



General information	
Academic subject	ANALYTICAL CHEMISTRY AND ANALYSIS OF HERBAL PRODUCTS
Degree course	SCIENCES AND TECHNOLOGIES OF HERBAL AND HEALTH PRODUCTS
Year of study	II
European Credit Transfer and Accumulation System (ECTS)	10
Language	ITALIAN
Academic Year	2021-2022
Academic calendar (starting and ending date)	09/20/2021 – 01/21/2021
Attendance	Compulsory attendance

Professor/ Lecturer	ANALYTICAL CHEMISTRY	ANALYSIS OF HERBAL PRODUCTS
Name and Surname	<i>Modesto de Candia</i>	Antonio Laghezza
E-mail	<i>modesto.decandia@uniba.it</i>	antonio.laghezza@uniba.it
Telephone	0805443573	0805442745
Department and address	Department of Pharmacy - Pharmaceutical Sciences	Department of Pharmacy - Pharmaceutical Sciences
Virtual headquarters		<i>Teams: Ouk6pz3</i>
Tutoring (time and day)		Monday and Friday from 15.00 to 16.30

Syllabus	
Learning Objectives	<ul style="list-style-type: none">• provide a basic preparation on the most important principles of analytical chemistry (calculations concerning the equilibria in solution)• provide adequate knowledge on what is meant by plant drugs, how it is produced and stored, how its quality and safety are assessed.
Course prerequisites	Basic knowledge of general inorganic chemistry and mathematics.
Contents	<p>Analytical Chemistry Module</p> <p>Introduction to analytical chemistry and to its applications. Definition of chemical analysis: quantitative and qualitative chemical analysis. Analytical methods. Stages of the analysis process. Mathematical concepts: exponential notation, logarithms, units of the International System.</p> <p>Evaluation of analytical data: systematic and casual error. Precision and accuracy. Significant figures. Sensitivity.</p> <p>Solutions: definition of a solution. Solubility. Units of measure for the concentration of a solution. Converting concentration units. Solution preparation. Concentrating solutions of pharmaceutical interest.</p> <p>Chemical equilibrium: equilibrium constant. Activity and ionic strength. Chatelier's principle.</p> <p>Acid-base equilibrium: ion product of water and pH. Calculating the pH of solutions of strong acids and strong bases. Calculating the pH of solutions of polyprotic acids. Calculating the pH of solutions of weak acids and weak bases. Salt hydrolysis equilibrium. Buffer solutions.</p> <p>Precipitation equilibrium: solubility and solubility product. Factors that influence solubility: temperature, common ion effect, salt effect, pH effect.</p> <p>Complexation equilibrium: chemical properties and nomenclature of coordination compounds. Formation constant of complexes. Solubility of slightly soluble salts in the presence of complexation agents.</p>



	<p>Analysis of Herbal Products Module</p> <p>Pharmacopoeia and monographies for herbal drugs. Recalls: herbal drug production; variability in the content of active ingredients; conservation methods; drug alterations. Drug preparation: mechanical methods (crushing, shredding, pulverization, squeezing). Extraction of active ingredients: traditional methods (infusion, decoction, maceration, percolation, enfleurage, continuous extraction, distillation) and modern methods (extraction with supercritical fluids, microwave assisted solvent extraction, ultrasound assisted extraction). Extract classification (fluid, soft and dry extracts), tincture, hydrolytes, alcoholates, hydrolates, elixirs, essences. Herbal drug quality control: morphological control, examination of organoleptic characteristics, microscopic exam. Physical chemistry analysis: moisture determination, ash analysis, tannin determination, determination of extractable substances, determination of the viscosity of gums and mucilage; bitterness, swelling and foaming index. Analysis for contamination from extraneous substances, pesticide residues, heavy metals, aflatoxins, radioactive substances, microorganisms. Limit test. Chromatography: TLC, HPLC, Gas chromatography. Principles and applications of UV-vis spectrophotometry. Quantitative analysis of chromatograms. Volumetric analysis. Acid-base titrations. Analytical data evaluation: absolute and relative error. Standard deviation and dispersion indexes. Physical chemical analysis of phytoconstituents (melting and boiling point; density; viscosity; refraction index; optical rotating power).</p>
Books and bibliography	<p>Francesco Capasso- Farmacognosia- Springer Cavrini Andrisano – Principi di Analisi Farmaceutica – Esculapio Palluotto: Appunti di chimica analitica con esercitazioni numeriche, <i>Aracne editrice</i> Harris: Fondamenti di chimica analitica quantitativa, <i>Zanichelli</i>.</p>
Additional materials	PowerPoint presentations of lectures are available

Work schedule			
Total	Lectures	Hands on (Laboratory, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
Hours			
125	32	15	78
ECTS (each module)			
5	4	1	
Teaching strategy		blended learning	
Expected learning outcomes			
Knowledge and understanding on:		<ul style="list-style-type: none"> ○ capability to assess the most opportune analytical techniques. capability to discuss the course topics and to solve numerical problems. 	
Applying knowledge and understanding on:		<ul style="list-style-type: none"> ○ capability to operate in the laboratory within safety norms, and to apply the most opportune techniques among those studied 	
Soft skills		<ul style="list-style-type: none"> • <i>Making informed judgments and choices</i> <ul style="list-style-type: none"> ○ capability to critically evaluate the results of experimental procedures. • <i>Communicating knowledge and understanding</i> <ul style="list-style-type: none"> ○ clear and complete exposition of the course contents. 	



	<ul style="list-style-type: none">• <i>Capacities to continue learning</i><ul style="list-style-type: none">○ capability to recognize and establish connections with the contents of other courses.
Assessment and feedback	
Methods of assessment	Optional intermediate exam in the middle of teaching; oral interview
Evaluation criteria	<ul style="list-style-type: none">• <i>Knowledge and understanding</i><ul style="list-style-type: none">○ capability to assess the most opportune analytical techniques. capability to discuss the course topics and to solve numerical problems.• <i>Applying knowledge and understanding</i><ul style="list-style-type: none">○ capability to operate in the laboratory within safety norms, and to apply the most opportune techniques among those studied.• <i>Autonomy of judgment</i><ul style="list-style-type: none">○ capability to critically evaluate the results of experimental procedures.• <i>Communicating knowledge and understanding</i><ul style="list-style-type: none">○ clear and complete exposition of the course contents.• <i>Capacities to continue learning</i><ul style="list-style-type: none">○ capability to recognize and establish connections with the contents of other courses.
Criteria for assessment and attribution of the final mark	The final grade is awarded out of thirty. The exam is passed when the grade is greater than or equal to 18.
Additional information	