SEMESTER 1st
MAJOR / MINOR COURSE

ICM122M INDUSTRIAL CHEMISTRY

CREDITS: THEORY: 04; PRACTICAL: 02

COURSE OBJECTIVES:

- *To describe the chemical industry and identify the distinguishing features of its components.*
- *To describe the industrial production of a number of important organic and inorganic compounds / chemicals.*
- *To use modern instrumentation techniques for chemical analysis and separation.*
- *To identify various concepts of industrial metallurgy which will help them to explore new innovative areas of research.*

LEARNING OUTCOMES:

On completion of the course, the student should be able to:

- *Understand the basics and role of chemical industries for real understanding of whole process.*
- *Understand various aspects of industrial gases and chemicals.*
- *Learn various operations in chemical industry.*
- *Understand basic metallurgical operations in chemical industries.*

THEORY (04 CREDITS)

UNIT 1: INTRODUCTION TO INDUSTRIAL CHEMISTRY

Introduction to Industrial Chemistry, Classification of the Chemical Industry, raw materials for the chemical industry. Unit operations and unit processes that make up chemical processes. Nomenclature: Generic names, Trade names. Flow diagrams.

UNIT II: INDUSTRIAL GASES AND INORGANIC CHEMICALS

Industrial gases: large scale production, uses, storage and hazards in handling of the following gases: oxygen, nitrogen, hydrogen, acetylene and carbon monoxide and phosgene.

Inorganic Chemicals: Manufacture, application, analysis and hazards in handling the following chemicals: sulphuric acid, hydrochloric acid, nitric acid, common salt, hydrogen peroxide, borax, caustic soda, bleaching powder, potash alum, chrome alum, potassium dichromate and potassium permanganate.

UNIT III: OPERATIONS IN CHEMICAL INDUSTRY

Distillation: Introduction, basic distillation apparatus, batch and continuous distillation, separation of azeotropes-plate column, packed column.

Evaporation: Introduction, equipment-short tubes (standard) evaporators, forced circulation evaporators, falling film evaporators, wiped (agitated) film evaporators.

Filteration: Introduction, filter media and filter aids, equipments-plate and frame press, rotary drum filter, bag filter and centrifuge.

Crystallization: Introduction, methods, equipments and process of crystallization.

UNIT IV: INDUSTRIAL METALLURGY

Basic metallurgical operations: Pulverization, calcinations, roasting, refining. Extraction of iron, copper, lead, silver, sodium, aluminium, magnesium, zinc and chromium and their physico-chemical properties.

BOOKS RECOMMENDED:

1. Industrial Chemistry; E. stocchi, Volume 1; Ellis Horwood Ltd. UK.
2. Elementary principles of Chemical processes; R. W. Rousseau, R. M. Felder; Wiley Publishers, New Delhi.
3. Handbook of Industrial Chemistry;J. A. kent, CBS Publishers, New Delhi.
4. A Textbook of Engineering Chemistry; S.S. Dara; S. Chand & Company Ltd. New Delhi.
5. Industrial Crystallization; N. S. Tavare (1995). Plenum Press, New York.

PRACTICAL (02 CREDITS)

COURSE OBJECTIVES:

- *To get acquainted with safety measures in laboratory hazards of chemicals.*
- *Undertake hands on lab work and practical activities and develop problem solving abilities required for successful career in pharmaceuticals, chemical industries, teaching research etc.*

LEARNING OUTCOMES:

On completion of the course, the student should be able to:

- *Use chemical techniques relevant to academia and industry.*
- *Become efficient in using standard operating procedures and will be well versed with the regulations for safe handling and use of chemicals.*

EXPERIMENTS:

1. Acquaintance with safety measures in laboratory hazards of chemicals.
2. Preparation of Standard solution: Primary and Secondary solutions. Determination of H_2SO_4 and H_3PO_4 in a mixture.
3. Simple laboratory techniques: Crystallization, Filtration, Distillation and Fractional distillation.
4. Determination of melting point of organic compounds (any three).
5. Determination of boiling point of organic solvents (any three).
6. Purification of organic compounds by crystallization process (any two).
7. Crystallization of simple organic compounds (any two).
8. Separation of azeotropes by distillation method.

BOOKS RECOMMENDED:

1. Vogel's Qualitative Inorganic Analysis; S. Vehla: 7th edn.; Orient Longman; 2004.
2. Advanced Practicla Inorganic Chemistry; Gurdeep Raj: 24th edn.; Goel Publishing House; 2012.

Analytical Chemistry; Gary D-Christian: 6th edn.; Wiley; 2010.