



UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze e Tecnologie Biologiche, Chimiche e Farmaceutiche		
ACADEMIC YEAR	2022/2023		
BACHELOR'S DEGREE (BSC)	CHEMISTRY		
SUBJECT	ANALYTICAL CHEMISTRY - LABORATORY		
TYPE OF EDUCATIONAL ACTIVITY	B		
AMBIT	50134-Discipline chimiche analitiche e ambientali		
CODE	15254		
SCIENTIFIC SECTOR(S)	CHIM/01		
HEAD PROFESSOR(S)	AMORELLO DIANA	Ricercatore	Univ. di PALERMO
OTHER PROFESSOR(S)			
CREDITS	8		
INDIVIDUAL STUDY (Hrs)	108		
COURSE ACTIVITY (Hrs)	92		
PROPAEDEUTICAL SUBJECTS	00133 - GENERAL AND INORGANIC CHEMISTRY 15248 - CHEMICAL PREPARATIONS WITH LABORATORY PRACTICE		
MUTUALIZATION			
YEAR	2		
TERM (SEMESTER)	2° semester		
ATTENDANCE	Mandatory		
EVALUATION	Out of 30		
TEACHER OFFICE HOURS	AMORELLO DIANA Monday 12:00 14:00 Studio 1/A18 Edificio 17 Friday 12:00 14:00 Studio 1/A18 Edificio 17		

DOCENTE: Prof.ssa DIANA AMORELLO

PREREQUISITES	Basic knowledge of general chemistry and stoichiometric calculations; Basic principles of classical and instrumental quantitative evaluations
LEARNING OUTCOMES	<p>Knowledge and understanding: Knowledge and deepening of the classical and instrumental methods of chemical analysis.</p> <p>Applying knowledge and understanding: Ability to identify and apply independently the appropriate methods to the analysis of a sample. Use of spreadsheets for the realization of graphics, statistics and calculation of regression functions.</p> <p>Making judgements: Ability to report and interpret the results of an analysis with uncertainty and draw conclusions</p> <p>Communication skills: ability to understand and use the proper language of the discipline</p> <p>Learning skills: Ability to transfer with critical and independent spirit the knowledge gained to new problems.</p>
ASSESSMENT METHODS	<p>The exam consists of an interview on laboratory experiences, with relative results presented, to ensure the possession of the skills and knowledge gained during the course. The knowledge and understanding of the subjects, the interpretation competence and the autonomy of judgment of concrete cases will be evaluated.</p> <p>Excellent (30-30 L): Excellent knowledge of the topics dealt with and the ability to elaborate and display knowledge with links between the various topics; Excellent judgment autonomy.</p> <p>Very good (27-29): very good knowledge of the topics dealt with and the ability to elaborate and display knowledge with links between the various topics; Great autonomy of judgment.</p> <p>Good (24-26): Good knowledge of the topics dealt with and the ability to elaborate and display knowledge with links between the various topics; Good autonomy of judgment.</p> <p>Satisfactory (21-23): satisfactory knowledge of the topics dealt with and the ability to elaborate and display knowledge with links between the various subjects; satisfactory autonomy of judgment.</p> <p>Sufficient (18-20): Limited knowledge of limited topics processing and linking skills. Limited autonomy of judgment.</p>
EDUCATIONAL OBJECTIVES	The goal of the course is to provide the basic knowledge about conventional and instrumental quantitative and qualitative analytical procedures usually applied. In addition, the course aims to enable the student to make a critical and correct choice of the most appropriate analytical techniques in specific determinations. For each technique, theoretical and instrumental aspects will be elucidated together with the possible range of application.
TEACHING METHODS	Lessons, Laboratory experiments
SUGGESTED BIBLIOGRAPHY	<p>Harris - Chimica analitica quantitativa, 3° Edizione (2017) – Zanichelli</p> <p>Skoog, West, Holler, Crouch- Fondamenti di Chimica Analitica 3 Ed. Edises</p> <p>Kolthoff, Sandell, Meehan, Bruckenstein- Analisi chimica quantitativa (1973)- Piccin</p> <p>Materiale fornito dal docente</p>

SYLLABUS

Hrs	Frontal teaching
6	Applied statistics: Experimental error. Systematic and random errors. Propagation of random errors. Mean and standard deviation. Confidence level. t-test and examples. Rejection of data. Calibration. Least squares fit-Standard additions.
4	Gravimetric analysis: general aspects; yield and separation factor; properties of precipitates and reagents for precipitations- Coprecipitation and postprecipitation. Applications
12	<p>Volumetric Analysis: primary Standards; acid-base titrations, indicators, standardization of acids and strong bases.</p> <p>Precipitation titrations, argentometric methods: Mohr, Volhard and Fajans.</p> <p>Titration with EDTA: conditional stability constants, titration curves, auxiliary complexing agents, metallochromic indicators. EDTA titration techniques: direct, indirect titrations, masking.</p> <p>Redox titrations: titration curves, indicators, adjustment of the oxidation state of the analyte; oxidation with potassium permanganate, cerium sulfate and chrome (VI) - iodometric methods.</p>
6	Electrochemical methods of analysis. Conductimetry, conductance, conductivity, molar conductivity at infinite dilution. Classical conductometric titrations. Potentiometry: indicators and reference electrode, membrane electrodes, glass electrode: calibration and errors. Ion selective electrodes. Potentiometric titrations. Identification of end points: the second derivative method and Gran method. Applications
4	Optical methods of analysis: Light properties. Absorption. Lambert-Beer's law. Absorption spectrophotometry. Deviations from Beer's law. Mixtures analysis. Spectrophotometers. Applications

Hrs	Workshops
60	<p>1. Preparation of standard HCl 2. Determination of water alkalinity 3. Preparation and standardization of a solution of AgNO₃ 4. Conductometric titration of a mixture of acids with a strong base. 5. Potentiometric titration of a mixture of halides with standard silver nitrate and determination of solubility products of the silver halides. 6. Determination of chlorides in a water sample 7. Spectrophotometric determination of the dissociation constant of an indicator. 8. Determination of the total hardness and the permanent hardness of water; determination of calcium and magnesium. 9. Iodometric titration of Vitamin C. 10. Potentiometric determination of fluoride in water: the calibration line method and standard addition. 11. Potentiometric titration of a mixture of acids with sodium hydroxide. 12. Spectrophotometric determination of titanium and vanadium (MLRA method). 13. Spectrophotometric determination of the constant of FeSCN₂ + 14. Gravimetric determination of sulphate as BaSO₄</p>