**Course code:** ……. **Plan position:** ……

## A. INFORMATION ABOUT THE COURSE

### B. Basic information

| | |
|---|---|
| Name of course | ***Analytical Chemistry*** |
| Field of studies | Chemical Technology |
| Level of studies | First degree |
| Profile of studies | General academic |
| Form of studies | Stationary |
| Specialty | 1. Chemical process technology<br>2. Bioengineering<br>3. Chemistry and technology of cosmetics |
| Unit responsible for the field of studies | Faculty of Chemical Technology and Engineering/Division of General and Inorganic Chemistry |
| Name and academic degree of teacher(s) | Przemysław Kosobucki, Ph.D., D.Sc., Associate Professor; Małgorzata Kaczorowska, Ph.D., D.Sc., Katarzyna Jurek, Ph.D. |
| Introductory courses | Background of chemistry and physics from secondary school and basic knowledge of algebra |
| Introductory requirements | Course of General Chemistry |

### C. Semester/week schedule of classes

| Semester | Lectures (W) | Auditorium classes (Ć) | Laboratory classes (L) | Project classes (P) | Seminar (S) | Field classes (T) | Number of ECTS points |
|---|---|---|---|---|---|---|---|
| winter | 15 | 30 | 60 | | | | 10 |

## 2. LEARNING OUTCOME

| No. | Learning outcomes description | The reference to the learning outcomes of specific field of study | The reference to the learning outcomes for the area |
|---|---|---|---|
| KNOWLEDGE | | | |
| W1 | Has a structured, theoretically underpinned knowledge of general understanding of analytical chemistry. | K_W03 | P6S_WG |
| W2 | Has knowledge of techniques and methods for the characterization and identification of chemical products. | K_W11 | P6S_WG |
| SKILLS | | | |
| U1 | Works individually and as part of a team. | K_U02 | P6S_UO<br>P6S_UK |
| U2 | Selects analytical methods for the qualitative and quantitative determination of chemical compounds and evaluation of their physico-chemical properties. | K_U11 | P6S_UW |
| SOCIAL COMPETENCES | | | |

| | | | |
|---|---|---|---|
| K1 | Is aware of the responsibility for jointly tasks, which are related to teamwork. | K_K04 | P6S_KK<br>P6S_KO |

## 3. TEACHING METHODS

### A. Traditional methods used

Multimedia lecture, laboratory experiments and calculations (classes) performed by students under supervision of academic staff.

## 4. METHODS OF EXAMINATION

Written exam from lectures, written tests from laboratories and classes.

## 5. SCOPE

| | |
|---|---|
| Lectures | Process of quantitative chemical analysis. Errors and statistical calculations of analytical results. Basic chemical laws used in quantitative analysis. Introduction to gravimetric determinations. Fundamentals of quantitative analysis in solution. Titrimetric analysis: acid-base, precipitations, redox, complexometric - EDTA. Titration analyses in applications. Theory of indicators: acid – base, redox, complexometric and precipitations. Classification of the instrumental methods. Introduction to spectrophotometry, spectrophotometers, UV - Vis spectrophotometry, IR spectroscopy in analytical applications, atomic absorption and emission spectroscopy. NMR. Fundamentals of electrochemical methods: potentiometry, conductometry. Introduction to chromatographic and electromigration techniques. |
| Classes | Calculation related to the preparation of solutions from a solid weight sample or by dilution. Calculation rules related to the standardization of solutions. Calculation related with determination of components by means of: volumetric, alkacymetric, precipitation and redoximetry. Methods of calculations necessary for instrumental determinations. |
| Laboratories | Health and safety rules and good laboratory practices. Systematics of analytical methods. Filtration and washing. Roasting and drying. Weighing determination of selected ions. Volume analysis: alkacymetry, complexometry, precipitation analysis and redoximetry. Standard solutions (preparation standardization), selected markings in the field of volumetric analysis. Water analysis and artificial fertilizers. Physicochemical methods in quantitative analysis, with particular emphasis on potentiometry, conductometry, spectrophotometry and electrogravimetry. |

## 6. METHODS OF VERIFICATION OF LEARNING OUTCOMES

| LEARNING OUTCOME | Form of assessment | | | | | |
|---|---|---|---|---|---|---|
| | Oral examination | Written exam | Colloquium | Project | Report | Credit for experiments |
| W1 | | x | | | | |
| W2 | | x | | | | x |
| U1 | | | | | | x |
| U2 | | | x | | | x |
| K1 | | | x | | | x |

## 7. LITERATURE

| | |
|---|---|
| Basic literature | 1. Harvey D., 2000. Modern Analytical Chemistry. MC Graw Hill. |
| Supplementary literature | 1. Harris D.C., 2010. Quantitative Chemical Analysis, W.H. Freeman and Co. N.Y. 8th Ed.<br>2. Fifield F.W., Kealey D., 2000. Principles and Practice of Analytical Chemistry, Blackwell Science.<br>3. Skoog D.A., Holler F.J., Holler F.J., Crouch S.R., 2014. Fundamentals of Analytical Chemistry, 9th Edition, Belmont.<br>4. Materials prepared by lecturer. |

## 8. TOTAL STUDENT WORKLOAD REQUIRED TO ACHIEVE EXPECTED LEARNING OUTCOMES EXPRESSED IN TIME AND ECTS CREDITS

| Student's activity | | Student workload– number of hours |
|---|---|---|
| Classes conducted under a direct supervision of an academic teacher or other persons responsible for classes | Participation in classes indicated in point 1B | 105 |
| | Supervision hours | 30 |
| Student's own work | Preparation for classes | 40 |
| | Reading assignments | 35 |
| | Other (preparation for exams, tests, carrying out a project etc) | 40 |
| Total student workload | | 250 |
| | Number of ECTS points | **10** |