DIPARTIMENTO DI SCIENZE

COURSE: **ANALYTICAL CHEMISTRY II**			
ACADEMIC YEAR: **2019-2020**			
TYPE OF EDUCATIONAL ACTIVITY: **Characterizing**			
TEACHER: **Dr. Rosanna Ciriello**			
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phone: **0971205944**		mobile (optional):	
Language: **Italian**			
ECTS: **6** (**6** of lessons)	n. of hours: **48** (**48** of lessons)	Campus: **Potenza** Dept./School: **Dipartimento di Scienze** Program: **Chemistry (L27)**	Semester: **II** (date) 02.03.2020 – 31.05.2020/ 30.06.2020

EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

A first goal to be pursued within this teaching is the acquisition of the basic knowledge related to the distribution of complex protolitic species in aqueous media, not treated within the course of Analytical Chemistry I. The majority of the course will then be finalized to provide students with the basic knowledge related to the methods of instrumental chemical analysis in order to enable them to understand the operating mechanisms of these techniques, in view of a possible employment in analysis laboratories.

Main knowledge:

- Systematic treatment of equilibrium in aqueous solution of complex protolitic systems
- Potentiometric and electroanalytical methods
- Analytical methods based on absorption and emission of electromagnetic radiation
- Separative methods based on chromatography

Main skills acquired:

- Approach to numerical and graphical analysis of polyprotic species at equilibrium
- Acquisition of the basic knowledge necessary to define and rationalize the most common methodological approaches to instrumental analysis.
- Ability to manage and propose instrumental methodologies for the quantitative determination of species of environmental and biological interest

PRE-REQUIREMENTS

The contents of the courses of “Analytical Chemistry I” and “Laboratory of Analytical Chemistry I” are a prerequisite for the understanding of the topics treated in “Analytical Chemistry II”. The basic knowledge of analytical chemistry is required and in particular:

- systematic treatment of chemical equilibria in aqueous solutions
- quantitative analysis based on volumetric and gravimetric methods
- overview of qualitative chemical analysis

SYLLABUS

ACID-BASE EQUILIBRIA (10 h). Numerical analysis of complex systems at equilibrium. Polyprotic acids and bases: pH calculation, distribution diagrams. Buffering systems based on polyprotic acids. Titration curve of polyprotic acids.

ELECTRODES AND POTENTIOMETRIC ANALYSIS (8 h). Nernst's equation. Standard electrode potentials. Reference electrodes. Indicator electrodes. Liquid junction potential. Ion-selective electrodes. Selectivity constant. Solid-state and liquid-membrane electrodes. Gas-sensing electrodes and biocatalytic membrane electrodes. Potentiometric titrations and graphical representations: Gran diagram.

ELECTROANALYTICAL METHODS (6 h). Basic concepts in electrochemistry. Faradic and non-faradic processes. Mass transport to the electrode and Cottrell equation. Voltammetry. Electrochemical instrumentation. Hg drop electrode. Ilkovic's equation. Diffusion current and residual current. Polarographic waveform. Half-wave potentials. Pulse polarography: normal pulse (NPP) and differential pulse (DPP).

ANALYTICAL METHODS BASED ON THE ABSORPTION AND EMISSION OF ELECTROMAGNETIC RADIATION (12 h).

Introduction to spectroscopic methods, electromagnetic spectrum. Electronic transitions. Instrumentation: sources, samples, monochromators and detectors. Resolution. Single and double beam spectrophotometers. Atomic spectroscopy: emission and absorption. Line width. Hollow cathode lamps. Flame and furnace. Interference. Luminescence: fluorescence and phosphorescence. Relationship between absorption spectra and emission spectra. Instrumentation for fluorescence and phosphorescence. Fluorescence intensity. Spectrophotometric titrations. Scatchard diagram.

CHROMATOGRAPHIC METHODS (12 h). Liquid chromatography. Distribution coefficient, retention time, capacity factor, theoretical plate and number of theoretical plates, selectivity and resolution. Factors causing the enlargement of the chromatographic band, van Deemter's equation. Liquid chromatograph: pumps, injectors, columns and detectors. HPLC and columns with chemically linked phases. Gas chromatography. Gas chromatography instrumentation: columns, support materials, liquid phases, injectors and detectors. Effect of temperature and load of liquid phase on retention time. Injectors, columns and detectors.

TEACHING METHODS

Theoretical lessons

EVALUATION METHODS

The final verification of the learning status will be based on an oral examination.

TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

Skoog, West, Holler “FONDAMENTI DI CHIMICA ANALITICA”, EdiSES, Napoli

D. Skoog, F. J. Holler, S. R. Crouch "CHIMICA ANALITICA STRUMENTALE", 2^ edizione, EdiSES, Napoli (2009)

D.C. HARRIS, "CHIMICA ANALITICA QUANTITATIVA", 2^ EDIZIONE, ZANICHELLI, BOLOGNA

Lecture notes provided by the teacher

INTERACTION WITH STUDENTS

At the beginning of the course the teacher informs the students about the objectives, the program and the verification methods and collects the list of attending students, together with e-mails. The teacher will provide students with an electronic copy of all the lessons projected in the classroom.
The office hours are as follows:
Tuesday: from 10 am to 11 am at the office 2DA302;
Wednesday: from 10 am to 11 am at the office 2DA302.
Thursday: from 10 am to 11 am at the office 2DA302;
The teacher is available to meet at all times students by appointment agreed through its own institutional e-mail address (rosanna.ciriello@unibas.it).

EXAMINATION SESSIONS (FORECAST)[1]

18/02/2020, 17/03/2020, 23/06/2019, 14/07/2019, 22/09/2019, 20/10/2019, 15/12/2019

SEMINARS BY EXTERNAL EXPERTS YES □ NO X

FURTHER INFORMATION

[1]Subject to possible changes: check the web site of the Teacher or the Department/School for updates.