique. | Defining corrosion and preventing them both physical and electro chemical coatings. |

**Concept:**

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| --- | --- | --- | --- | --- |
| Understanding the concept of pollution and green chemistry. | Understanding about fuels, combustion and stoichiometric equation for combustion. | Understanding about natural and manmade polymer and gain knowledge about abrasive composite materials | Understanding electro chemistry and energy resources. Gain knowledge about chemical separation techniques. | Understanding about corrosion and preventing methods. |

**Facts:**

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| --- | --- | --- | --- | --- |
| Environmental Chemistry  Air Pollution  Water Pollution  Solid Waste Management | Fuels  Combustion  Rocket Propellants | Polymer  Abrasives  Composite Materials | Electro Chemistry  Energy Sources  Chemical Separation Techniques | Corrosion  Methods of Prevention of Corrosion  Organic Coatings |

**BOARD EXAMINATION - QUESTION PATTERN**

**Engineering Chemistry II**

**Time : 3 Hours Max. Marks 100**

**PART A** - 8 Questions to be answered out of 12 questions

**PART B** -8 Questions to be answered out of 12 questions

**PART C** -All the 5 Questions to be answered

Each Question In Part C Contain 3 Sub Questions Out Of Them 2 Sub Questions To Be Answered For 6 Marks Each

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| --- | --- | --- |
| **Part A** | **8 x 2** | **16 Marks** |
| **Part B**  Short Answer Type | **8 x 3** | **24 Marks** |
| **Part C**  Descriptive answer type questions  Each question in Part C contains 3 sub questions out of them 2 Sub Questions to be answered For 6 Marks Each. | **5 x 2 x 6** | **60 Marks** |
| **Total** |  | **100 Marks** |

Out of the 3 Sub questions in **PART C**, one sub question must be on problem based to test the analytical ability/logical ability /diagnostic ability/conceptual ability relevant to that subject content. Equal importance is to be given to whole syllabus.

**Clarks table will not be permitted for the Board Examinations.**

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| --- | --- | --- | --- | --- |
| **Sl.No** | **Addition in**  **N-Scheme** | **Deletion in**  **N-Scheme** | **Remarks for** | |
| **Addition in**  **N-Scheme** | **Deletion in**  **N-Scheme** |
| **UNIT II** | Rocket propellants |  | Already existed in previous scheme |  |
| **UNIT IV** | Chemical SEPARATION TECHNIQUES-FILTERATION-CRYSTALLISATION-DISTILLATION-CHROMOTOGRAPHY | ADHESIVE | Engineering chemistry-few application in many manufacturing industry | FOR WANT OF TIME AND NEW INTRODUCTION |
|  | FUEL CELL | STRONG ELECTROLYTE, WEAK ELECTROLYTE, PREPARATION OF SURFACE-FACTORS AFFECTING COATING-ELECTROLESS PLATING-ADVANTAGES-APPLICATION-CONCENTRATION CELL-DRY CELL | EMERGING TECHNOLOGY already existed in previous scheme | FOR WANT OF TIME AND NEW INTRODUCTION |