SLOVENSKO OGRODJE KVALIFIKACIJ

Archived

Doktor znanosti/doktorica znanosti s področja kemije in kemijske tehnike

Selected qualifications

Name of qualification	Doktor znanosti/doktorica znanosti s področja kemije in kemijske tehnike
Translated title (no legal status)	Doctorate in the field of chemistry and chemical engineering
Type of qualification	Doktorat
Category of qualification	Izobrazba
Type of education	Doctoral education
Duration	3 years
Credits	180 credits

Admission requirements

Enrolment in the third-cycle (Bologna) doctoral programme in Chemistry and Chemical Engineering is open to candidates who have completed:
• a second-cycle study programme in any field
• an academic higher education programme adopted before 11 June 2004
• a professional higher education programme adopted before 11 June 2004 and a study programme to obtain a specialised qualification. Prior to enrolment in the programme, course units essential for further study totalling 30 ECTS credits will be determined for such candidates and prescribed by the studies committee at the proposal of the supervisor
• a study programme from a domestic or foreign university giving access to professions regulated by EU directives, or other integrated master's degree programme

ISCED field

Field
Tehnika, proizvodne tehnologije in gradbeništvo

ISCED subfield

subfield kemijsko inženirstvo in procesi

Qualification level

SQF 10
EQF 8
Third level

Learning outcomes

Qualification holders are qualified to:

(general competences)

- develop brand-new knowledge, concepts and methods on the basis of concrete problems,
- introduce new methodologies in the independent resolution of problems in the fields of chemical engineering, biochemical engineering, chemical environmental protection and sustainable development, chemistry and chemometrics and materials chemistry,
- use acquired highly specialised knowledge to address the most complex qualitative and quantitative tasks in the fields of chemistry, chemical engineering and biochemical engineering,
- identify and resolve the most complex problems through application of the most modern scientific methods and procedures in a given specialised field,
- carry out scientifically supported analysis and synthesis in the field of chemical and biochemical engineering and demonstrate understanding of the influence of technical solutions on environmental and social relations,
- deal holistically with problems on the basis of fundamental and advanced analytical and synthetic approaches,
- integrate technical applications with finances, management and business organisation,
- communicate effectively, including in foreign languages, and use modern presentation tools,
- publish the results of research in prominent journals/symposia,
- demonstrate understanding of the principles of leadership and business practice,

- demonstrate understanding of own professional and ethical responsibility,
- demonstrate understanding of the interdependence of different types of knowledge and procedures and the importance of using specialised literature,
- design plans and strategies to achieve the most complex goals,
- use relevant software,
- demonstrate autonomy in professional work and research,
- acquire the knowledge necessary to participate in other research groups or work in development laboratories in manufacturing organisations.

(subject-specific competences)

- use and develop information technology and advanced computer tools for systems thinking and environmental modelling,
- define technologically and economically optimal configurations of (bio)reactor systems,
- demonstrate understanding of the method of validation of new measuring procedures, and its importance,
- demonstrate familiarity with procedures of formulation into a product with specific properties for an application,
- demonstrate familiarity with complex thermodynamic and transport models and their areas of use,
- demonstrate mastery of and develop the theory and applications of modern mathematical programming in the synthesis of processes and other technical structures,
- demonstrate proficiency in mathematical modelling of chemical and biochemical processes,
- plan and optimise processes and transfer them to the industrial scale,
- demonstrate mastery of in-depth chemical engineering knowledge for the understanding, description and addressing of complex problems in the planning and operation of chemical and biochemical processes, innovation in existing processes and the development of new processes and products,
- demonstrate mastery of methodologies for the preparation of studies and carry out economic evaluation of processes and projects,
- demonstrate understanding of safety, health and the environment and ability to use and develop the concept of sustainability,
- demonstrate understanding of and develop the concept of chemical product engineering,
- apply acquired knowledge in the education process at university faculties, secondary technical schools and in industry.

As well as the common subject-specific competences listed above, doctoral candidates will acquire the following narrower competences with regard to their selected stream:

Chemistry stream:

- the ability to plan and use processing techniques to obtain new products with different properties,
- the ability to plan syntheses of new organic compounds and autonomous proficiency in physical organic chemistry,
- understanding of the complex connections between the structural properties of organic compounds, their reactivity and their spectral characteristics,
- the ability to autonomously plan chemical processes for the synthesis of new coordination compounds,
- the ability to plan the synthesis and structure of new polymers with the desired properties,
- familiarity with and the ability to develop methods for the controlled synthesis of nanoparticles,
- the ability to autonomously plan development research for the manufacture of planned ceramic materials,
- in-depth understanding of the influence of the structure of materials on their physical and chemical properties,
- the ability to use and plan laboratory procedures for the sonochemical synthesis of nanoparticles in

aqueous and non-aqueous solvents,
- the ability to scientifically evaluate experiments to plan processes of polymer membrane formation using wet phase inversion,
- familiarity with methods of optimisation of the effect of validations of new measuring procedures in the R&D, standardisation and metrological fields (at the national and international levels),
- the ability to use, modify and develop electrochemical sensors and methods for in-depth studies and the comparison of different analytical systems,
- the ability to introduce key processes relating to technical infrastructure into the working environment,
- the ability to use and develop analytical methods to monitor the surface properties of polymers and the stability of colloids.

Chemical engineering:

- the ability to develop new mathematical methods and optimisation procedures in the addressing of applied problems,
- familiarity with and the ability to develop practical possibilities for energy optimisation and the use of renewable sources,
- mastery of the conceptual planning of sustainable processes,
- the ability to select suitable techniques, skills and other modern tools for the addressing of problems in science,
- the ability to manage uncertainties and risks in decision-making processes within the manufacturing or business process and apply methods of technical and economic optimisation in order to evaluate the viability of investment in energy systems,
- comprehensive understanding and planning of complex new industrial (bio)reactor systems,
- the development of new natural products with high added value, the ability to plan implementation of advanced biocatalytic reactions in unconventional media,
- the ability to identify common connections in environmental systems and creatively seek improvement,
- the ability to analyse the problem of waste water treatment and select the optimal solution to the problem.

Assessment and completion

Students' knowledge is assessed by means of practical exercises and seminar papers, and also via products, projects, performances, services, etc. and by examinations. Examination performance is scored as follows: 10 (excellent); 9 (very good: above-average knowledge but with some mistakes); 8 (very good: solid results); 7 (good); 6 (adequate: knowledge satisfies minimum criteria); 5–1 (inadequate). In order to pass an examination, a candidate must achieve a grade between adequate (6) and excellent (10).

Progression

Students may progress to the next year if they have met the requirements defined by the programme. Conditions for progress to the 2nd year are the completion of all first-year course units (60 ECTS credits). Conditions for progress to the 3rd year are the completion of all second-year course units (60 ECTS credits).

Condition for obtaining certificate

In order to complete the third-cycle doctoral programme in Chemistry and Chemical Engineering, students must complete all course units prescribed by the programme for a total of at least 180 ECTS credits, have a first paper published in a scholarly journal, have a second paper submitted for publication and write and successfully defend a doctoral dissertation. A patent or a new application may take the place of the second paper.

Awarding body

Faculty of Chemistry and Chemical Technology, University of Maribor

URL

http://www.fkkt.um.si/en