Course Title: Elective: Analysis of Cement, Minerals, Alloys, Trace Metals and Polymers *w.e.f. the session 2023-24 and onwards*	
Class: M.Sc. Pt.-II / Semester-III	Course code: MCH-E304
Lectures: 60	Credits : 04
MM: 70	Exam Hours: 03

NOTE: The question paper shall consist of Two sections (Sec.-A and Sec.-B). Sec.-A shall contain 10 short answer (about 150 words) type questions of SIX marks each and student shall be required to attempt any five questions. Sec.-B shall contain 08 descriptive type questions of TEN marks each and student shall be required to attempt any four questions. Both sections shall have questionsfrom the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

COURSE CONTENTS:

Unit - I

Analysis of Limestone, Dolomite and Talcum powder: Loss on ignition, Impure silica or insoluble matter, combined oxides (AI_2O_3 + Fe_2O_3), Calcium oxide, Magnesium oxide, Carbondioxide, Volumetric procedure for the determination of calcium and Magnesium (EDTA Titration).Analysis of talcum powder: Determination of Ca and carbon dioxide in $CaCO_3$, Determination of Mg in Magnesium sulphate, Determination of phosphate in sodium phosphate.

Unit - II

Cement: Introduction, Portland cement, Manufacture (Outline), sampling, standard methods of chemical analysis of Portland cement, setting and hardening, Gypsum, Plasters and their setting, Weathering of cement and concrete, Chemical admixtures of concrete, other types of cement.

Unit - III

Analysis of steels and alloys: Determination of carbon by volumetric method, Determination of silicon by gravimetric method, Determinationof Mn by the Bismuthate method, Determinationof P, V, and Cr in alloyed steels, Determinationof Iron in iron ore.Analysis of brass, Nickel coin, slag and fluxes.Determination of Zn by ferrocyanide method.

Unit - IV

Colorimetry and spectrophotometry in trace metal analysis :

General aspects of Inorganic colorimetric trace analysis, Methods for the separation and isolation of traces of elements, General colorimetric reagents, Procedure for the determination of traces of metals viz; As, Cu, Cr, Pb and Ni.

Unit – V

Synthesis and Analysis of polymers: Purification of monomer, polymerization technique, synthesis of polymer of acrylonitrile, styrene, methyl methacrylate, ethylene glycol with maleic acid, Terephthaloyl chloride with ethylene diamine.

Isolation and purification of polymers. Determination of glass transition temperature and Molecular weight.Determination of viscosity, pH, electrolytic stability, Hardness, tensile strength, percentage elongation of polymers.

Suggested Readings:
1. Analytical Chemistry in Metallurgy (Mir publishers) by: V. I. Posypanko and
   N. A. Vasina
2. Industrial Chemistry by: B. K. Sharma
3. Quantitative Inorganic Analysis by: Vogel
4. Chemistry in Engineering & Technology by: R. Ram & Kuriacose
5. Colorimetric determination of traces of metals by: E. B. Sandell

COURSE OBJECTIVES:

1. Analysis of Limestone, Dolomite and Talcum powder
2. Cement and its analysis
3. Analysis of Steels and Alloys
4. Trace metal analysis by colorimetric and spectrophotometry
5. Synthesis of polymers

COURSE OUTCOMES:

On completion of this course, student shall be able to:
CO 1: To impart knowledge of qualitative and quantitative analysis of limestone, dolomite and talcum powder.
CO 2: To discuss about Portland cement, cement, gypsum, admixtures, standard methods of chemical analysis of cement etc.
CO 3: To develop the ability to analyze the steel sample for its component elements.
CO 4: To describe the general aspects of Inorganic colorimetric trace analysis with some specific examples, Methods for the separation and isolation of traces of elements, General colorimetric reagents,
CO 5: To explain synthesis, analysis, polymerization, isolation and separation and physico-chemical properties of polymers.

Mapping of Course outcomes (Cos) with Programme outcomes (POs)

Course outcomes/ Programme outcomes	1	2	3	4	5	6	7	8
CO 1	X		X					X
CO 2	X		X					X
CO 3			X		X			X
CO 4	X				X			X
CO 5	X					X		X