

**University of Maribor**  
**Faculty of Natural Sciences and Mathematics**

**Information on the undergraduate programme**  
***Educational Chemistry***

#### **4.2.2.1 Splošni opis / General description**

##### **QUALIFICATION AWARDED**

- **Bachelor two-subject programme on “Educational Chemistry”**

Qualification rewarded: Bachelor in educational Chemistry

Duration of studies: 3 years

##### **ADMISSION REQUIREMENTS**

###### **Bachelor programme:**

- a) a successfully completed Matura examination, or
- b) a successfully completed vocational leaving exam and exam from one of the subjects of the Matura examination; the selected subject can not be one of the subjects passed on the vocational leaving exam; or
- c) Successfully finished secondary school before June 1, 1995.

In case of enrolment limitations, applicants under a) and c) are admitted according to their GPA on the Matura examination or final exam (60% of the points) and their overall GPA in the third and the fourth year of secondary school (40% of the points).

In case of enrolment limitations, applicants under b) are admitted according to

- their general success in vocational Matura examination 20%
- their general success in 3<sup>rd</sup> and 4<sup>th</sup> year 20%
- success in mathematics in 3<sup>rd</sup> and 4<sup>th</sup> year 40%
- success in Matura Subject 20%

##### **EDUCATIONAL AND PROFESSIONAL GOALS**

###### **Basic goals of the study programme**

The goal of the study programme is that graduates acquire the basic knowledge of chemistry. Graduates also acquire the knowledge of other natural sciences and pedagogical fields of study. The system of selecting subjects enables the students to acquire specific knowledge according to their plans for further study or employment.

###### **Basic competences achieved through the study programme**

- Ability of analytical and synthetic thinking and understanding the pretentious concepts of chemical science.
- Knowledge of basic chemical fields of work and interdisciplinary connection of natural science contents.
- Ability to make critical judgement in the field of natural sciences and flexible use of knowledge for the contentment of professional and everyday needs.
- Solving professional applicate problems by seeking sources of knowledge and using scientific methods.

- Ability of oral and written communication and collaboration / team work.
- Autonomy at scientific work.
- Informative literacy.
- Ability to communicate in a foreign language for professional needs.

### **Subject specific competences achieved through the study programme**

- Ability of didactical and technological planning, preparation and realization of experiments of chemical and related industries.
- Ability of connecting selected aspects of different curricular knowledge and using these connections at current fields of economic activities.
- Ability of separating and explaining current laboratory and processing operations within laboratory and technological process of extraction and remaking of concrete chemical samples or technological products.
- Understanding mechanisms of chemical reactions.
- Solving basic chemical problems at qualitative and quantitative level.
- Global awareness and solution of environmental problems by using styles of natural science thinking.

### **ACCESS TO FURTHER STUDIES**

Graduates of the bachelor university programme “*Educational Chemistry*” can continue their studies at the second level leading to the second Bologna degree (master degree). Graduates of the master level will be able to continue the studies at the third level, leading to the Doctor degree.

### **COURSE STRUCTURE DIAGRAM WITH CREDITS**

Complete curricula of the bachelor university programme “*Educational Chemistry*” are given in the following pages. All the courses (obligatory and elective) are given together with the semester of study, the amount and type of the contact hours and the assigned number of the ECTS credits. The abbreviations in the curriculum have the following meaning:

L – lectures  
 S – seminar  
 T – tutorial  
 LW – lab work  
 IW – independent work

## The two-subject bachelor programme Educational Chemistry

### 1<sup>st</sup> year, 1<sup>st</sup> semester

| Course title                                        | Type of subject | Professor           | Range of realization (hours) |   |         |    | Total contact hours | Individual work | Total hours/ECTS |
|-----------------------------------------------------|-----------------|---------------------|------------------------------|---|---------|----|---------------------|-----------------|------------------|
|                                                     |                 |                     | L                            | S | T       | LW |                     |                 |                  |
| 1.* Mathematics or Fundamentals of Computer Science | obligatory      | J. Vukman           | 22,5 (45)                    |   | 15 (30) |    | 37,5 (75)           | 52,5 (105)      | 90 (180)/ 3 (6)  |
| 2. General Chemistry                                | obligatory      | M. Drofenik         | 45                           |   | 15      | 60 | 120                 | 120             | 240/ 8           |
| 3. Analytical chemistry I                           | obligatory      | D. Brodnjak-Vončina | 30                           |   |         | 30 | 60                  | 60              | 120/ 4           |
| <b>Total hours/ ECTS</b>                            |                 |                     |                              |   |         |    | <b>217,5</b>        | <b>232,5</b>    | <b>450/15</b>    |

\* Subject is obligatory except in binding with Mathematics, where students choose a professional subject defined in the second part of the study programme.

### 1<sup>st</sup> year, 2<sup>nd</sup> semester

| Course title                   | Type of subject | Professor           | Range of realization (hours) |         |   |          | Total contact hours | Individual work | Total hours/ECTS |
|--------------------------------|-----------------|---------------------|------------------------------|---------|---|----------|---------------------|-----------------|------------------|
|                                |                 |                     | L                            | S       | T | LW       |                     |                 |                  |
| 4. Physics or Modern Biology** | obligatory      | A. Fajmut           | 15 (30)                      | 15 (30) |   | 7,5 (15) | 37,5 (75)           | 52,5 (105)      | 90 (180)/ 3 (6)  |
| 5. Inorganic chemistry         | obligatory      | M. Kristl           | 45                           | 15      |   |          | 60                  | 120             | 180/ 6           |
| 6. Analytical chemistry II     | obligatory      | D. Brodnjak-Vončina | 30                           |         |   | 30       | 60                  | 120             | 180/ 6           |
| <b>Total hours/ ECTS</b>       |                 |                     |                              |         |   |          | <b>157,5</b>        | <b>292,5</b>    | <b>450/15</b>    |

\*\* Subject is obligatory except in binding with Physics, where students choose a professional subject defined in the second part of the study programme.

First year represents joint basics of the study which consists of lectures and seminars within 6 obligatory subjects. During the first two semesters students perform 900 hours of organised and individual forms of study work. After completion all study obligations of the first year, students gain 30 ECTS.

### 2<sup>nd</sup> year, 3<sup>rd</sup> semester

| Course title                              | Type of subject | Professor            | Range of realization (hours) |          |          |    | Total contact hours | Individual work | Total hours/ECTS |
|-------------------------------------------|-----------------|----------------------|------------------------------|----------|----------|----|---------------------|-----------------|------------------|
|                                           |                 |                      | L                            | S        | T        | LW |                     |                 |                  |
| 7. Psychology of development and learning | obligatory      | K. Bakračević Vukman | 22,5 (45)                    | 7,5 (15) | 7,5 (15) |    | 37,5 (75)           | 52,5 (105)      | 90 (180)/ 3 (6)  |
| 8. Organic chemistry 1                    | obligatory      | P. Krajnc            | 60                           | 15       |          | 45 | 120                 | 240             | 360/ 12          |
| <b>Total hours/ ECTS</b>                  |                 |                      |                              |          |          |    | <b>157,5</b>        | <b>292,5</b>    | <b>450/15</b>    |

### 2<sup>nd</sup> year, 4<sup>th</sup> semester

| Course title                                      | Type of subject | Professor   | Range of realization (hours) |          |          |         | Total contact hours | Individual work | Total hours/ ECTS |
|---------------------------------------------------|-----------------|-------------|------------------------------|----------|----------|---------|---------------------|-----------------|-------------------|
|                                                   |                 |             | L                            | S        | T        | LW      |                     |                 |                   |
| 9. Information and communication technology (ICT) | obligatory      | I. Gerlič   | 15 (30)                      |          |          | 15 (30) | 30 (60)             | 30 (60)         | 60/(120) 2 (4)    |
| 10. Organic chemistry 2                           | obligatory      | P. Krajnc   | 60                           |          |          | 30      | 90                  | 90              | 180/ 6            |
| 11. Laboratory technique                          | obligatory      | D. Sikošek  | 10                           | 15       |          | 25      | 50                  | 70              | 120/ 4            |
| 12. Basics of molecular biology                   | elective        | U. Potočnik | 7,5 (15)                     | 7,5 (15) |          |         | 15 (30)             | 75 (150)        | 90 (180)/ 3 (6)   |
| 13. English for Chemists                          | elective        | N. Šabec    |                              | 7,5 (15) | 7,5 (15) |         | 15 (30)             | 75 (150)        | 90 (180)/ 3 (6)   |
| <b>Total hours/ ECTS</b>                          |                 |             |                              |          |          |         | <b>185</b>          | <b>265</b>      | <b>450/15</b>     |

During two semesters of the second year students perform 900 hours of organised and individual forms of study work. After completion of all study obligations of the second year, students gain 30 ECTS.

In semester 4 students choose one of two optional subjects.

### 3<sup>rd</sup> year, 5<sup>th</sup> semester

| Course title                 | Type of subject | Professor              | Range of realization (hours) |          |        |    | Total contact hours | Individual work | Total hours/ ECTS |
|------------------------------|-----------------|------------------------|------------------------------|----------|--------|----|---------------------|-----------------|-------------------|
|                              |                 |                        | L                            | S        | T      | LW |                     |                 |                   |
| 14. Pedagogy                 | obligatory      | Mateja Pšunder         | 15 (30)                      | 7,5 (15) |        |    | 22,5 (45)           | 37,5 (75)       | 60/(120) 2 (4)    |
| 15. Physical Chemistry 1     | obligatory      | A. Petek               | 60                           |          |        |    | 60                  | 90              | 150/5             |
| 16. Technologies overview    | obligatory      | M. Habulin             | 60                           |          |        | 15 | 75                  | 75              | 150/5             |
| 17. Chemistry of materials   | elective        | M. Drogenik, P. Krajnc | 10 (20)                      |          | 5 (10) |    | 15 (30)             | 75 (150)        | 90 (180)/ 3 (6)   |
| 18. Mathematics in chemistry | elective        | P. Žigert              | 10 (20)                      |          | 5 (10) |    | 15 (30)             | 75 (150)        | 90 (180)/ 3 (6)   |
| <b>Total hours/ ECTS</b>     |                 |                        |                              |          |        |    | <b>172,5</b>        | <b>277,5</b>    | <b>450/15</b>     |

### 3<sup>rd</sup> year, 6<sup>th</sup> semester

| Course title  | Type of subject | Professor       | Range of realization (hours) |          |   |    | Total contact hours | Individual work | Total hours/ ECTS |
|---------------|-----------------|-----------------|------------------------------|----------|---|----|---------------------|-----------------|-------------------|
|               |                 |                 | L                            | S        | T | LW |                     |                 |                   |
| 19. Didactics | obligatory      | M. Ivanuš Grmek | 15 (30)                      | 7,5 (15) |   |    | 22,5 (45)           | 37,5 (75)       | 60/(120) 2 (4)    |

|                                             |            |                            |             |             |  |            |              |               |                              |
|---------------------------------------------|------------|----------------------------|-------------|-------------|--|------------|--------------|---------------|------------------------------|
| 20. Physical Chemistry 2                    | obligatory | A. Petek                   | 30          | 30          |  | 60         | 120          | 180           | 300/ 10                      |
| 21. Project Work in Science Education       | elective   | N. Vaupotič,<br>D. Sikošek | 7,5<br>(15) | 7,5<br>(15) |  |            | 15<br>(30)   | 75 (150)      | <b>90</b><br>(180)/<br>3 (6) |
| 22. Fundamentals of Environmental Chemistry | elective   | P. Krajnc                  | 15<br>(30)  | 7,5<br>(15) |  | 15<br>(30) | 37,5<br>(75) | 52,5<br>(105) | <b>90</b><br>(180)/<br>3 (6) |
| <b>Total hours/ ECTS</b>                    |            |                            |             |             |  |            | <b>180</b>   | <b>270</b>    | <b>450/15</b>                |

In the third year students perform 6 obligatory subjects. Students choose one of two optional subjects in semester 5 and 6. During these semesters students perform 900 hours of organised and individual forms of study work and gain 30 ECTS.

## **EXAMINATION AND ASSESMENT REGULATIONS**

Types of assesment:

- written and oral exams
- written and oral colloquium
- assesment of composition and presentation of seminar papers
- products and projects
- real problem solving
- completion of open tasks/problems

Final forms of examination are defined within subject syllabuses of the study programme; The examination and assesment of students' knowledge consists of:

- grade from (laboratory) practice
- grade from written and/or oral exam / colloquium
- grade from project work
- presentation of seminar paper

By assesing, university tecahers follow the basic rules and regulations of assesment, defined by the Senat of the Faculty Of Natural Sciences And Mathematics and other statutes of University Of Maribor.

## **FINAL EXAMINATION**

There is no final examination.

## **EXAMINATION AND ASSESMENT REGULATIONS**

The examinations are usually written and oral. Some of the courses involve the preparation of a seminar work which is usually defended by an oral presentation. The oral examination is usually preconditioned by laboratory attendance, the successful completion of the written exam and the seminar work where required.

Timetables of examinations are issued yearly by the Faculty senate at the beginning of the academic year and are published on the faculty web page and on the notice boards. There are at least 6 examinations for each course per academic year and students are free to choose the date of examination. The students need to register for examination 7 days before the examination date. The examination can be cancelled no later than 3 days before the examination date. The use of calculators, literature and other items during the examination is determined by the lecturer and may vary from course to course.

## **ECTS DEPARTMENTAL CO-ORDINATOR**

ECTS departmental co-ordinator is the actual head of the department.

#### 4.2.2.2 Seznam predavanj / List of Courses

### The two-subject bachelor programme Educational Chemistry

| Code | Course title                                   | Type | ECTS |
|------|------------------------------------------------|------|------|
| 1    | Mathematics                                    | O    | 3    |
| 2    | General Chemistry                              | O    | 8    |
| 3    | Analytical chemistry I                         | O    | 4    |
| 4    | Physics                                        | O    | 3    |
| 5    | Inorganic chemistry                            | O    | 6    |
| 6    | Analytical chemistry II                        | O    | 6    |
| 7    | Psychology of development and learning         | O    | 3    |
| 8    | Organic chemistry 1                            | O    | 12   |
| 9    | Information and communication technology (ICT) | O    | 2    |
| 10   | Organic chemistry 2                            | O    | 6    |
| 11   | Laboratory technique                           | O    | 4    |
| 12   | Basics of molecular biology                    | E    | 3    |
| 13   | English for Chemists                           | E    | 3    |
| 14   | Pedagogy                                       | O    | 4    |
| 15   | Physical Chemistry 1                           | O    | 5    |
| 16   | Technologies overview                          | E    | 5    |
| 17   | Chemistry of materials                         | O    | 3    |
| 18   | Mathematics in chemistry                       | E    | 3    |
| 19   | Didactics                                      | O    | 2    |
| 20   | Physical Chemistry 2                           | O    | 10   |
| 21   | Project Work in Science Education              | E    | 3    |
| 22   | Fundamentals of Environmental Chemistry        | E    | 3    |
| 23   | Fundamentals of Computer Science               | O    | 6    |
| 24   | Modern Biology                                 | O    | 6    |

O ... obligatory course

E ... elective course