GOVERNMENT OF TAMILNADU

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN ENGINEERING
I YEAR

SEMESTER SYSTEM

L - SCHEME

2011 - 2012

II SEMESTER

ENGINEERING CHEMISTRY - II

CURRICULUM DEVELOPMENT CENTER

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING - SYLLABUS
L-SCHEME
(Implements from the Academic Year 2011-2012 on wards)

Course Name : All Branches of Diploma in Engineering and Technology and Special Programmes except DMOP, HMCT and Film & TV

Subject Code : **22005**

Semester : II Semester

Subject Title : **ENGINEERING CHEMISTRY - II**

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per Semester: 16 Weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours/ Week	Hours/ Semester	Internal assessment	Board Examination	Total	
ENGINEERING CHEMISTRY-II	4 Hours	64 Hours	25	75	100	3 Hours

Topics and Allocation of Hours:

Unit No	Topics	Time Hours
Unit-I	Environmental Chemistry	11 Hours
Unit-II	Fuels, Rocket propellants and combustion	12 Hours
Unit-III	Extraction of metals, Powder Metallurgy, Alloys and Abrasives	11 Hours
Unit-IV	Composite materials, Ceramics, Refractories and Lubricants	11 Hours
Unit-V	Polymer and Rubber	11 Hours
Revision and Examination		8 Hours
Total		64 Hours

Rationale:

Modern development of industries require more understanding of materials required for Engineering and industrial purposes. This part of chemistry explains various aspects with regard to environment, fuels, metals and alloys, and polymers. This subject will develop basic understanding and skill of Engineering Students.

Objectives:

The objective of this Course is to make the student:

1. To acquire knowledge about Environmental chemistry.
2. To acquire knowledge about fuels, advantages and combustion of fuels and analysis.
3. To know about metal extraction, powder metallurgy, alloys, and Abrasives.
4. To acquire knowledge about composite Materials, Ceramics, Refractories and Lubricants.
5. To know about polymers and Rubber.

Learning Structure

Application	Apply the knowledge in controlling environmental pollution and selecting fuels, propellants, metals and alloys used in Engineering and polymeric materials used in domestic, industrial and medical fields. To select material where requirements are very stringent and specific.				
Procedure	Explaining Pollution, pollutants and Managing pollution.	Defining fuels types, Propellants, combustion and calculation of volume of air required for combustion.	Explaining the extraction of titanium and Tungsten, composition and uses of alloys, applications of powder metallurgy and essentiality of Abrasives.	Explaining applications of composite materials and manufacture of Ceramic materials. Essentiality of Refractories and Lubricants.	Defining polymerization and study of plastics and Rubber
Concepts	Understanding Environmental Pollution and methods to control.	Knowledge of various types of fuels calorific value and propellants and combustion of fuels.	Understanding Extraction of metals, powder metallurgy, properties of alloys and uses of abrasives.	Understanding Characteristics of Composite materials. Manufacture of ceramic materials. Refractories and Lubricants.	Understanding of organic reactions like polymerization and producing polymers like plastics and Rubber.
Facts	Study of Pollutants and their Problems.	Fuels Different Types, Quality of propellants and Combustion qualities.	Study of extraction of metals, Powder metallurgy, Alloys and Abrasives.	Knowledge of composite materials. Ceramics, Refractories & lubricants as important Engineering Materials and their uses.	Plastics types and uses, Rubber types and uses.

DETAILED SYLLABUS

CONTENT

Unit No.	Name of the Topic	Hours	Marks
I	**ENVIRONMENTAL CHEMISTRY:** **1.1. Air Pollution - 4 Hours** Definition- Pollutants (SO_2, H_2S, HF, CO, Dust) -harmful effects -Acid rain – formation - Harmful effects-Green House effect- causes- Global Warming - Harmful effects - Ozone layer- importance - causes for depletion of Ozone layer (No equations)- effects of Ozone layer depletion -Control of air Pollution. **1.2. Water Pollution - 4 Hours** Causes – (Sewage, effluents, algae microorganisms)- Harmful effects, sewerage - Industrial effluents- harmful effects of heavy metal ions (metals like Lead, Cadmium, Zinc and Copper) – treatment – Eutrophication - Definition and effects – Carcinogenic wastes, pesticides, Insecticides - Health problems. **1.3. Solid Waste management - 2 Hours** solid wastes-definition-problems-types of wastes- methods of disposal (land fill-incineration) - recycling –advantages of recycling (Basic ideas). **1.4. Green Chemistry - 1 Hour** Definition- Goals of green Chemistry (Basic ideas).	**11**	15
II	**FUELS, ROCKET PROPELLANTS AND COMBUSTION:** **2.1. Fuels: – 6 Hours** Definition-Calorific value- classification, solid fuels-wood-coal - varieties of coal-composition-specific uses-liquid fuels-petroleum-fractional distillation -Fractions and uses, Cracking (concept only). Liquid Hydrogen as fuel- gaseous fuels-preparation and specific uses of producer gas, water gas, biogas-LPG- composition and uses. Advantages of gaseous fuels. **2.2. Rocket propellants: – 2 Hours** Definition- Essential characteristics- classifications of propellants-brief account of solid & liquid propellants with example. **2.3. Combustion: – 4 Hours** Combustion of fuels- Definition- combustion calculation by mass (for solid and liquid fuels)- combustion calculation of gaseous fuels- stoichiometric calculations-Volume of air required-excess air- Flue gas- Flue gas analysis- Orsat Apparatus-simple numerical problems.	**12**	**15**

Unit No.	Name of the Topic	Hours	Marks
III	**EXTRACTION OF METALS, POWDER METALLURGY, ALLOYS AND ABRASIVES** **3.1. Extraction of metals - 2 Hours** Extraction of Tungsten and Titanium-uses. **3.2. Powder Metallurgy - 2 Hours** Definition – Metal Powder- Preparation of Metal Powder- Atomisation- Reduction of Metal Oxide- Applications of Powder Metallurgy. **3.3 Alloys – 4 Hours** Definition- purpose of Alloying**- Non- Ferrous alloys -** Definition- Composition and uses of – Nickel alloys- Nichrome, Locanel - Copper alloys- Brass - Dutch metal, Cartridge brass, German silver- Bronze- coinage bronze, Gun metal. Aluminium alloys- Duralumin, Magnalumin**.** **3.4. Abrasives -3 Hours** Definition -classification-hardness in moh's scale - Natural abrasives-Diamond, Corundum, Emery, and Garnet. - Synthetic abrasives-Carborundum – Boron carbide manufacture-Properties and uses.	**11**	**15**
IV	**COMPOSITE MATERIALS, CERAMICS, REFRACTORIES AND LUBRICANTS** **4.1. Composite Materials – 3 Hours** Definition-advantages over metals and polymers-general applications – types - fibre reinforced composites- particulate composites-layered composites.(basic ideas and specific applications) **4.2. Ceramics – 3 Hours** White pottery- Definition-manufacture of White pottery-uses-glazing -definition -purpose-method-salt glazing. **4.3. Refractory – 3 Hours** Definition-requirements-classification with examples and uses of fireclay bricks, Alumina bricks and silica bricks. **4.4. Lubricants -2 Hours** Definition- Characteristics of Lubricants- Types of Lubricants: Solid, Semisolid and liquid Lubricants.	**11**	**15**

Unit No.	Name of the Topic	Hours	Marks
V	**POLYMERS AND RUBBER :** **5.1 Polymers:** **Plastics - 6 Hours** Polymerization-types of polymerization-Addition polymerization-formation of polythene-condensation polymerization-formation of phenol formaldehyde-types of plastics-thermoplastics & thermo set plastics-Differences-Mechanical properties-Advantages over traditional materials, (wood &metal)-specific uses of Bakelite, PVC, Nylon & urea formaldehyde resin-reinforced or filled plastics-definitions- advantages-applications-polymers in surgery-biomaterial-definition-Biomedical uses of polyurethane, PVC, polypropylene, polyethylene. **5.2 Rubber -5 Hours** Natural rubber-preparation from latex –defects of natural rubber compounding-ingredients & their functions-vulcanization-purpose-synthetic rubber-Buna-S. Thiokol, Neoprene (Preparation & specific uses only-no equation) reclaimed rubber-definition-process-properties-uses.	**11**	**15**

Text Books:

1. Engineering Chemistry-Jain& Jain Dhanpat Rai&Sons - 2005
2. A Textbook of Engineering Chemistry S.S.Dara. S.Chand& Company Ltd. - 1996

Reference Books :

1. Engineering Chemistry-Uppal Khanna publishers. - 1986
2. Chemistry of Engineering Materials C.V. Agarwal, C. Parameswara Moorthy, Andra naidu B.S. Publications. - 2006
3. A Textbook of Inorganic Chemistry –P.L. Soni, S.Chand & Company Limited. - 1997
4. Rain Water Harvesting –handbook Chennai metro water.

ENGINEERING CHEMISTRY - II

MODEL QUESTION PAPER -1

Time: 3 Hrs **Total marks: 75**

PART-A

I. Answer any Fifteen Questions: 15x1=15 marks

All Questions carry equal marks

1. Define Pollution.
2. What is Sewage?
3. Give two examples of greenhouse gases.
4. Give two Harmful effects of Lead pollution.
5. Give two uses of silica bricks.
6. What are the components present in LPG gas?
7. What is flue gas?
8. What are Propellants?
9. What is producer gas?
10. Mention the ore of Tungsten.
11. Mention the methods of metallic powder.
12. What are alloys?
13. What are abrasives?
14. What is called Bisque?
15. What are refractories?
16. What are the types of composite materials?
17. Give two examples of solid lubricants.
18. What are the types of polymers?
19. Mention any two uses of PVC.
20. What is Vulcanization?

PART- B

II. Answer any TWO Sub-divisions in each of the following Questions: 5x12=60

All Questions carry equal marks

1. a) What is global warming? List its harmful effects.
   b) Define Green Chemistry. Give the goals of green Chemistry.
   c) Explain how solid wastes are recycled for use.

2. a) Explain fractional distillation of petroleum?
   b) How is water gas manufactured?
   c) A fuel contains 40% H_2 45% CO 11% CH_4 and 4% O_2 by volume Determine the volume of air required to burn $1m^3$ of the fuel?
3. a) Describe the extraction of Titanium from its ore?
   b) List the advantages of alloying a metal.
   c) Write a note on Natural Abrasives.

4. a) What are the advantages of composite materials over traditional materials?
   b) Describe the manufacture of white pottery?
   c) What are the characteristics of good refractories.

5. a) Distinguish between Addition and condensation polymerization?
   b) What are the Mechanical properties of plastics?
   c) Write notes on synthetic Rubber.

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ENGINEERING CHEMISTRY - II

MODEL QUESTION PAPER -2

Time: 3 hours **Maximum Marks: 75**

Part – A

I. Answer any 15 questions **(15 x 1 =15)**

All questions carry equal marks

1. Define air pollution.
2. Mention the name of a pollutant responsible for depleting ozone layer.
3. What is called effluent?
4. Give any two goals of green chemistry.
5. Define Calorific value of a fuel.
6. What is meant by cracking?
7. Give two examples of liquid propellants.
8. Give the composition of water gas.
9. Mention the ores of Titanium.
10. Give the composition of German silver.
11. Define powder metallurgy.
12. Give two examples for synthetic abrasives.
13. Mention two uses of alumina bricks.
14. Give two examples for fibre reinforced composites.
15. Define white pottery.
16. Give two examples for Liquid Lubricants.
17. Define Addition polymerization.
18. What are reinforced plastics?
19. Mention the uses of Thiokol rubber.
20. What is reclaimed rubber?

Part – B

II. Answer any two subdivisions in each of the following questions:(5 x 12=60)
All Questions carry Equal marks

1. a) What are the main air pollutants? Mention their harmful effects.
   b) Define Eutrophication. What are its harmful effects?
   c) Write the advantages of recycling of solid wastes.
2. a) Write a note on solid fuels.
   b) Give a brief account on Solid Propellants.
   c) A producer gas has the following composition by volume:
   CH_4=3.5%; CO = 25%; H_2= 10%; CO_2=10.8%; N_2 = 50.7%.
   Calculate the theoretical quantity of air required for combustion per m^3 of the gas.

3. a) Describe the extraction of Tungsten from its ore. Mention any of its two uses.
   b) What are Alloys? How are they classified? Give Examples.
   c) Explain how Carborundum and Boron Carbide are manufactured. Mention their uses.

4. a) Write a note on particulate composites and layered composites.
   b) Define and explain glazing.
   c) Explain classification of lubricants with examples.

5. a) What are the advantages of plastics over traditional materials?
   b) What are the ingredients added during compounding of rubber? Give their functions.
   c) Write a note on Reclaimed rubber.

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