



NATIONAL UNIVERSITY OF ENGINEERING COLLEGE OF GEOLOGICAL, MINING AND METALLURGICAL ENGINEERING

METALLURGICAL ENGINEERING PROGRAM

ME312 INSTRUMENTAL CHEMICAL ANALYSIS

I. GENERAL INFORMATION

CODE	:	ME312 Instrumental Chemical Analysis
SEMESTER	:	5
CREDITS	:	3
HOURS PER WEEK	:	5 (Theory, Practice, Laboratory)
PREREQUISITES	:	ME212 Chemical Analysis
CONDITION	:	Compulsory
DEPARTMENT	:	Metallurgical Engineering

II. LEARNING UNITS

1. GENERAL ASPECTS OF A CHEMICAL ANALYSIS LABORATORY

Organization of the laboratory. Distribution of working areas. Indispensable working conditions. Balances and scales, precision and calibration. Preparation of chemical samples. Description and proper use of glass materials. Preparation of chemical products. Safety measures in reactants storage. Statistical analysis of test results.

2. RESULTS RELIABILITY

Calibration of methods and equipment. General concepts of measurement. Measurement error. Error detection. Repeatability. Precision and accuracy. Types of errors and their sources. Errors with Gaussian distribution. Reliability limits. Systematic errors and their detection. Error propagation. Presentation of results.

3. PRECISION AND ACCURACY IN ANALYTICAL CHEMISTRY

Statistical processing of analytical data. Volumetric methods. Reaction with formation of complex ions. Complexometric methods. Titration with acid etilendiaminotetracetic EDTA. Preparation and analysis of EDTA solutions. Applications. Lead analysis and determination in mineral samples. REDOX reactions.

4. VOLUMETRIC METHODS AND REDOX VOLUMETRY

Indicators for oxidants and reducers. Permanganometry. Preparation and analysis of potassium permanganate solutions KMnO_4 . Applications. Iron analysis and determination in mineral samples. Iodometry. Preparation and analysis of a solution of sodium tiosulfate. Copper analysis and determination in mineral samples. Determination of arsenic and tin in mineral samples.

5. GRAVIMETRIC METHODS

Classification of Gravimetric Methods. Calculations in gravimetric methods. Definite Proportions Law for gravimetric analysis. Calculation of gravimetric factor. Determination of atomic weight.

Indirect gravimetric methods. Dry testing analysis. Determination of gold and silver in a mineral sample.

6. INSTRUMENTAL METHODS

Comparison between classic and modern analytic method. Sampling and sensitivity. Classification of instrumental techniques. Sensitivity and accuracy. Detection and resolution limit. Optical spectroscopy. Colorimetry..Determination of copper quantity in aqueous solutions. Atomic spectroscopy. Molecular spectroscopy. X ray spectroscopy.

III. LABORATORY

Laboratory 1. Determination of lead content in a sample mineral. EDTA method

Laboratory 2. Determination of iron content in a sample mineral. Permanganometric method.

Laboratory 3. Determination of copper content in a sample mineral. Iodometric method.

Laboratory 4. Determination of CaO in a sample mineral. Gravimetry.

Laboratory 5. Determination of gold and silver in sample minerals. Gravimetry.

Laboratory 6. Determination of copper content in a sample mineral. Spectrophotometric method.

Laboratory 7. Atomic absorption spectrophotometry.

Laboratory 8. Potentiometry