

COURSE ID SHEET



Course No. **5069**

NTUA

Semester: **3** Core **X** Elective Specialization

Title: **INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS**

Aim: Ability to demonstrate knowledge and understanding of concepts and principles of Instrumental Methods of Analysis and to choose the appropriate methods to solve qualitative and quantitative problems of an unfamiliar nature.

Content:

- Introduction to Instrumental Methods of Analysis.
- Performance characteristics of Instrumental Methods of Analysis (precision, accuracy, sensitivity, selectivity, dynamic range, limit of detection, limit of quantification).
- Calibration of Analytical Methods: Method of external standard, standard addition, internal standard and calibration plot. Combination of calibration methods. Method validation.
- Atomic Absorption Spectrometry (AAS): Principles, Instrumentation, Qualitative and Quantitative measurements. Applications.
- Inductively Coupled Plasma - Optical Emission Spectrometry (ICP-OES), Inductively Coupled Plasma - Mass Spectrometry (ICP-MS): Principles, Instrumentation, Qualitative and Quantitative measurements. Applications.
- X-Ray Methods: Fluorescence (XRF), Diffraction (XRD): Principles, Instrumentation, Qualitative and Quantitative measurements. Applications.
- Ultraviolet- Visible Spectrometry (UV-Vis): Principles, Instrumentation, Qualitative and Quantitative measurements. Field analysis. Applications.
- Molecular fluorescence. Principles, Instrumentation, Qualitative and quantitative analysis. Applications.
- Infra-Red Spectrometry (IR), Fourier Transform Infra-Red Spectrometry (FT-IR): Principles, Instrumentation, Qualitative and Quantitative measurements. Applications.
- Molecular Mass Spectrometry (MS): Principles, Instrumentation, Qualitative and Quantitative measurements. Applications.
- Thermo-analytical Methods: Thermogravimetric analysis (TGA): Principles, Instrumentation, Qualitative and Quantitative measurements. Applications.
- Introduction to Chromatographic techniques: Principles, Classification, Theoretical Analysis.
- Gas Chromatography (GC). Instrumentation. Detectors. Modern Trends. Qualitative and quantitative analysis. Applications.
- High Performance Liquid Chromatography (HPLC): Instrumentation. Detectors. Modern Trends. Qualitative and quantitative analysis. Applications.
- Electroanalytical techniques. Voltammetry. Polarography. Principles. Type of electrodes. Qualitative and quantitative analysis. Applications.

Hours per semester:

LECTURE	26	EXERCISES	-	LABORATORY	26	HOME-WORK	98	TOTAL HOURS: 150
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Student performance /evaluation:

The evaluation of the students will be done:

- Through a Final written Examination (FE), and
- Through Laboratory Practice (LP) (participation, questions on the theory and practice, written tests, reports).

The final grade results as follows: Final Grade = 0.7 x (FE) + 0.3 x (LP)