



FACULTY OF PHARMACY

Approved

by the Council meeting of Faculty of  
Pharmacy,  
Minutes No. 4 of 13.06.2016

Dean of Faculty of Pharmacy,  
Associate professor,

Nicolae Ciobanu

Approved

by the meeting of Department  
of Pharmaceutical and Toxicological  
Chemistry,  
Minutes No. 10 of 11.05.2016

Head of Department, professor

Vladimir Valica

## Syllabus

DISCIPLINE MODERN INSTRUMENTAL ANALYSIS

Name of the course: **MODERN INSTRUMENTAL ANALYSIS**

Code of the course: **S06A064**

Type of course: **Optional**

**Total number of hours – 34**

**including lectures – 17 hours, practical classes (seminar) – 17 hours**

**Number of credits provided for the course – 2**

**Lecturers teaching the course:**

– PhD in Pharmaceutical Sciences, professor **Vladimir Valica**



**I. Aim of the discipline:**

The discipline modern instrumental analysis comes to supplement their knowledge in the field of physical-chemical methods of analysis.

The discipline studies modern methods of analysis of medicinal active substances and auxiliaries, as well as their pharmaceutical forms, their use in the methodology of creation of new medicinal substances and their role in the synthesis of new medicinal substances dirajată (compilation of disignului and confirmation of their structure).

It also studies the use of instrumental contemporary methods of research for the development of methods of analysis and standardization of pharmaceutical active substances and their pharmaceutical forms, the role of modern instrumental methods for the analysis and testing of medicinal products (raw materials, intermediates, finished product).

**II. Objectives obtained in teaching the discipline:**

Acquiring theoretical and practical methods of analysis, that students use in the study of other disciplines with pharmaceutical profile and in the further upcoming activity as pharmacists practitioners.

Within the discipline of physico-chemical analyses are theoretical and practical bases of physical-chemical methods of analysis, instrumental methods (separation, optical, electrochemical, thermal, etc.).

**III. Basic content of discipline:****A. Lectures:**

| <i>Semester VI</i> |  |       |
|--------------------|--|-------|
| Nr.                | Contents   | Hours |
| 1.                 | <b>Instrumental Analysis. General considerations</b> The purpose of analytical chemistry. Classification of instrumental methods of analysis. General characteristics of analytical methods and their classification in operational terms. Characteristics of measuring instruments. | 2     |
| 2.                 | <b>Separation Methods.</b> Classification of chromatographic methods. Nomenclature in chromatography.  | 2     |
|                    | <b>Adsorption chromatography.</b> Adsorption. Adsorbents. Solvents. Column chromatography. Thin-layer chromatography. Applications of thin layer chromatography  |       |
|                    | <b>Repartition Chromatography.</b> Distribution process. Paper chromatography. Stationary phase. The mobile phase. Work technique. Qualitative analysis. Applications of paper chromatography.   | 2     |
|                    | <b>Gas chromatography.</b> Principles. Separation mechanism. Apparatus. Used Terms. Gas-liquid chromatography. Gas-solid chromatography. The influence of various factors on the separation. Detectors. Qualitative and quantitative analysis. Analytical applications.              | 2     |
|                    | <b>High performance liquid chromatography.</b> Overview. Apparatus. Stationary phase HPLC. HPLC mobile phases. Separation mode high performance liquid chromatography. Detectors in gas chromatography HPLC. Analytical applications.  | 2     |
|                    | <b>Ion exchangers.</b> Definition. Examples, classification (inorganic, organic). Ion exchange mechanism. Sizes characterizing ion exchangers. Technique. Equipment.   | 2     |





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|----|--|-----------|
|    | Applications.  |           |
| 3. | <b>Spectral methods.</b> The IR spectrophotometry. The UV and visible spectrophotometry. Fluorescence spectrometry. Nuclear magnetic resonance spectroscopy and electron spin resonance. <b>Nonspectral methods.</b> Refractometry. Optical rotatory dispersion. Circular dichroism. | 2         |
| 4. | <b>Electrochemical methods.</b> Potentiometry. Amperometry. Conductometry. Polarography.   | 1         |
| 5. | <b>Other methods</b> Methods Roentgenography. Thermal analysis methods.  | 2         |
|    | <b>Total</b>   | <b>17</b> |

**B. Laboratory work:**

| <i>Semester VI</i> |  |           |
|--------------------|--|-----------|
| Nr.                | Contents   | Hours     |
| 1.                 | <b>Adsorption chromatography</b> Adsorption. Adsorbents. Solvents. Column chromatography. Thin-layer chromatography. Applications of thin layer chromatography   | 2         |
| 2.                 | <b>Repartition Chromatography</b> Repartition process. Paper chromatography. Stationary phase. The mobile phase. Work technique. Qualitative and quantitative analysis. Applications of paper chromatography.  | 2         |
| 3.                 | <b>Gas chromatography</b> Separation mechanism. Apparatus. Used Terms. Gas-liquid chromatography. Gas-solid chromatography. The influence of various factors on the separation. Detectors. Qualitative and quantitative analysis. Analytical applications.         | 2         |
| 4.                 | High performance liquid chromatography Separation mechanism. Apparatus. Stationary phase HPLC. HPLC mobile phases. Separation mode high performance liquid chromatography. Qualitative and quantitative analysis.  | 2         |
| 5.                 | <b>Ion-exchange chromatography.</b> Ion exchange mechanism. Examples, classification (inorganic, organic). Sizes characterizing ion exchangers. Technique. Equipment. Applications.  | 2         |
| 6.                 | <b>UV and visible spectrophotometry. Fluorescence spectrometry</b> Apparatus. Qualitative and quantitative analysis. Applications.   | 2         |
| 7.                 | <b>IR spectrophotometry. Nuclear magnetic resonance spectroscopy and electron spin resonance.</b> Equipment. Qualitative and quantitative analysis. Applications   | 2         |
| 8.                 | <b>Atomic absorption spectrometry. Emission spectrometry.</b> Equipment. Qualitative and quantitative analysis. Applications. <b>Non-spectrale methods.</b> Refractometria. Polarimetria. Circular Dichroism. Qualitative and quantitative analysis. Applications. | 3         |
|                    | <b>Total</b>   | <b>17</b> |





**IV. Recommended literature:**

**A. Compulsory:**

1. Bojița M., Săndulescu R., Roman L., Oprean R. Analiza și controlul medicamentelor, Ed. Intelcredo, Deva, 2003.
2. Muntean D.L., Bojița M. Controlul medicamentelor. Metode spectrale, cromatografice și electroforetice de analiză, Ed. Medicală universitară "Iuliu hațieganu", Cluj-Napoca, 2004.
3. Imre S., Muntean D.L. Principii ale analizei medicamentului, Ed. University Press, Târgu Mureș, 2006,
4. Imre S., Muntean D.L., Molnar A. Impurități farmaceutice, Ed. University Press, Târgu Mureș, 2008.
5. David V. Metode de separare și de analiză a urmelor, capitolul IV: Spectrometria de masă, Editura Universității București, 2001, pg. 80-118.
6. Gocan S. Cromatografia de înaltă performanță, partea a II-a: Cromatografia de lichide pe coloane. Editura Risoprint, Cluj-Napoca, 2002.
7. Roman L, Bojița M., Săndulescu R. Validarea Metodelor de analiză și control. Ed. Medicală 1998.
8. Skoog D.A, West D.M, Holler. Fundamentals of analytical Chemistry 7<sup>ed</sup> Saunder College Publishing, 1996.

**B. Additional:**

1. Farmacopea Română. Ediția X-a –București: Editura medicală, 1993.-1315 p.
2. European Pharmacopoeia. – 2011.
3. British Pharmacopoeia. – London, 2009.

**V. Teaching and learning methods:**

Course, practical work (seminar).

**VI. Suggestions for individual work:**

Additional literature consulted, individual consultations, thematic reports.

**VII. Methods of assessment:**

*Current:* checking along the way

*Final:* colloquium.

*Absence on colloquium without good reason is recorded as „absent” and is equivalent to 0 (zero). The student has the right to re-take the on colloquium twice.*

**VIII. Language of instruction:**

Romanian.