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**COURSE: ANALITICAL CHEMISTRY**

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**ACADEMIC YEAR: 2017-2018**

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**TYPE OF EDUCATIONAL ACTIVITY: Basic**

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**TEACHER: Prof. Giuseppe Innocenzo Casella**

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website:

phone: **0971206124**mobile (optional):

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Language: **ITALIAN**

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ECTS: **8** (7 lessons and  
1 tutorials/practice)n. of hours: **68** (56 lessons  
and 12 tutorials/practice)Campus: **Potenza**  
Dept./School: **Department of  
Sciences**  
Program: **Pharmacy (LM-13)**Semester: **I**  
(dal 02/10/2017 al  
31/01/2018)

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**EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES:**

The objectives of this course are based on the acquisition of basic knowledge about the thermodynamic conditions of the chemical equilibrium of the reactions. In particular the equilibria regards: the acid-base and redox equilibria. The study focuses mainly on the understand the most important implications regarding the numerical and conceptual problems in different contexts of the Analytical Chemistry.

The approach on the common analytical techniques such as: potentiometric, spectrophotometric in absorption and/or emission has the aim to provide a basic but exhaustive vision to the chemical analysis and relevant laboratory approaches.

The study of the general characteristics and properties of gas- and liquid-chromatography has finally the purpose of providing the necessary information of these techniques for the purification and/or separation of various classes of molecules. The general combination of chromatographic techniques and some common selected detectors represents the general trends for the definition of analytical procedures for molecules of pharmaceutical interest.

The cycle of lectures, with numerous numerical approaches, will have the goal to provide the following capabilities:

- Ability to calculate acid-base and redox species under equilibrium conditions;
- Knowledge and critical capacity to the understanding the procedures in order to define the common methods of analysis;
  - Comprehension of the main principles and properties of the modern analytical procedures.

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**PRE-REQUIREMENTS:**

The optimal approach of the Course in Analytical Chemistry implies the minimal knowledge of: Mathematics and Physics.

In addition are required the basic knowledge of the General and inorganic Chemistry.

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**SYLLABUS:**

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1) **CHEMICAL EQUILIBRIA:** Thermodynamics concepts and constants of equilibria. ( 2

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hours)

2) ACID-BASE Equilibria: Strong and weak acid-base species, pH calculation.  
Concept of buffer solutions and calculation of buffer capacity. pH indicators. (10 hours)  
Volumetric analysis, primary standards, titration curves. (3 hours)  
Acid / base titration, indicators, titration errors. (4 hours + 5 hours of numerical exercise)

3) REDOX Equilibria: Galvanic and electrolysis cells. Equation of Nernst  
Definition of standard potentials and their experimental evaluation. Calculation of the equilibrium constants. (4 hours)  
Redox titrations; redox indicators. (4 hours)  
Permanganometry; Iodometry; Iodimetry. (2 hours + hours of numerical exercise)

4) POTENTIOMETRY: Galvanic Cells as of measuring instruments. Indicator Electrodes and reference electrodes. Types of membranes for ion-selective electrodes in potentiometry. Glass electrode and pH measurement. Ion selective electrodes: applicative examples. (6 hours)

5) UV-VIS: General definitions of spectrophotometry . Lambert Beer law and its limitations.  
Energy diagrams. Conditions of absorption. (2 hours)  
Spectrophotometer schemes: single / dual beam.  
Absorption analysis and applicative examples: direct analysis and spectrophotometric titrations. (3 hours + 2 hours of numerical exercise)

6) SPECTROPHOTOMETRY IN EMISSION: Fluorescence: Properties and general definitions.  
Molecular structure vs. quantum yield. (2 hours)  
Fluorescence signal vs. concentration. (2 hours)  
Instrumentation and relevant schemes. Examples of analytical applications. (2 hours)

7) SEPARATION TECHNIQUES:

Definitions and general properties. Factors of capacity, resolution, efficiency. 2 hours)  
Equation of Van Deemter. Chromatographic techniques: Gas-chromatography: packed and capillary columns. stationary and mobile phases; examples of applications. 4 hours)

Liquid chromatography: stationary and mobile phases. Isocratic and gradient conditions. Types of chromatography: partition, ionic, size exclusion, etc. (4 hours + 2 hours of numerical exercise).

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**TEACHING METHODS:**

The teaching method is based on the traditional approach: lecture with extensive use of numerical presentation and exercises; in addition a large use of graphic representations.

The course consists of 8 (7+1), 7 credits of frontal lessons.

An important part involves the use of the traditional approach and the use of software for electronic presentation based on the Power Point, EXCELL, etc.

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**EVALUATION METHODS:**

The evaluation is based on the traditional approach: the final evaluation involves a written and oral test.

The evaluation procedures provide a direct interaction phase with students during the cycle of lessons through numerical exercises and questions of topics interest regarding the modern aspects of the Analytical Chemistry.

The final and definitive evaluation concerning the verification of the learning state, is based on the written test and a subsequent oral examination considering the quantitative numerical approach to the subject of study.

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**TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL:**

- **FONDAMENTI DI CHIMICA ANALITICA.** Skoog, West, Holler. EdiSES, Napoli.
- **ANALYTICAL CHEMISTRY,** G.D. Christian, 5th Ed. Wiley
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No on-line material is expressed required.

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**INTERACTION WITH STUDENTS**

The interaction with the students is based on the direct approach during the cycle of the lesson through numerical exercitations, and direct questions on the cultural material of the analytical chemistry.

A dedicated calendar of weekly reception of student is generally is provided.

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**EXAMINATION SESSIONS (FORECAST)<sup>1</sup>**

16 February 2018

09 March 2018

15 June 2018

20 July 2018

28 September 2018

11 October 2018

21 December 2018

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**SEMINARS BY EXTERNAL EXPERTS** YES  NO

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**FURTHER INFORMATION**

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<sup>1</sup>Subject to possible changes: check the web site of the Teacher or the Department/School for updates.

