

# Course description

|                             |  |                 |                  |
|-----------------------------|--|-----------------|------------------|
| <b>Course abbreviation:</b> | KCH/IMACH                                | <b>Page:</b>    | 1 / 3            |
| <b>Course name:</b>         | Instrumental Methods in Analytical Chemi |                 |                  |
| <b>Academic Year:</b>       | 2016/2017                                | <b>Printed:</b> | 20.01.2018 15:44 |

|   |   |                               |                 |
|---|---|-------------------------------|-----------------|
| <b>Department/Unit /</b>                | KCH / IMACH                                     | <b>Academic Year</b>          | 2016/2017       |
| <b>Title</b>                            | Instrumental Methods in Analytical Chemi        | <b>Type of completion</b>     | Exam            |
| <b>Long Title</b>                       | Instrumental Methods in Analytical Chemistry    |                               |                 |
| <b>Accredited/Credits</b>               | Yes, 5 Cred.                                    | <b>Type of completion</b>     | Oral            |
| <b>Number of hours</b>                  | Přednáška 2 [Hours/Week] Seminář 1 [Hours/Week] |                               |                 |
| <b>Occ/max</b>                          | Status A      Status B      Status C            | <b>Course credit prior to</b> | NO              |
| <b>Summer semester</b>                  | 1 / -      0 / -      0 / -                     | <b>Counted into average</b>   | YES             |
| <b>Winter semester</b>                  | 29 / -      0 / 0      2 / 3                    | <b>Min. (B+C) students</b>    | not determined  |
| <b>Timetable</b>                        | Yes   | <b>Repeated registration</b>  | NO              |
| <b>Language of instruction</b>          | Czech   | <b>Semester taught</b>        | Winter semester |
| <b>Substituted course</b>               | None  | <b>Internship duration</b>    | 0               |
| <b>Preclusive courses</b>               | N/A   |                               |                 |
| <b>Prerequisite</b>                     | N/A   |                               |                 |
| <b>Informally recommended courses</b>   | N/A   |                               |                 |
| <b>Courses depending on this Course</b> | N/A   |                               |                 |

## Course objectives:

### Aims

The theoretical and experimental bases of the instrumental methods of analytical chemistry. The electrochemical, optical, and separative methods.

## Requirements on student

### Requirements

Satisfying the requirements to obtain at least grading "good"

Evaluation of the subject as well as the exam grading is made according to the articles No 31 - 33 in the Regulations on Study and Examinations University of Ostrava

## Content

### Content

1. Introduction into the instrumental analytical chemistry - basic characteristics, comparison with the classical methods of chemical analysis. Diversification of methods.
2. Potentiometry - electrode, electrochemical cell. Indicator, reference electrodes. Ion-selective electrodes. Application of potentiometry.
3. Conductometry. Electrogravimetric analysis, coulometry.  
The direct methods. Titration application. Practical application.
4. Voltammetry (polarography). Methods of pulse voltammetry.  
Stripping voltammetry on the solid electrodes. Applications.
5. Electrochemical sensors, biosensors. Application.
6. Introduction into the spectral methods - interactions of electromagnetic radiation with substances. Quantities and their relations.
7. Methods of atomic spectroscopy - absorption and emission spectroscopy. X-ray fluorescence spectroscopy. Principles, instrumentation, practical application.
8. Methods of spectrophotometry in UV/VIS region.  
Principles, instrumentation, practical application.
9. IR and Raman spectroscopy. Principles, instrumentation, practical application.
10. NMR and EPR spectroscopy. Mass spectrometry. Principles, instrumentation, analytical application.
11. Chromatographic methods, basic concepts, basic theoretical relations, diversification of methods according to principle of separation process. Thin layer chromatography.
12. Gas chromatography. High performance liquid chromatography. The basic concepts, instrumentation, examples of the

analytical application.

13. Electromigration methods - electrophoresis, isotachophoresis. The basic concepts, instrumentation, examples of the analytical application.

#### Prerequisites - other information about course preconditions

none

#### Competences acquired

Competences

The student acquire knowledge of principles of the instrumental analytical methods, they orientate in practical use of the instrumental analytical methods and acquire ability of calculation in the field of the instrumental analysis.

#### Fields of study

#### Guarantors and lecturers

- **Guarantors:** doc. Ing. Zuzana Navrátilová, CSc.
- **Lecturer:** doc. Ing. Zuzana Navrátilová, CSc.
- **Seminar lecturer:** doc. Ing. Zuzana Navrátilová, CSc.

#### Literature

- **Basic:** Štulík K., Barek J. *Elektrochemické analytické metody*, SNP, Praha 1989..
- **Basic:** Čůta F. a kol. *Instrumentální analýza*. SNTL, Praha 1986..
- **Recommended:** Holzbecher Z. a kol. *Analytická chemie*. SNTL, Praha 1987..
- **Recommended:** Churáček J. a kol. *Analytická separace látek*, SNTL, Praha 1990..
- **Recommended:** Kalous V. a kol. *Metody chemického výzkumu*, SNTL Praha 1987..
- **Recommended:** Churáček J. a kol. *Nové trendy v teorii a instrumentaci vybraných analytických metod*, Academia, Praha 1993..

#### Time requirements

| Activities   | Time requirements for activity [h] |
|--|------------------------------------|
| Being present in classes                                       | 39                                 |
| Self-tutoring  | 26                                 |
| Preparation for an exam  | 45                                 |
| Consultation of work with the teacher/tutor (incl. electronic) | 15                                 |
| <b>Total:</b>  | <b>125</b>                         |

#### assessment methods

##### professional knowledge

Oral examination

Written examination

#### teaching methods

##### professional knowledge

Dialogic (discussion, dialogue, brainstorming)

Monologic (explanation, lecture, briefing)

#### learning outcomes

##### professional knowledge - knowledge resulting from the course:

Competences

The student acquire knowledge of principles of the instrumental analytical methods, they orientate in practical use of the

instrumental analytical methods and acquire ability of calculation in the field of the instrumental analysis.

**Course is included in study programmes:**

| Study Programme | Type of             | Form of   | Branch   | Stage | St. plan v. | Year | Block                      | Status | R.year | R. |
|-----------------|---------------------|-----------|--|-------|-------------|------|----------------------------|--------|--------|----|
| Applied Physics | Postgraduate Master | Full-time | Biophysics   | 1     | 2014        | 2016 | Povinné předměty           | A      | 2      | ZS |
| Biology         | Postgraduate Master | Full-time | Experimental Biology   | 1     | 2           | 2016 | Povinné předměty           | A      | 2      | ZS |
| Chemistry       | Bachelor            | Full-time | Chemistry  | 1     | 2012        | 2016 | Povinné předměty           | A      | 3      | ZS |
| Chemistry       | Postgraduate Master | Full-time | Teaching for Secondary Schools - Single-Specialization Chemistry     | 1     | 2           | 2016 | Povinné předměty           | A      | 2      | ZS |
| Chemistry       | Postgraduate Master | Full-time | Teaching for Secondary Schools - Chemistry, Didactic Specializations | 1     | 2           | 2016 | Povinně volitelné předměty | B      | 2      | ZS |