



# JOŽEF STEFAN INTERNATIONAL POSTGRADUATE SCHOOL

Summary of Self-Evaluation Report  
for the 2024/25 Academic Year

Mission · Integration into Environment and Society · Study Programmes · Teaching Staff · Students ·  
IPS Recognition Awards · Student Achievements · Social Life · Study and Research Support



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## DEAN'S FOREWORD

### **Dear readers, students, supervisors, colleagues and partners,**

This brochure complements the Self-Evaluation Report of the Jožef Stefan International Postgraduate School for the 2024/25 academic year. It offers a brief overview of our main achievements, developments and priorities.

Our work is guided by the quality cycle: planning, implementation, evaluation and improvement. By regularly reflecting on our work and introducing targeted improvements, we aim to ensure a high standard of study programmes, research and student support.

In the 2024/25 academic year, we further strengthened students' involvement in research, increased scientific output, and expanded cooperation with international partners and industry. We are especially pleased with the strong international character of our school and the active role of our students in national and European projects.

We also place great importance on strengthening the competences of all those involved in the educational process — students, supervisors and teachers. In a time of rapid change, new demands require new approaches to teaching and learning. We therefore continue to develop more innovative, interdisciplinary and digitally supported ways of working.

In all that we do, we strive to create an open, stimulating and responsible environment based on excellence, interdisciplinarity and sustainable development. We also remain committed to connecting science with society through projects, events and wider engagement.

I would like to sincerely thank everyone who helps shape our school — students, supervisors, researchers, industry partners and the wider community. Together, we continue to build a space of knowledge, cooperation and inspiration.

**May this brochure be both a reflection of our work and an invitation to future collaboration.**

Prof. Milena Horvat,  
Dean

# IPS Mission

The mission of the Jožef Stefan International Postgraduate School (hereinafter IPS) is to **ensure the highest quality of master and doctoral postgraduate studies** with the help of a research and educational process in an intensive R&D and innovative environment.

Additionally, the school aims **to contribute to strengthening the role of excellent science and high technologies** in the development potential of the society, which can significantly **contribute to the economic power and harmonious social development**. The IPS acts as

a **centre of excellence** closely interlacing **basic research with postgraduate education and innovation development**. Research achievements are directly incorporated into innovation projects aimed at developing production, service activities, and management. IPS masters and doctors, together with their supervisors and co-supervisors, contribute to new achievements in basic research and innovation development.

Slovenian Quality Assurance Agency for Higher Education (**NAKVIS**) established that in addition to the legal provisions, the IPS also meets the Criteria for Accreditation and Reaching Quality Standards, as defined in the Criteria, and therefore prolonged the accreditation of the school until 30 September 2028.

To realise the vision of the school, we follow **three long-term strategic orientations**:

## 1 Strategic Orientation

**Improving the study process**, which will focus on students and their research path. The emphasis is placed on supervising work, competence development, innovative teaching methods and creating an environment that encourages creativity.

## 2 Strategic Orientation

**Increasing IPS visibility** and international integration of IPS through greater involvement in international projects, networks, exchanges, and partnerships. The IPS strives to increase the mobility of students and teachers, increase the representation of foreign students, and establish its research content in the European higher education space.

## 3 Strategic Orientation

**Connecting research and social responsibility** which includes collaboration with the industry, local community and NGOs, as well as incorporating sustainable, digital, green and inclusive topics into teaching content and research work.

The school monitors the realisation of these goals using a set of **quality indicators** that include both quantitative and qualitative data on the effectiveness of the study process, student research performance, international mobility, graduate employment, and contribution to sustainable development. The quality indicators are not only a measurement tool, but also an important basis for self-reflection and strategic decision-making.

Quality Indicator	Goal	Realised
• Courses with new methodologies	1	2
• Courses with advanced competence tools	1	2
• Average score of professors	4.5	4.7
• Competence workshops	1	4
• Advancement from 1st to 2nd year	80%	86%
• Advancement from 2nd to 3rd year	80%	95%
• Graduation during the period of student status	50%	46%
• Average number of articles	3	3.39
• Percentage of A* articles	20%	8%
• Erasmus mobile individuals	15	42
• Percentage of foreign students	30%	46%
• Joint doctoral degrees	1	0
• Bilateral agreements	35	33
• International projects (coordinator or partner)	1	2
• Social media posts	100	100
• Website visits	4000	37913
• Participants in IPSSC	40	64
• External participants in IPSSC	5	10
• IPSSC sponsors	3	10
• IPS events in the media	2	4
• Grade of newly enrolled students	8.5	8.9
• Theses prepared in collaboration with the industry	1	1
• Agreements with the industry	1	1
• Employment of graduates in the industry	10%	15%
• Courses on the topic of sustainability	4	12
• Collaboration with NGOs/local communities	2	4

## COLLABORATION WITH NATIONAL INSTITUTES

The basic strategy of the IPS is **to invite leading researchers** from the founding and partner institutes in the selected fields and include them in the research and educational process of the school. Thus, in collaboration with the IPS founders and partners, who also provide state-of-the-art research infrastructure, the school ensures material and intellectual capacities in order to educate new masters and doctors of science.

**Jožef Stefan Institute (JSI)**  
**Institute of Metals and Technology (IMT)**  
**National Institute of Biology (NIB)**



## COLLABORATION WITH INDUSTRIAL PARTNERS

Through industrial seminars, joint research projects, and involvement of industry representatives in evaluation and expert procedures, the IPS strengthens the mutual transfer of knowledge and creates long-term partnerships focused on developing competences for the needs of the modern labour market. Practical seminars, joint project development, and collaboration on students' doctoral dissertations and master theses contribute to the direct transfer of knowledge into practice. Such a model enables a flexible response to the needs of the environment while drawing development challenges directly from industry and the community.

17 founders and associate partners:

**BSH**, Nazarje  
**Cosylab**, Ljubljana  
**Domel**, Železniki  
**ETI**, Izlake  
**Gorenje**, Velenje  
**HYB**, Šentjernej  
**Kolektor Group**, Idrija  
**LTH Ulitki**, Škofja Loka  
**Luka Koper**, Koper

**Premogovnik Velenje**, Velenje  
**Alpacem**, Anhovo  
**Slovenian Insurance Association**, Ljubljana  
**Štore Steel**, Štore  
**Telekom Slovenije**, Ljubljana  
**Termoelektrarna**, Šoštanj  
**Trimor**, Trebnje  
**Unior**, Zreče



The IPS was established mostly out of the need for an efficient transfer of excellent research achievements to the industry and the service sector.



The school aims to contribute to strengthening the role of excellent science and high technologies in the development potential of society.



The IPS acts as a centre of excellence closely interlacing basic research with education and innovation development.



The IPS fosters collaboration with excellent Slovenian and international institutions, scientists and research groups.

# Integration of IPS into Environment and Society

The IPS cultivates integration into the environment and society by directly connecting and implementing all its activities with founding and partner institutes, by contributing to the world treasury of knowledge, and by increasing the efficiency of drawing from it. Great concern is devoted to inviting excellent Slovenian and foreign institutions to collaborate with the IPS in the field of study programmes, projects and special actions by individually including international leading scientists as IPS visiting professors and by encouraging collaboration between IPS professors and leading research groups in the framework of joint projects.

## IPS PROJECTS

The IPS has a research group which participates in an **ARIS programme** and various projects. It also carries out joint Slovenian and European research and development projects in collaboration with its founders and other partners from the business and non-business sectors. In the 2024/2025 academic year, the IPS coordinated the **Erasmus+ KA2 project IGNITE**, which promotes sustainable innovation and entrepreneurship in STEAM study programmes through personalised digital solutions and innovative teaching methods. The project develops nano-learning modules, a virtual learning environment, an innovation marathon, and a competence-monitoring application supporting students' career development. The IPS also participated in the **Erasmus+ project GreenLead** (2024–2026), which focuses on defining the role of a green leader and supporting organisations in establishing green departments through a competence framework, curriculum and e-learning platform. In addition, IPS obtained two new **Erasmus+ projects**, **BeeSensorVET**, coordinated by IPS, and **GreenBye**, where

IPS participates as a project partner; both will start in the 2025/2026 academic year.

In the field of research, IPS is involved in the **MultiPart project funded by ARIS**, which investigates environmental impacts on human health using a participatory multi-stakeholder approach and advanced analytical and digital methods. IPS also implemented the **Proact-STEM operation** within the national PUŠ "**Students in the Working Environment**" programme, focusing on the development of a platform for monitoring sustainable entrepreneurial competencies and promoting sustainable innovations among STEM students. The results will be further developed in the future **Digi-STEM project** also financed by the national PUŠ programme. IPS also continued its participation in the **Erasmus+ TSAAI project**, contributing to the development of the "FUTUR-IA" platform for training students in applied artificial intelligence, which was successfully completed in the 2024/2025 academic year.

In the 2024/2025 academic year, the IPS continued implementing **two Erasmus Mundus projects** – joint master **GREENANO** within the Nanosciences and Nanotechnologies programme together with partners from France and Italy, and joint master **SpaceMED** within the Ecotechnologies programme together with partners from France and Germany. GREENANO is dedicated to promoting the development of nanomaterials for the green and digital transition, which requires new powerful and sustainable devices. The SpaceMED master programme takes an interdisciplinary approach to studying the effects of extreme environments, particularly space flight, on humans, with an emphasis on practical work in state-of-the-art laboratories and field studies. IPS also participated in the **EIT RIS DustRec-II project**, engaging higher education students in developing processing technologies with minimal waste and improved environmental and social impact. The EIT Dust-Rec project was completed in the academic year 2024/2025.



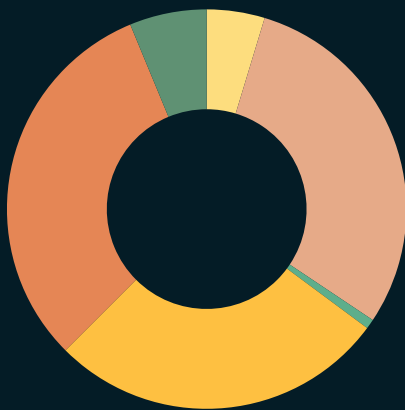
## STUDENTS FROM AROUND THE WORLD

46 % of IPS students come from outside of Slovenia (shown as green on the map), representing a diverse international community with students from over 40 countries, mainly from Europe, Asia, and the Americas.

- |                        |                 |                    |
|------------------------|-----------------|--------------------|
| Australia              | India           | The Philippines    |
| Azerbaijan             | Indonesia       | Poland             |
| Bangladesh             | Iran            | Romania            |
| Bosnia and Herzegovina | Ireland         | Russian Federation |
| Brazil                 | Italy           | Serbia             |
| China                  | Kosovo          | South Korea        |
| Colombia               | Lebanon         | Sri Lanka          |
| Croatia                | Mexico          | Syria              |
| Czechia                | Morocco         | The Netherlands    |
| Ecuador                | Mongolia        | Tunisia            |
| Egypt                  | Montenegro      | Türkiye            |
| France                 | Nigeria         | Ukraine            |
| Germany                | North Macedonia | United Kingdom     |
| Greece                 | Pakistan        | Vietnam            |

## STUDENTS' ATTITUDE TOWARDS KNOWLEDGE IN SOCIETY AND ENVIRONMENT

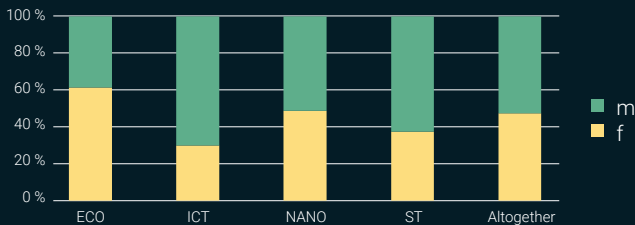
IPS students are actively involved in society and the environment, contributing to the dissemination of scientific knowledge and raising awareness of important societal challenges. They participate in public events such as Open Days at the Jožef Stefan Institute, science festivals, and workshops for schools, where they organise interactive demonstrations, hands-on experiments, and educational activities for pupils and the wider public. Many students also act as mentors or co-mentors to undergraduate, Erasmus+, and even high-school students, supporting research projects and encouraging the next generation of scientists. Their engagement extends to citizen science initiatives, environmental awareness activities such as workshops on plastic pollution, and projects that involve the public in research (e.g., sampling biofilms on solar panels). Through these activities, IPS students help bridge the gap between research and society while developing valuable communication and leadership skills.



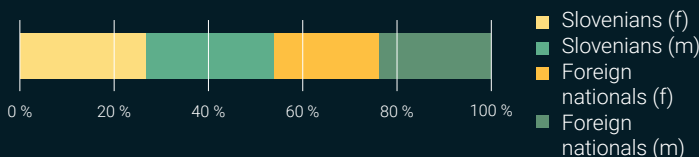
ENROLLED STUDENTS BY REGION

- Africa
- Asia
- Australia
- EU countries (excl. Slovenia)
- Non-EU countries
- Americas

### STUDENT STRUCTURE BY SEX AND STUDY PROGRAMMES



### STUDENT STRUCTURE BY SEX AND NATIONALITY

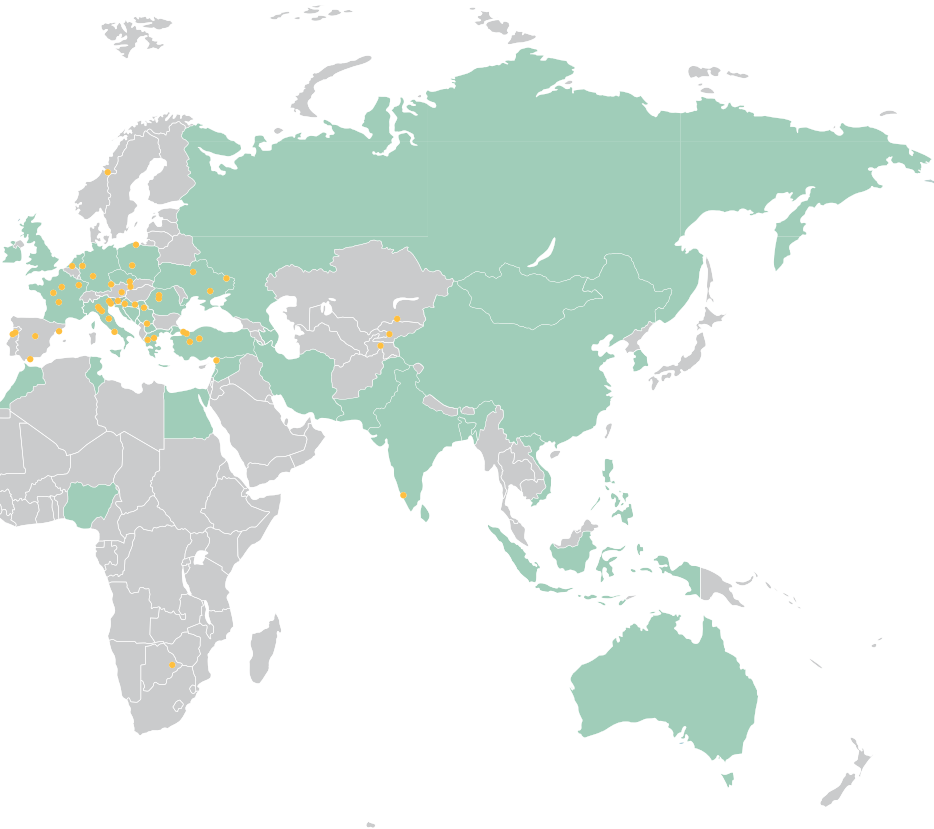


## INTERNATIONAL AGREEMENTS

Beyond outreach activities, IPS students contribute to public discourse and knowledge transfer through media appearances (radio, television), public lectures, interviews, and articles in both professional and popular journals. They present their work at international conferences, workshops, and research seminars, participate in international scientific networks and societies, and contribute to policy- or industry-relevant reports, standards, and innovation initiatives. Many are involved in organising conferences, student research events, and international workshops, while also communicating research through social media, podcasts, and science communication platforms. Through these diverse activities, IPS students actively co-create the scientific and cultural space, promoting scientific literacy, interdisciplinary collaboration, and responsible engagement with societal and environmental challenges.

The IPS currently holds **46 collaboration** agreements with foreign research and higher education organisations (shown as dots on the map):

- Al-Farabi Kazakh National University, Almaty, Kazakhstan
- Anadolu University, Eskisehir, Türkiye
- Aristotle University of Thessaloniki, Greece
- Atilim University, Türkiye
- Babes-Bolyai University, Cluj-Napoca, Romania
- Botswana International University of Science and Technology, Botswana
- Deggendorf Institute of Technology, Germany
- Dnipro University of Technology, Ukraine
- Josip Juraj Strossmayer University of Osijek, Croatia
- Mahatma Gandhi University, Kottayam, Kerala, India
- Max Planck Institute for Iron Research (MPIE), Düsseldorf, Germany
- Montanuniversität Leoben, Austria
- Mustafa Kemal University, Antakya, Türkiye
- National Aerospace University "Kharkiv Aviation Institute", Ukraine
- Norwegian University of Science and Technology, Trondheim, Norway
- Nuclear Technology Development Center (CDTN), Belo Horizonte, Brazil
- Osh State University and I.K. Akhunbaev Kyrgyz State Medical Academy, Kyrgyzstan
- Sabancı University, Istanbul-Tuzla, Türkiye
- Slovak University of Technology in Bratislava, Slovakia
- Taras Shevchenko National University of Kyiv, Ukraine
- Technical University of Cluj-Napoca, Romania
- Technical University of Darmstadt, Germany
- Tomas Bata University in Zlín, Czech Republic
- Universidad Autónoma de Madrid, Spain
- Universidad de las Palmas de Gran Canaria, Spain
- Universidade de Trás-os-Montes e Alto Douro, Portugal
- Universitat de Barcelona, Spain
- Université de Limoges, France
- Université de Lorraine, Nancy, France
- University of Antwerp, Belgium
- University of Belgrade, Serbia
- University of Gdansk, Poland
- University of Ioannina, Greece
- University of La Laguna, Tenerife, Spain
- University of Malaga, Spain
- University of Pavia, Italy
- University of Perugia, Italy
- University of Porto, Portugal
- University of Prishtina, Kosovo
- University of Salerno, Italy
- University of Tours, France
- University of Udine, Italy
- University of Wrocław, Poland
- University of Zagreb, Croatia
- University of Parma, Italy
- Yeditepe University, Istanbul, Türkiye



# Study Programmes

## NANOSCIENCES AND NANOTECHNOLOGIES

master and doctoral degree programme

The Nanosciences and Nanotechnologies programme represents a field at the crossroads of physics, chemistry, and biology, combined with elements of electrical engineering, medicine, and environmental sciences. It explores nature and the use of systems with components of nanometric size. Potential applications can also be found in almost all economic sectors.

### PROGRAMME PRESENTATION

The principal objective of studying nanosciences is **to acquire the understanding of the structure and dynamics of materials at an atomic and molecular level**, which is also the basis for their macroscopic properties. Through knowledge of methods of **atomic and molecular micromanipulation** we can build new molecules, devices and machines with entirely new properties and possibilities of application. Some examples are projects aimed at building atomic-scale computer components, constructing new sensors at a molecular level, which can sense specific viruses and bacteria, magnets at a level of specific molecules, nanoparticles that serve as carriers of active substances for targeted cancer therapies, micromotors and molecules which can use sunlight to control environmental contaminants.

One of the programme's virtues is also **successfully ensuring multidisciplinary approaches** of nanophysics, nanochemistry, biosciences, material sciences and nanomechanics. This systematic cultivation of coordinated inter- and multi-disciplinary approaches allows for a fast discovery of **new fields of applications**. This is also supported by the project-oriented structure of the study programme, as all students are **directly involved in economic, national, and international projects**. Within the framework of projects and alongside research work, they discover and deepen the methods for creating, transferring and applying knowledge. Being involved in the projects gives the students **access to the state-of-the-art research equipment** within the JSI, associate institutes, and centres of excellence.

### PROGRAMME IN THE CONTEXT OF USER NEEDS

Nanosciences and Nanotechnologies is an interdisciplinary study programme covering the following research fields:

- 1 **new nanomaterials and nanochemistry,**
- 2 **nanophysics** (including physics of artificial nanostructures and the development of methods of research and nanomanipulation of atoms and molecules, and their dynamics),
- 3 **biosciences** (including biomedicine),
- 4 **advanced metallic materials,**
- 5 **nanomechanics** (including mechanics of time-dependent materials).

All the fields also include the fundamental knowledge needed for establishing successful communication with experts in the field of **commercial and civil law, microeconomics of companies and project management, and the basics of sustainable development**.

More information:

MASTER STUDIES

DOCTORAL STUDIES



The Nanosciences and Nanotechnologies programme attracts a lot of students each year. The principal reasons behind that are the prospects of nanotechnologies in relation to the development of high technologies and products with high added value. To the same extent, young researchers are also attracted by breakthrough research in this particular field, interesting international projects and excellent researchers acting as their supervisors.

# INFORMATION AND COMMUNICATION TECHNOLOGIES

master and doctoral degree programme

The Information and Communication Technologies study programme is an interdisciplinary postgraduate programme that follows the latest trends in the field and, through its outstanding research results, directly contributes to pushing the boundaries of knowledge and technology in its field. The programme covers the following areas: knowledge technologies, advanced internet technologies, computer structures and systems, information security systems, intelligent systems and robotics, modern concepts in telecommunications, while the master programme also includes the field of digitisation.

## PROGRAMME PRESENTATION

The study programme is oriented towards solving actual problems and digital challenges of the modern society. Examples of such challenges are the Future Internet and the Internet of Things as factors that will have a decisive impact on the life of the society in the future years, and lately also the digitalisation of economic operators, the development of services of the digital market, and artificial intelligence. Despite concerns that the Future Internet and the Internet of Things interfere with the living space of an individual, they should in fact be accepted as a challenge for further development and an opportunity to realise creative ideas. The reoccurring economic crises will also shape the future of workplaces in numerous branches of economy. Basic knowledge of information and communication technologies is crucial even for our sole survival, while a more profound knowledge of the field is becoming vital in research work, development of new products and services, economic analyses, medicine, and the entire field of sustainable development.

## PROGRAMME IN THE CONTEXT OF USER NEEDS

**Modern information and communication technologies are of key importance for the economic and social progress:** new and efficient ways of exchanging information expand the development possibilities of production, the service sector, scientific, cultural and social establishments, and in addition fundamentally support the transfer of knowledge with the aim of sustainably developing a knowledge society. In the increasingly globalised economy, the information and communication technologies are crucial for ensuring competitiveness and economic growth of companies, and also entire countries.

**Development of the knowledge society primarily depends on the development of the knowledge-based economy** which further on depends on the most educated and enterprising experts who master quick access to information, efficient ways of managing it and recognising essential messages, as well as its incorporation into problem solving within the development and optimisation of new procedures, products, and services. **Information and communication technologies play an important role in increasing the employment structure** in every single field since Europe, and Slovenia within, can face the world competition only with a highly competent workforce that masters digital skills and where the ability of quickly acquiring, managing, transferring and applying information is an inevitable

requirement of the modern management. For the needs of integration into the emerging European digital market, attention in delivering the learning content will be devoted to the digitalisation of the economy, which is a prerequisite for an equal position of economic operators in the implementation and operation of the digital market and related trust services. The Information and Communication Technologies postgraduate study programme therefore provides to future masters and doctors of science fundamental knowledge in the given fields, while at the same time it prepares them for **solving key development problems**, such as increasing the efficiency of production and marketing processes, management support in companies, administrative authorities and in banking, upgrading business processes with ICT technology, ensuring business security, facing the challenges of artificial intelligence, developing new branches of economy, environment and health protection, as well as creating new quality employment opportunities in all the given fields.

Within the programme, research is mostly conducted in the following fields:

- 1 knowledge technologies,
- 2 advanced internet technologies,
- 3 computer structures and systems,
- 4 intelligent systems and robotics,
- 5 modern concepts in telecommunications,
- 6 information security systems,
- 7 digitalisation.

The application of acquired knowledge includes **management of networks, high performance computer resources and artificial intelligence technologies and especially machine learning for computer-assisted analysis of databases/data warehouses** generated as a result of scientific research in the fields of physics, chemistry, biology, biochemistry and pharmacology, bioinformatics, environmental sciences, and also in the fields of social and economic sciences, as well as the data that is accumulated as a result of ambient measurements and data acquisition on the Internet.

The implementation of the study programme is interlaced with national and especially EU projects within which ICT achieves enviable results in both the scope and complexity of research which also directly involves the students of the school.

More information:

MASTER STUDIES

DOCTORAL STUDIES



**The implementation of the study programme is interlaced with national and especially EU projects within which ICT achieves enviable results in both the scope and complexity of research which also directly involves the students of the school.**

# ECOTECHNOLOGIES

## master and doctoral degree programme

The Ecotechnologies programme incorporates science that supports the efforts of meeting the needs of the humankind in harmony with nature while causing as little damage to the environment as possible, especially by efficiently incorporating natural processes. As it is oriented towards solving actual problems, which calls for a comprehensive approach, ecotechnologies are characterised by bringing together achievements from natural, technological and social sciences, which are oriented towards sustainable development. That makes the multidisciplinary approach a strong characteristic of the Ecotechnologies programme. Emphasis is also placed on the environmental and economic approach.

### PROGRAMME PRESENTATION

The strategy of sustainable development incorporates the **integration of environmental, technological, economic and social objectives, especially in production and consumption**. The study programme provides the acquisition of knowledge and the development of skills in order to be able to carry out competent research, **establish international connections, and manage sustainability-oriented development**, transfer and application of ecotechnologies.

The emphasis is placed on threefold qualifications:

- **broadening and deepening of scientific content, methods and techniques** in selected fields of natural sciences, technologies, engineering and informatics, which will support the strategic choice, development, transfer, optimisation, exploitation and supervision of selected ecotechnologies **for improving business efficiency while at the same time satisfying broader social interests in sustainable development**,
- developing competences and skills for **raising the quality of processes, products and services, and increasing the added value** while striving for excellence and maximal enforcement of the principles of sustainable development,
- **developing an integral way of thinking** which surpasses individual fields and develops competences for: communicating with experts from other disciplines and fields, **comprehensive problem definition, systemic approaches, decision-making and solving complicated problems** in teams, and strategic planning with a long-term perspective

It should especially be emphasised that the school **systematically steers** the Ecotechnologies postgraduate study programme from the previously predominant environment protection content to a **more comprehensive orientation towards sustainable development, especially for improving the efficiency of using input materials and energy sources**. This requires a significantly stronger emphasis on a more efficient development and transfer of ecotechnologies and introducing sustainability-oriented consumption. Considering these demands, the Ecotechnologies programme requires the development and implementation of multidisciplinary synthesis methods, which the IPS systematically cultivates in the framework of postgraduate research oriented towards sustainable development.

### PROGRAMME IN THE CONTEXT OF USER NEEDS

The Ecotechnologies study programme is embedded in **development projects intended to achieve ecotechnological reform and progress in the production, service activities, and public services**. The programme emphasises economic efficiency alongside environment protection.

The topics of the programme are tied to solving actual problems in the following fields:

- 1 **tools for environmental quality control** which also include integrated modelling tools for political decision-making,
- 2 **development and testing of environmentally acceptable materials,**
- 3 **food and environmental health technologies,**
- 4 **characterisation and treatment of waste and waste waters,**
- 5 **water management,**
- 6 **plasma technologies,**
- 7 **development of intelligent systems for environmental quality control,**
- 8 **sustainable civil engineering.**

One of the programme's virtues is also that it successfully ensures **multidisciplinary approaches** which include the following fields: chemistry, geology, biochemistry, biological sciences, biotechnology, hydrology, ecotoxicology, chemical engineering, biostatistics, and modelling. In addition, these disciplines are to a great extent intertwined with tools that ensure **support to political decision-making in the field of environment and human health and/or ensure a practical value in the industrial environment**. This is also supported by the project-oriented structure of the study programme, as all students are directly involved in economic, national, and international projects. Within the framework of projects and alongside research work, they discover and deepen the methods for creating, transferring and applying knowledge. Being directly involved in the projects gives the students access to the state-of-the-art research equipment within the JSI, associate institutes, and centres of excellence.

More information:

MASTER STUDIES

DOCTORAL STUDIES



**The Ecotechnologies study programme educates top experts in the development and implementation of sustainable ecotechnological solutions that combine environmental, technological, economic, and social goals and strengthen the competitiveness of the economy, public sector, and service activities.**

# SENSOR TECHNOLOGIES

## doctoral degree programme

The Sensor Technologies programme is an interdisciplinary doctoral study programme that was first implemented in the 2016/2017 academic year.

Sensors have become an invisible yet indispensable part of our world. For example, our cars are full of sensors for regulating the engine functioning, speed, fuel consumption, temperature, ventilation and, last but not least, our own safety. Environmental sensors are crucial for pollution control. Biosensors, among which nanosensors, promise considerable progress, especially in healthcare. Designing and manufacturing of so many different sensors is enabled by sensor technologies which are based on outstanding achievements in science and technology.

The Sensor Technologies study programme connects knowledge from the fields of physics, chemistry, biology, materials, environmental and technical sciences, nanosciences and nanotechnologies, as well as information and communication technologies.

### PROGRAMME PRESENTATION

The objective of the doctoral **degree programme is to acquire knowledge of sensors and sensor technologies** from the selected fields of physics, chemistry, materials, environmental and technical sciences, nanosciences and nanotechnologies, as well as information and communication technologies. **It also encourages the development of an integral way of thinking** as a foundation for interdisciplinary research. Beside mastering the methods and techniques of research work, the students will also develop competences for conducting independent and team R&D work and for using the acquired knowledge in practice.

### PROGRAMME IN THE CONTEXT OF USER NEEDS

The programme systematically **connects knowledge from the field of sensors and sensor technologies with great international expertise in order to educate a highly-skilled workforce** to support the penetration of economic development projects to the global market while at the same time ensuring socially balanced sustainable development.

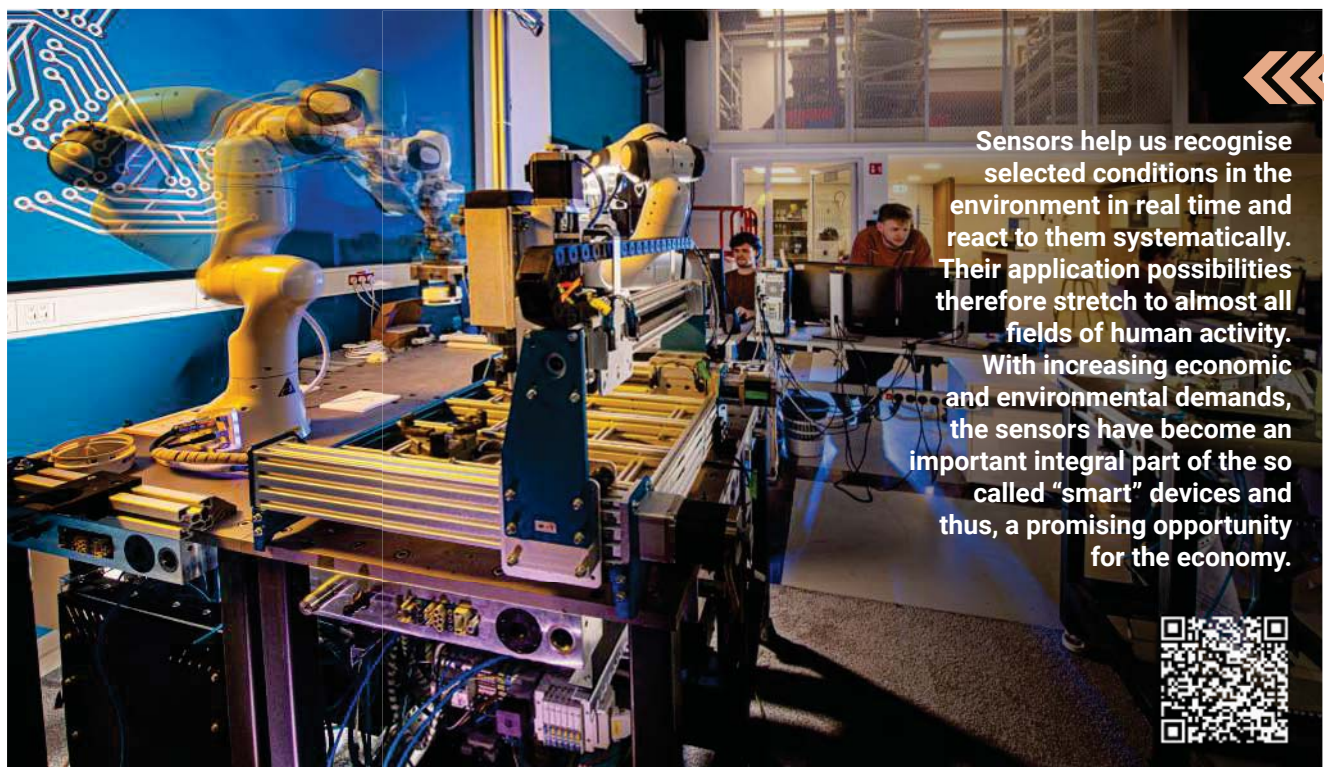
This interdisciplinary study programme **provides the acquisition of knowledge and the development of skills in order to be able to carry out competent research, transfer the scientific achievements** to industrial development, and establish international connections in the following fields of sensor technologies:

- 1 **sensors for ionizing photons and particles,**
- 2 **physical and chemical sensors,**
- 3 biosensors,
- 4 information and communication technologies in sensorics.

The implementation of the study programme is intertwined with **national and international projects**, especially within the framework of the European Community, and projects carried out with partners from the industry.

More information:

DOCTORAL STUDIES



Sensors help us recognise selected conditions in the environment in real time and react to them systematically. Their application possibilities therefore stretch to almost all fields of human activity. With increasing economic and environmental demands, the sensors have become an important integral part of the so called "smart" devices and thus, a promising opportunity for the economy.

# IPS Teaching Staff

A great majority of IPS higher education teachers are employed full time at IPS founders and partners, especially at the Jožef Stefan Institute which is also the seat of the IPS. Supervisors are therefore available to collaborate with the students directly.

The structure of academic titles for **182** IPS higher education teachers is the following: **88** full professors, **42** associate professors, **52** assistant professors. We only have **14** teaching assistants as the research and education process of postgraduate studies requires predominantly highly demanding and individualised supervision work. The share of less demanding group forms of study, which normally require the help of teaching assistants, is very small. The number of higher education teachers (182 professors and 14 assistants) is nearly equal to the number of enrolled students (199, excluding graduates), allowing for an individual approach, closer supervision, and greater accessibility and support for students.

## TEACHING STAFF SELECTION CRITERIA

The basic criteria for selecting the teaching staff of the Jožef Stefan International Postgraduate School are **their internationally highly acclaimed scientific quality, development-oriented attitude, and talent for supervising students**.

Since 2019, a domain has been available on the **SICRIS** website, which gives access to bibliographic indicators of performance for appointment to title. Among other criteria is also their creative role in national, European and international projects, to which they also include the IPS students, and their willingness to adapt the study programmes according to the specific needs of a postgraduate student's research work, i.e. the so-called "tailored studies".

## VISITING PROFESSORS

The IPS is especially interested in directly including **brilliant scientists** from leading research groups around the world in IPS programmes.

Such groups usually operate within **acclaimed institutions**. The IPS systematically maintains personal contacts of its professors with colleagues from such research groups and invites them individually as visiting professors. These are as a rule brilliant scientists – experts in fields selected based on the **achievements** of the leading branches of science and economic interests.

## SUPERVISION

Master theses and doctoral dissertations are the main part of the studies at the IPS. The **quality of conceptualising the topic** of a master thesis or a doctoral dissertation is therefore at the centre of all student interactions with their higher education teachers and especially their supervisors.

Supervision initiates the moment students first come to the IPS, when they start discussing their **"tailored studies"**, generally in breakthrough research fields or in fields that are economy- and development-oriented. It starts with the conceptualisation of the research topic, which is then discussed by the Study Commission and approved by the IPS Senate, and concludes with carefully monitoring the realisation of the master thesis or doctoral dissertation. Special attention of the IPS is therefore devoted to the supervisor selection procedure which takes place in two phases. The first supervisor helps the student as a mentor before the enrolment, especially in outlining the individually selected study programme, and monitors the student during the first semester. After that, the student can keep the same supervisor or select a new one. If the topic covers several specific fields, the student is appointed one or more co-supervisors. If the topics are directly development-oriented, the students are also appointed supervisors from the industry who help direct their research work systematically and apply their achievements into practice in real time.





## QUALITY OF THE TEACHING STAFF

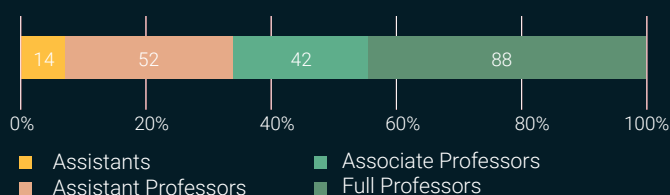
The quality of the majority of professors and assistant professors at the IPS is at **an enviably high level** according to scientific criteria. The same goes for their participation **in national and international projects**, whereas a lot of them are still gaining experience in directly transferring the research achievements into practice. To this end, **we enhanced our collaboration with the industry and the service sector**. Continuous professional training, both in the field of education and scientific research, is a compulsory element of the work of IPS higher education teachers. To develop the pedagogical skills of its teachers, the IPS offers them training in the field of higher education didactics and encourages mobility in the international environment.

The IPS regularly monitors the work of its professors by:

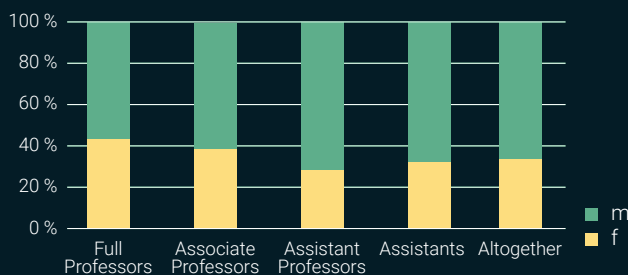
- assessing **the scope and quality of their scientific publications** in internationally renowned scientific journals and the scope of their citations with a special emphasis on including the research achievements of IPS students,
- monitoring the participation of IPS supervisors and students in **national and international projects**,
- supporting the collaboration of IPS professors with the industry, especially in regard to target-oriented R&D projects, and protecting the intellectual property of their achievements,
- **evaluating, with the help of committees**, the interim results of the research and educational process for each student at research seminars held in each academic year, and giving assessments and pointers for future work,
- **regularly monitoring the work of supervisors** within the framework of the Study Commission with special committees designated for this purpose, from conceptualising the topic of doctoral dissertations to gradually realising the set out plans and finally assessing the quality of the submitted dissertations or master theses. In the 2024/2025 academic year, the IPS processed:
  - 10** master thesis topic proposals,
  - 35** doctoral dissertation topic proposals and
  - 6** master thesis proposals and
  - 31** doctoral dissertation proposals,
- anonymously surveying the students at the end of each academic year regarding the quality of the IPS teaching staff and informing all the participants of the outcomes. If the given results show less than 80% of the maximum quality assessment (below 4 out of 5), the IPS Dean carries out individual interviews with the professors in question and addresses the problems in board meetings.

**The results of the questionnaire** for the 2024/2025 academic year were the following:  
 average grade of professors was **4.7**,  
 average grade of courses was **4.7**.

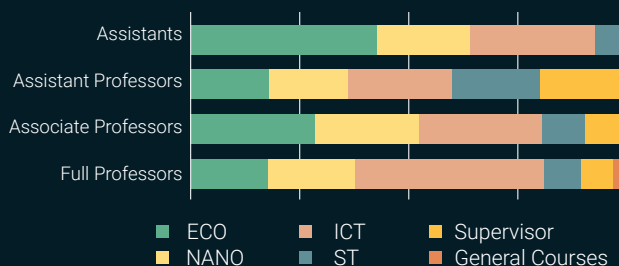
## STRUCTURE OF ACADEMIC TITLES



## HIGHER EDUCATION TEACHER STRUCTURE BY SEX



## STRUCTURE BY ACADEMIC TITLES AND STUDY PROGRAMMES



The professor : student ratio at the IPS is generally higher than 1 : 2



A significant factor of quality is the fact that the students work in their supervisors' research groups and are therefore normally in contact with them on a daily basis.



The quality of the majority of professors and assistant professors at the IPS is at an enviably high level according to scientific criteria. The same goes for their participation in national and international projects.



Our professors receive prestigious awards and recognitions every year.

## OUTSTANDING ACHIEVEMENTS AND AWARDS RECEIVED BY PROFESSORS IN 2024/2025

**Prof. Dr. Ingrid Milošev** received the prestigious H. H. Uhlig Award from the Electrochemical Society (ECS) and the European Medal for Corrosion from the European Federation of Corrosion (EFC) for her groundbreaking research in corrosion science and biomaterials. Both awards are among the most prestigious recognitions in the field of corrosion science, honouring researchers whose work has significantly advanced the understanding and application of corrosion knowledge. Prof. Milošev is the third woman in the 40-year history of these awards to receive either, and the only researcher to receive both.

**Prof. Dr. Sašo Džeroski** and **Prof. Dr. Nada Lavrač** received the Computer Science Leader awards in the 2025 edition of Research.com. Sašo Džeroski was ranked 1st in Slovenia and 1939th globally, while Nada Lavrač was ranked 2nd in Slovenia and 3605th globally. Additionally, Nada Lavrač, together with Bojan Cestnik and Andrej Kastrin, published the monograph *Bisociative Literature-Based Discovery: Methods with Tutorials in Python* (Springer, 2025), introducing innovative methods for knowledge discovery in scientific literature.

**Prof. Dr. Kristina Gruden** received the Zois Award for outstanding achievements in systems and molecular biology. Her work has deepened the understanding of how plants respond to environmental stresses and biotic threats, combining molecular biology, computational modeling, and biotechnology to promote sustainable agriculture and the development of resilient plant varieties.

**Assoc. Prof. Dr. Matjaž Humar** received the Zois Award for outstanding achievements in the field of microscopic sources of laser and quantum light. Together with his research team, he was the first in the world to develop highly sensitive lasers from soap bubbles and lasers integrated into living cells. His group also created entangled photons in liquid crystals, enabling the control of quantum light properties with an electric field, analogous to LCD technology.

**Assist. Prof. Dr. Špela Baebler** supervised PhD student **Mojca Juteršek**, who received the Miroslav Zei Award for outstanding doctoral work. The award recognises Mojca Juteršek's exceptional research in biotechnological approaches for plant protection.

## OUTSTANDING ACHIEVEMENTS OF IPS PROFESSORS, STUDENTS, AND ALUMNI – EXCELLENT IN SCIENCE 2025

**Helena Plešnik, Žan Rekar, Dr. Janja Snoj Tratnik, Prof. Dr. Milena Horvat**, and **Assist. Prof. Dr. Tina Kosjek** were awarded for their contribution "Nontargeted urinary profiling strategy for endocrine-disrupting chemicals in women with ovarian malignancies", accepted for publication in *Environmental Science & Technology*.

**Assoc. Prof. Dr. Matjaž Humar** received recognition for the contribution "Tunable entangled photon-pair generation in a liquid crystal", published in *Nature*.

**Dr. Nataša Hojnik, Dr. Janez Zavašnik**, and **Prof. Dr. Igor Križaj** received the award for the paper "Combating the antigenicity of common ragweed pollen and its primary allergen Amb a 1 with cold atmospheric pressure air plasma", published in *Journal of Hazardous Materials*.

**Klemen Motaln, Prof. Dr. Anton Kokalj, Assist. Prof. Dr. Matic Lozinšek, Assist. Prof. Dr. Mirela Dragomir**, and **Dr. Kristian Radan** co-authored the awarded paper "Reactive noble-gas compounds explored by 3D electron diffraction: XeF<sub>2</sub>-MnF<sub>4</sub> adducts and a facile sample handling procedure", published in *ACS Central Science*.

**Assoc. Prof. Dr. Blaž Likozar** and **Dr. Matej Huš** were recognised for the article "Designing and understanding efficient catalysts for CO<sub>2</sub> hydrogenation to ethanol", contributing to sustainable chemical processes.

**Karmen Pogačar, Assist. Prof. Dr. Tjaša Lukan**, and **Prof. Dr. Kristina Gruden** were part of the awarded research team for "Protein complexes from edible mushrooms as a sustainable potato protection against coleopteran pests", published in *Plant Biotechnology Journal*.

**Dr. David Levovnik** and **Prof. Dr. Marko Gerbec** received recognition for their contribution "Examining the relationship between managers' commitment to safety, leadership style, and employees' perception of managers' commitment", published in *Journal of Safety Research*.

**Prof. Dr. Veronika Stoka** was recognised as a co-author of the paper "Minimal information for studies of extracellular vesicles (MISEV2023): from basic to advanced approaches", published in *Journal of Extracellular Vesicles*.



# IPS Students

The school informs potential students about the studies at the IPS through responsible government institutions, media, invitations to IPS and JSI Open Days, IPS research and industrial partners, and, most efficiently, through personal contacts among potential candidates, students and the higher education teaching staff.

## STARTING THE STUDIES

The IPS predominantly enrolls students with considerable achievements from their undergraduate studies – the average grade of all students upon first enrolment at the IPS in the 2024/25 academic year was 8.96 for doctoral studies. However, undergraduate achievements are not the only criteria. The school holds systematic interviews with candidates for enrolment where we assess their creative disposition and research talent. An important role is also played by their potential employers, especially in the field of research and economy.

The average grade from undergraduate studies of newly enrolled doctoral students per academic year:

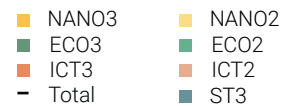
• 2015/2016	8.78	• 2020/2021	8.97
• 2016/2017	8.71	• 2021/2022	8.99
• 2017/2018	8.75	• 2022/2023	8.93
• 2018/2019	8.85	• 2023/2024	9.02
• 2019/2020	8.78	• <b>2024/2025</b>	<b>8.91</b>

## COMPLETING THE STUDIES

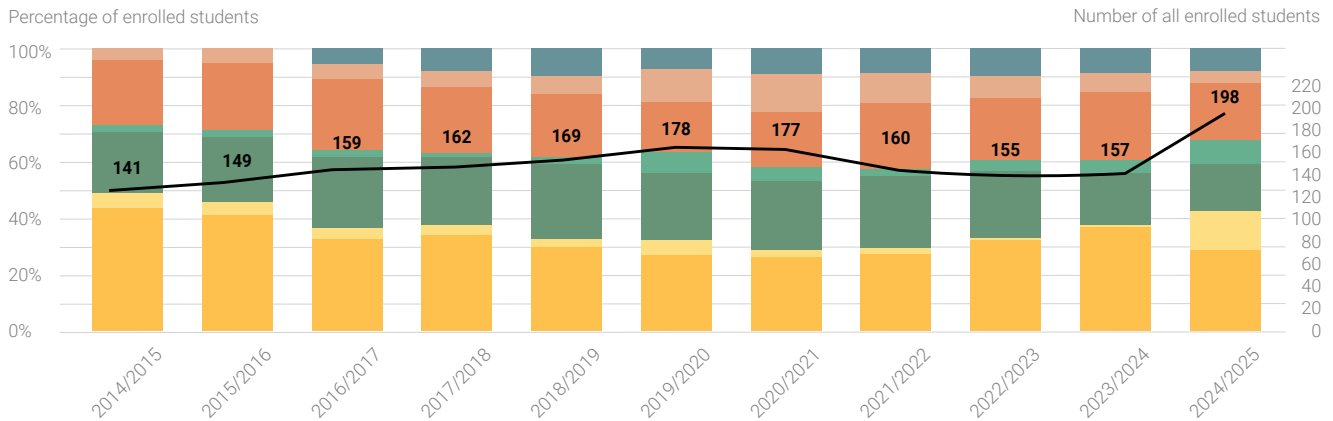
The quality of master theses and especially doctoral dissertations at the IPS is high. The quality of the study process is at the European or even global level, as attested by student achievements, publications in high quality scientific journals, and patents.

Average time needed to complete the studies (applies to 2024/2025):

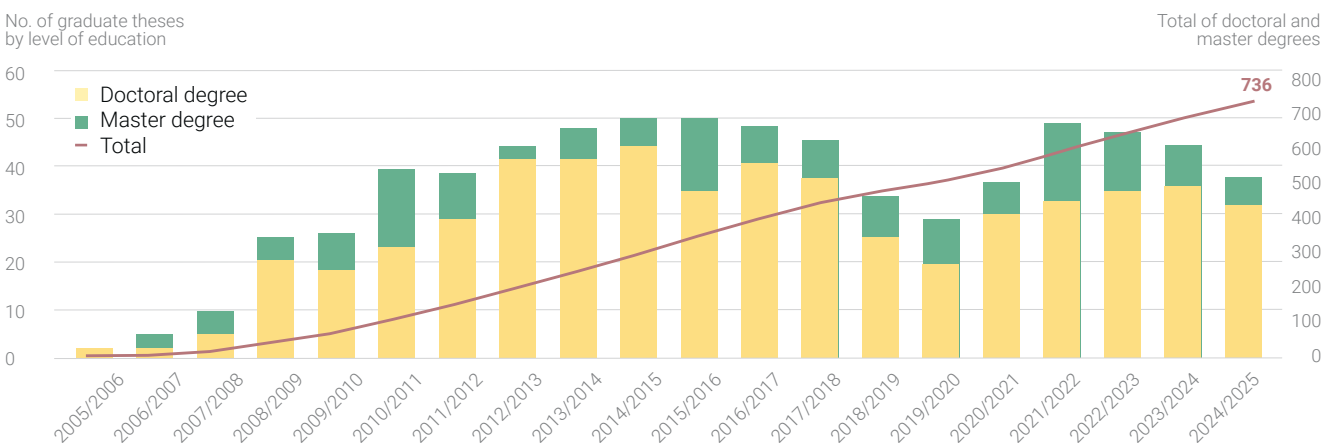
- Doctoral studies: **5.7 years**
- Master studies: **3.4 years**

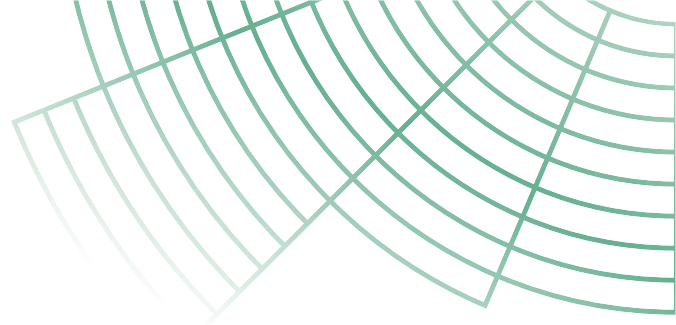


## NUMBER AND DISTRIBUTION OF ENROLLED STUDENTS BY STUDY PROGRAMMES



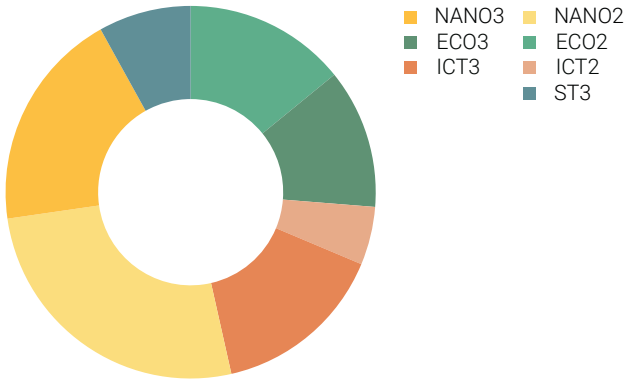
## NUMBER OF DOCTORAL AND MASTER DEGREES



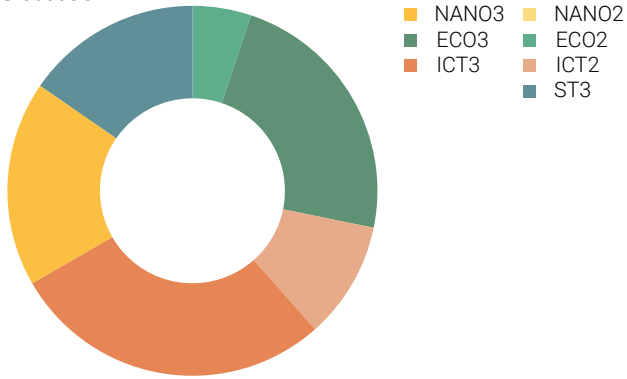


### STRUCTURE BY STUDY PROGRAMMES IN 2024/2025

Enrolment

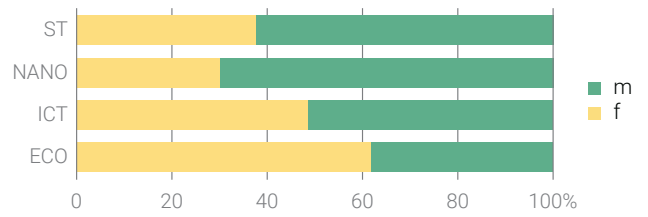


Graduation

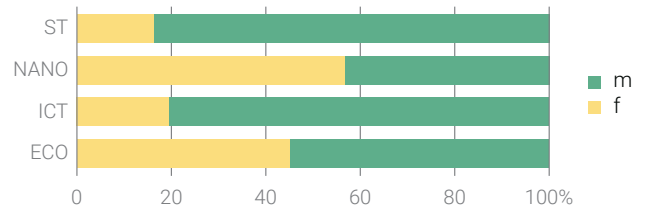


### STUDENT STRUCTURE BY SEX IN 2024/2025

Enrolment

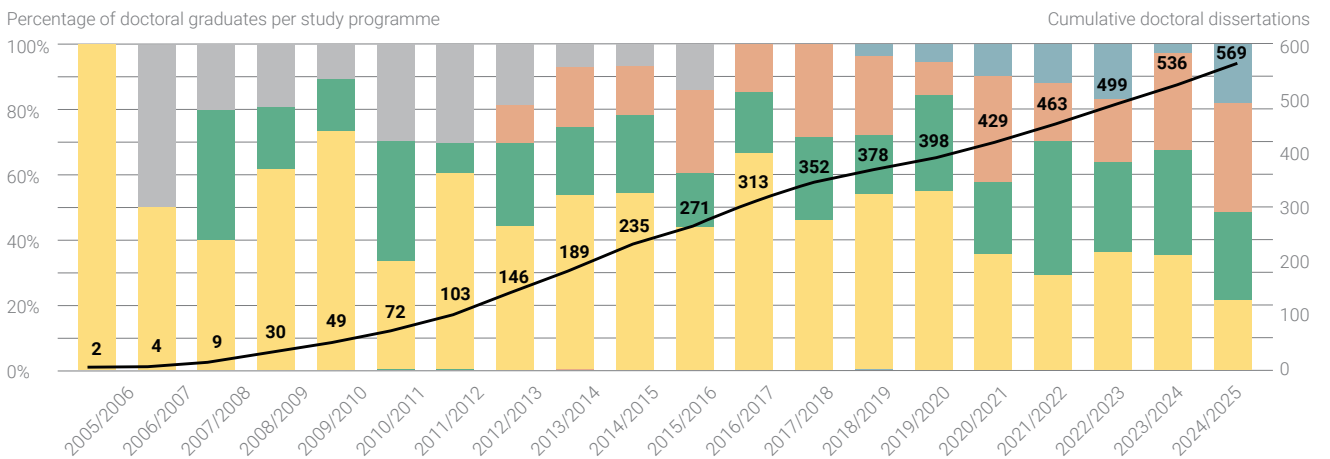


Graduation



### NUMBER OF DOCTORAL GRADUATES AND DISTRIBUTION BY STUDY PROGRAMMES

Legend: NANO (yellow), ECO (green), ICT (red), ST (blue), NM ES (grey), Total (black line)



## STUDENT COUNCIL

The Student Council is an official **body of the IPS**, as defined in the IPS Statute, and therefore participates and takes equal part in joint decision-making in the IPS Study Commission, Senate, Academic Council, and Governing Board sessions. **The Student Council has the right and duty to give opinion and take part in joint decision-making regarding all matters related to the rights and duties of students.**

The Student Council consists of **12 elected representatives** of students who select two representatives from among the members as the president and the vice-president.

Throughout the year they organised a variety of extracurricular activities, such as:

- Ice skating,
- Hike to Rožnik,
- Karaoke night,
- Paintball and Woop pixel afternoon,
- Board game night,
- Opening of the academic year,
- IPSSC conference,
- Bowling with professors,
- IPS sports picnic,
- IPS Open Day,
- Jožef Stefan Days,
- Workshop about the use of AI in research,
- Workshop about time management,
- Workshop about abstract writing.

The central event of the academic year was the 17th Jožef Stefan International Postgraduate School Students' Conference (IPSSC), which returned to the historic town of Kamnik. Hosted at the Mekinje Monastery at the foot of the Kamnik–Savinja Alps, the venue provided an inspiring and serene environment for focused academic exchange. Under the theme "From Research to Reality", the conference focused on the translation of technical research into tangible, real-world impact and commercial applications. The programme featured a diverse array of invited lectures that bridged the gap between academia and industry. Dr. Luka Suhadolnik (National Institute of Chemistry, Quipnex) shared his journey in research-driven entrepreneurship, while representatives from the Young Academy of Slovenia and Assist. Prof. Dr. Kristina Žagar Soderžnik offered perspectives on institutional support and solving real-world challenges through portable sensors.

The industrial perspective was further strengthened by experts from Lek and Avantor, who presented on safety in drug products and advanced battery science. A highlight of the event was the alumni

round table, where former IPS students reflected on their career paths, providing current students with invaluable insights into the professional realities of life after a PhD.

The core of the conference remained the student contributions, with 64 Master and PhD students presenting their research across the fields of ecotechnologies, nanosciences and nanotechnologies, sensor technologies, and information and communication technologies. The high quality of oral and poster presentations demonstrated the vibrant research potential at IPS. The event concluded with the presentation of awards for the best contributions for each of the four programmes, the best poster, and the best presentation by a Master student. These awards were selected by a committee composed of professors from IPS.

The conference served as an excellent platform for networking among young researchers, professors, and industry representatives. It also offered an environment for proactive students to learn the ins and outs of organising a conference. The successful execution of the event was made possible through the dedication of the Student Conference Organising Committee (SCOC), the support of the IPS leadership and staff, and the generous contributions of numerous sponsors. Their support ensured that the conference remained free of charge for all participants, fostering an inclusive environment for scientific growth and the pursuit of moving "research to reality".

Beyond the annual conference, the Student Council successfully launched a new series of educational workshops designed to enhance the professional development of both students and staff. During this academic year, two key sessions were held. The first, led by former Student Council President Mark Zver, focused on strategic time management and organisational efficiency for researchers. The second workshop, facilitated by Juš Polanšek, addressed the integration of Artificial Intelligence (AI) in research. This session was particularly impactful due to its interdisciplinary approach; by drawing on his background in the Nanosciences and Nanotechnologies programme, the presenter was able to translate complex ICT concepts into practical applications for a broader scientific audience. These workshops have established a valuable framework for internal knowledge transfer and the strengthening of practical skills within the IPS community.



## EMPLOYMENT PREPARATIONS

The IPS prepares its students for employment from the very beginning. Employment is **an important conversation topic** from the initial enrolment interview and the first meeting with a potential supervisor. Consequently, it also helps design the student's curriculum. The emphasis is even stronger when selecting the topic of a master thesis or a doctoral dissertation which is usually at least roughly related to the future employment of the candidate. Students have the possibility of **collaborating with co-supervisors from the industry** or working supervisors.

During their studies, they can also go on **industrial secondments**. **The IPS offers its students possibilities of establishing direct contact with founders and partners from the industry and organises activities designated for this purpose** (arrange visits of postgraduate students and their supervisors to the industry, holding talks with responsible development officials in the economy and the service sector, organising meetings with IPS students and potential employers, etc.).

### Employment of IPS doctoral graduates:

out of **33 doctoral graduates** who completed their studies in the 2024/2025 academic year, **26 were employed** in Slovenia and **7 abroad**.

- Number of countries where they are employed: **6** (Slovenia, Austria, Germany, Italy, Spain, Sweden).
- Number of doctoral graduates who are employed in companies: **7**.
- Number of doctoral graduates who are employed at prestigious foreign universities and research institutes: **6**.

The **Career Centre** at IPS plays an important role in enhancing the employability of our students and graduates by connecting them with industry and research institutions. Through practical experience, exposure to real-sector business, and engagement in research addressing current economic and sustainability challenges, students acquire skills and insights that directly increase their career readiness. By facilitating access to employment opportunities, postdoctoral positions, scholarships, and international exchanges, as well as maintaining strong links with alumni and employers, the Career Centre ensures that students are well-prepared to navigate the professional landscape and adapt to evolving industry needs. Its services, offered free of charge, also support informed career planning and continuous development, providing students with a competitive edge in the job market.

In addition, IPS actively integrates innovative educational approaches and digital tools to strengthen students' competencies and employability. Projects such as IGNITE and Proact-STEM have guided the creation of nanomodules and virtual learning environments that align with students' cognitive and emotional learning preferences, while the RESPO application, enhanced with an AI-based e-advisor, provides personalised guidance and tracks competence development in both technical and soft skills. Workshops on sustainability, project proposal writing, and career planning, as well as learning modules for emerging professional profiles like the Green Leader (GreenLead project), enable students to acquire interdisciplinary knowledge and practical skills that are highly valued by employers. By combining tailored digital learning, real-world experience, and evidence-based insights into student competencies, IPS equips graduates with the skills, confidence, and professional networks needed to succeed in a dynamic and sustainability-focused labour market.

## SCIENTIFIC RESEARCH EXCELLENCE OF STUDENTS

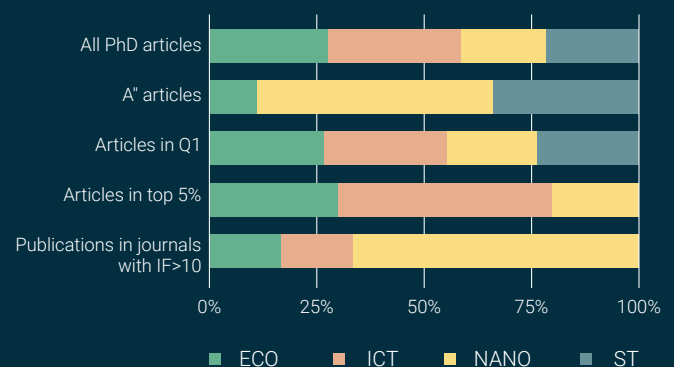
Within the framework of all study programmes, the postgraduate students are systematically encouraged to write scientific articles for acclaimed international journals, scientific contributions for conferences, their abstracts and independent scientific compositions or chapters in monographs, patent applications, project proposals, and research reports, as well as to publish their research achievements in internationally acclaimed scientific journals and as patents.

## PUBLICATIONS

The DELO newspaper analysed the data of eight Slovenian universities and postgraduate schools (published on 23 August 2019) and established that **the average number of publications per new doctor of science is the highest at the IPS**. A detailed examination of the published articles shows that **their number amounts to, on average, 4 articles per obtained doctoral degree in a 4-year period**, which is well above the average in the field of postgraduate studies of most universities. It should also be stressed that **more than a half of articles were published in international journals with impact factors which contributed to a high number of citations**. The articles written by IPS students and professors are also published in journals with the highest impact factor, i.e. Nature and Science.

In the 2024/2025 academic year, a total of **33 doctoral candidates successfully completed their PhD** at the IPS. Their research activity demonstrates a high level of scientific excellence. The doctoral graduates published **112 scientific articles** directly related to their dissertation topics, representing an average of **3.39 publications per doctoral candidate**. In addition, doctoral students were first authors in **91 scientific articles**, indicating their strong intellectual contribution and leadership in research work. The quality of the publication output is reflected in the fact that 50% of all publications were published in Q1 journals, meaning journals ranked in the top quartile (top 25%) within their scientific field according to the Journal Impact Factor ranking. Furthermore, 9% of the publications are ranked among the TOP 5% of journals and 2% among the TOP 3% within their respective categories, while 8% of the publications are classified as A\* according to the ARIS classification, which includes journals ranked first or second in their category or among the top 3% of journals in a field.

The overall quality of the publications is further demonstrated by the impact of the journals in which IPS doctoral candidates publish. Six articles were published in journals with an Impact Factor (IF) higher than 10, and one in a journal with an IF above 25. Impact Factor values refer to the 2024 Journal Impact Factor determined by Clarivate Analytics in the Journal Citation Reports (JCR). Doctoral candidates published their work in several leading international journals, including Advanced Materials (IF 2024: 26.8), Advanced Functional Materials (IF 2024: 19.0) Applied Energy (IF 2024: 11.0), ACS Nano (IF 2024: 16.0), IEEE Transactions on Evolutionary Computation (IF 2024: 12.0), Journal of Materials Chemistry A (IF 2024: 9.5), and TrAC Trends in Analytical Chemistry (IF 2024: 12.0). Such publication performance confirms the strong integration of IPS doctoral candidates into the international research environment and highlights the role of doctoral studies in generating high-quality scientific knowledge and contributing to global scientific progress. When interpreting these data, it should be noted that journal rankings can change annually due to external and systemic factors, such as methodology changes in IF calculation, stricter citation monitoring, or exclusion of journals from indexing databases. These factors may affect the yearly distribution of publications across quartiles without reflecting an actual change in the scientific quality of doctoral research. Future support will focus on scientific writing, publication ethics, and open science.



Category	Percentage of publications in the 2024/2025 academic year (%)
A"	8
TOP 3%	2
TOP 5%	9
Q1	50
IF > 10	5



\* The analysis is based on publications by doctoral graduates relevant to the topic of the doctoral dissertation, using data from the SICRIS database (for doctoral students who are not registered in SICRIS, data is taken from the dissertation and the SCOPUS database).  
 \* IF of journals in 2024.

## INVOLVMENT OF STUDENTS IN PROJECTS

An analysis of more than 140 annual individual research work (IRW) reports (in 2024/2025) revealed the exceptionally high involvement of IPS students in scientific research and development projects at the national and international level. The analysis also highlighted the diversity of research fields, the students' active role as first authors in publications, and their participation in strategic collaborations with leading institutions and industry partners, emphasising both the quality and impact of their work. The results show that IPS students are involved in over 75 national projects and programmes supported by ARIS, 12 industrial projects with companies such as Unior, CGP Novo mesto, Arvio, Knauf Insulation, Calcinat BG, and Eco Flame, bilateral research collaborations with Bosnia and Herzegovina, Serbia, France, Austria, the United Kingdom, and Czechia, and more than 55 international projects funded by Horizon Europe, Horizon 2020, LIFE, COST, MSCA, Interreg, ESA, EIT, ERA-MIN, M-ERA-NET, Erasmus+, EU4HEALTH, and other programmes. This combination of institutional, project-based, and industry-linked funding ensures a stable research environment and active student participation in cutting-edge national and international R&D and innovation activities. Their project work often involves combining academic and applied knowledge, participating in multidisciplinary and international research teams, and co-creating innovative approaches to solving current social, environmental, and technological challenges. This intensive and diverse project collaboration demonstrates that IPS students are an important part of the research and innovation community and that they actively contribute to the development of science, technology, and society at both the national and European levels already during their studies.



**During this academic year, 33 doctoral graduates published a total of 50 scientific articles in Q1 journals.**



**We are running 8 international projects.**



**Higher education teachers have achieved more than 10 outstanding accomplishments for which they received top awards.**



**IPS students participate in more than 75 ARIS projects and 50 international projects.**

# IPS Recognition Awards for Outstanding Achievements

At the Diploma Ceremony for new Doctors of Science and professional Masters held in November 2024 and June 2025, the Jožef Stefan International Postgraduate School (IPS) also awarded recognitions for outstanding achievements. These awards cover a broader period, as many results included in the doctoral dissertations were published in top scientific journals even after the defence.

## GOLD CERTIFICATE OF DISTINCTION FOR OUTSTANDING MASTER THESIS/DOCTORAL DISSERTATION "SUMMA CUM LAUDE"

is the highest distinction given to students who achieved exceptional academic accomplishments and showed exceptional knowledge, devotion and intellectual excellence in their study programme. The Gold Certificate of Distinction was awarded to **Dr. Taja Verovšek**.

## CERTIFICATE OF RECOGNITION FOR EXCEPTIONAL CONTRIBUTION TO THE DEVELOPMENT OF EXTRACURRICULAR ACTIVITIES AT IPS

was awarded to **Anja Pavlovič, Taja Kuzman, Alnilan Lobato** and **Žan Gostenčnik**. Representatives of the IPS Student Council and the Organising Committee of the 17th IPSSC Students' Conference contribute significantly to extracurricular activities and the pleasant, inclusive atmosphere among students, professors, and supervisors through their dedicated work. Their organisation of social events, hikes and round tables with alumni, and visits to companies enrich the student experience and strengthen the IPS community.

## CERTIFICATE OF RECOGNITION FOR EXCEPTIONAL PROFESSIONAL WORK THAT CONTRIBUTED TO THE DEVELOPMENT AND ACTIVITY OF THE SCHOOL

was awarded to **Prof. Dr. Maja Ponikvar-Svet** in recognition of her outstanding dedication and excellence in teaching, supervision, and student development. She has demonstrated exceptional commitment in delivering the courses Fundamentals of Analytical Chemistry and Selected Chapters from Analytical Chemistry, effectively combining deep theoretical knowledge with practical relevance, and motivating students to apply analytical methods creatively in their own research. Beyond her teaching duties, Prof. Dr. Ponikvar-Svet has provided invaluable guidance as a supervisor, offering timely and constructive feedback on students' work. She has also actively contributed to the International Postgraduate School Student's Conference (IPSSC), evaluating student presentations and abstracts, ensuring high scholarly standards, and fostering student engagement. Her consistent dedication has significantly enhanced the educational experience, supported student growth, and contributed to the overall development and activity of the school.



## LIST OF GRADUATES AND TITLES IN THE 2024/2025 ACADEMIC YEAR

### PROFESSIONAL MASTERS

Name and surname		Supervisor(s)	Thesis title
<b>Din Mušić</b>	ICT	Dr. Carolina Fortuna	Kubitect - a Solution for On-premise Cluster Computing Management
<b>Fatima Aziz</b>	ICT	Assist. Prof. Martin Žnidaršič	A lexicon-based approach for software bug severity classification
<b>Matevž Ogrinc</b>	ICT	Assist. Prof. Tome Eftimov	Zero-shot evaluation of chatgpt for food named-entity recognition and linking
<b>Matevž Skobe</b>	ICT	Assist. Prof. Anton Biasizzo, Assist. Prof. Andrej Trost	Prototype control system for the low energy ion beamline
<b>Miroslav Štrbac</b>	ECO	Prof. Janez Ščančar	The use of enriched isotopic tracers of 50Cr(VI) and 53Cr(III) for Cr speciation in mineral materials by high performance liquid chromatography – inductively coupled plasma mass spectrometry
<b>Teja Colja</b>	ECO	Prof. Aleš Lapanje, Assist. Prof. Tomaž Rijavec	Determination of probiotic potential of culturable bacterial fraction of oral microbiome

### DOCTORS OF SCIENCE

<b>Aleksandar Sebastijanović</b>	NANO	Prof. Janez Štrancar, Assist. Prof. Iztok Urbančič	In vitro-detected early events to unravel environmentally triggered neurodegeneration
<b>Allwin Mabes Raj</b>	ECO	Prof. Aleksandra Lobnik, Prof. Aleš Lapanje	Nanoengineering for Enhanced Toxic Metals Adsorption: From Synthesis to Biorecognition
<b>Ana Damnjanović</b>	NANO	Prof. Ingrid Milošev, Dr. Nataša Kovačević	Enhancing the performance of highly filled polymer-bonded Nd-Fe-B magnets: Integrated advanced surface treatments and additive manufacturing
<b>Ana Kostovska</b>	ICT	Assist. Prof. Panče Panov, Prof. Sašo Džeroski, Assist. Prof. Tome Eftimov	Representing and Exploiting Benchmarking Data for Optimisation and Learning
<b>Andraž Repar</b>	ICT	Assist. Prof. Senja Pollak	Terminology extraction and alignment for the translation industry
<b>Anubhav Vishwakarma</b>	NANO	Assist. Prof. Matej Andrej Komelj	Design-based optimisation of a custom permanent magnet focused on a reduced raw-material consumption
<b>David Susič</b>	ICT	Assist. Prof. Anton Gradišek, Prof. Matjaž Gams	Identification of heart sounds for the analysis of cardiac pathology using machine learning
<b>Edoardo Donà</b>	ST	Prof. Aleksandra Lobnik, Prof. Uroš Cvelbar	Detection of food freshness and pesticides through chemical interaction of liquids or gases with surfaces
<b>Erik Novak</b>	ICT	Prof. Dunja Mladenič	Using machine learning methods for analyzing sequential textual data
<b>Gašper Petelin</b>	ICT	Assoc. Prof. Gregor Papa	Feature Construction Techniques in Time-Series Analysis and Single-objective Optimization
<b>Harshit Sahai</b>	ECO	Prof. María Dolores Hernando Guil, Prof. Amadeo R. Fernández-Alba, Prof. Ester Heath	Micro and Nano Plastics in Agriculture: Interactions with pesticide residues and bioaccumulation in plants
<b>Ivano Vascotto</b>	ECO	Dr. Janja Francé	Ecological modelling of the phytoplankton community in the northern Adriatic sea
<b>Jakob Jelenčič</b>	ICT	Prof. Dunja Mladenič	Smart denoising for recurrent neural networks optimization



<b>Jan Gnidovec</b>	ECO	Assoc. Prof. Gašper Tavčar	Synthesis and investigation of organofluorosilicate and organofluorogermanate species
<b>Jason Thomas Fisher</b>	ST	Prof. Igor Mekjavić, Dr. Urša Ciuha	Thermal and Non-Thermal Factors Affecting Regional Blood Flow Regulation
<b>Katarina Žiberna</b>	ST	Prof. Andreja Benčan Golob, Assoc. Prof. Hana Uršič Nemevšek	Local mechanical properties of perovskite oxide ferroelectric materials
<b>Klara Žagar</b>	ECO	Dr. Polona Vreča	Isotopic fingerprint of water from source to tap
<b>Luka Mišković</b>	ICT	Assoc. Prof. Tadej Petrič	Pneumatic variable stiffness mechanisms for application in lower-limb exoskeletons
<b>Luka Žnidarič</b>	ICT	Prof. Đani Juričić	Diagnosis and prognosis of solid oxide cell systems: a statistical approach
<b>Majda Nikezić</b>	ECO	Assist. Prof. Tea Zuliani	Strontium Isotope Composition: Insights into Geological and Environmental Influences on the Provenance Studies of Dairy Products and Timber
<b>Margarita Antoniou</b>	ICT	Prof. Gregor Papa	Evolutionary algorithms for optimising pessimistic bilevel problems and min-max problems
<b>Mark Zver</b>	ST	Assoc. Prof. Gregor Primc, Assist. Prof. David Dobnik	Low-pressure gaseous plasma for inactivation of viruses in water
<b>Martin Brešar</b>	ICT	Assoc. Prof. Pavle Bošković	Numerical Methods for Directional Coupling Detection from Time Series of Complex Systems
<b>Martin Marzidovšek</b>	ICT	Dr. Vid Podpečan, Assoc. Prof. Patricija Mozetič	Explainable Machine Learning Techniques for Applications in Life Sciences
<b>Neža Palir</b>	ECO	Assist. Prof. Ingrid Falnoga	Genetic Variability and Lead Exposure Biomarkers
<b>Nina Kuzmić</b>	NANO	Assoc. Prof. Srečo Davor Škapin, Assoc. Prof. Matjaž Spreitzer, Prof. Heli Jantunen	Room-temperature fabrication of electroceramic composites
<b>Petruša Borštnar</b>	NANO	Assoc. Prof. Nina Daneu	Microstructure development in lithium lanthanum titanate solid electrolyte
<b>Riccardo Sorrentino</b>	ST	Prof. Igor Mekjavić, Prof. Matej Supej, Dr. Andrej Vovk	The integrated impact of artificial gravity and vibration exercise training on muscle structure and function
<b>Robert Pintarič</b>	ECO	Prof. Metka Filipič, Prim. Dr. Jožef Matela	Development of aerosolizer for disinfection of radiological devices and rooms using Steriplant® N and assessment of possible toxicity
<b>Sabi William Konsago</b>	ST	Prof. Barbara Malič, Prof. Hana Uršič Nemevšek	Microstructure Design and Multifunctionality of Barium Zirconate Titanate-Barium Calcium Titanate Thin Films Prepared by Chemical Solution Deposition
<b>Samir Salmanov</b>	NANO	Assist. Prof. Mojca Otoničar, Prof. Danjela Kušcer Hrovatin	Cold sintering of lead-free ferroelectric perovskites
<b>Tjaša Žerdoner</b>	ECO	Assist. Prof. Tea Zuliani, Assist. Prof. Janja Vidmar	Source apportionment of Pb in PM10 from the upper Meža Valley by the use of advanced analytical techniques
<b>Vida Jurečič</b>	NANO	Prof. Vid Bobnar, Dr. Nikola Novak	Different approaches for enhancing dielectric response of polymer and ceramic materials

# Student Achievements

## NANO STUDENT ACHIEVEMENTS

### LARA EINFALT

received the Best Poster Award at the High-entropy Alloy Nanostructures: From Theory to Application Faraday Discussion, an international discussion conference on advances in the field of high-entropy alloys, held in London, United Kingdom, from 24th to 26th September 2025. Titled "Anodized TaNbHfZrTi High-Entropy Alloys as a Catalyst for the Antibiotic Tetracycline Removal", her poster presented research on the application of high-entropy materials for environmental remediation. The study demonstrates anodic oxidation as a practical synthesis approach for developing self-ordered mixed-metal oxide nanotube arrays on a refractory high-entropy alloy. These unique nanostructures show strong potential as catalysts for the photo(electro)catalytic removal of antibiotic tetracycline from wastewater, highlighting both the application of high-entropy materials in catalysis and their relevance for addressing urgent global water pollution challenges.



Figure: Lara Einfalt with the award for the best poster contribution at the High-entropy Alloy Nanostructures: From Theory to Application Faraday Discussion.

## MIHAELA REBERNIK GRACEJ

developed a novel short-loop magnet recycling and upcycling approach based on extracting matrix-phase  $\text{Nd}_2\text{Fe}_{14}\text{B}$  grains using citric acid. For the first time, a single-grain grain-boundary engineering concept was applied to revitalise  $\text{Nd}_2\text{Fe}_{14}\text{B}$  permanent magnets. Instead of relying on bulk reprocessing or compensating performance losses with additional rare-earth elements, the method is based on controlled liquid-phase reactions at the level of individual grains through Nd–Cu additions. The research also clarifies the mechanism of oxygen redistribution during rapid sintering, where oxidised surface regions of degraded grains dissolve into the Nd–Cu-rich liquid and reprecipitate as oxygen-rich secondary phases at triple junctions. This process restores the surface  $\text{Nd}_2\text{Fe}_{14}\text{B}$  grains and the non-ferromagnetic grain-boundary phases that effectively decouple hard-magnetic grains, significantly increasing intrinsic coercivity while reducing the total rare-earth content in the final magnets by up to 4%. The work represents an important contribution to the sustainable recycling and more resource-efficient production of advanced permanent magnetic materials.

DOI: [10.1016/j.jallcom.2025.185605](https://doi.org/10.1016/j.jallcom.2025.185605)

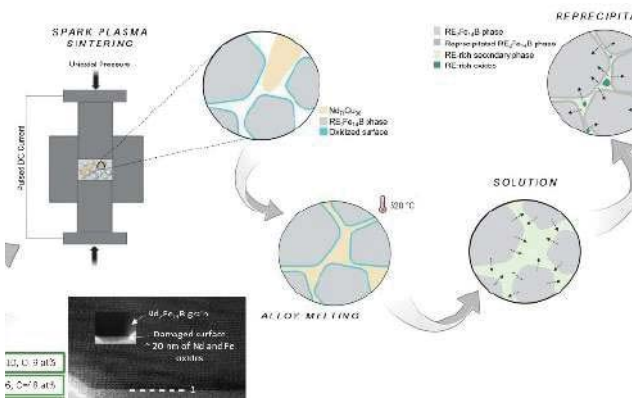


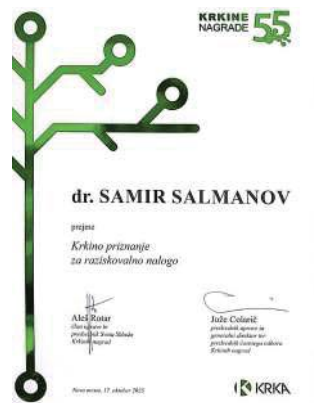
Figure: Single-grain grain-boundary engineering with Nd-Cu for sustainable recycling and reprocessing of Nd-Fe-B magnets.

## SAMIR SALMANOV

received the Krka Award for Research Achievement for the work carried out in his doctoral dissertation, which was recognised by the pharmaceutical company Krka, where he is currently employed. His research focused on the development of the cold sintering process (CSP) for the production of lead-free piezoelectric ceramics at significantly lower temperatures than those required in conventional sintering—only about 300 °C. This low-temperature approach enables the fabrication of high-voltage capacitors and allows the combination of different material compositions without thermal degradation, making it possible to produce complex composite materials. The research contributes to a deeper understanding of the preparation of piezoelectric materials and has important implications for their sustainable production.

As such, CSP represents a promising technology for modern electronics and materials engineering, opening new possibilities for applications in medical imaging, precision drug delivery, and various pharmaceutical technologies.

DOI: [10.1016/j.jeurceramsoc.2024.116846](https://doi.org/10.1016/j.jeurceramsoc.2024.116846)



## MOJCA JUTERŠEK

received the Miroslav Zei Award for outstanding doctoral work, which is awarded by the National Institute of Biology for exceptional research achievements. The doctoral student received the award for her research work in the field of biotechnological approaches to plant protection. The work included the preparation of a labelled viral clone used in research on plant response to viral infection with the aim of developing resistant crop varieties. In addition, she researched the biotechnological production of insect pheromones, which would enable the sustainable production of environmentally friendly means of controlling harmful insects in agriculture. The research work was published in renowned journals with a high impact factor.

DOI: <https://doi.org/10.3389/fpls.2022.941338>

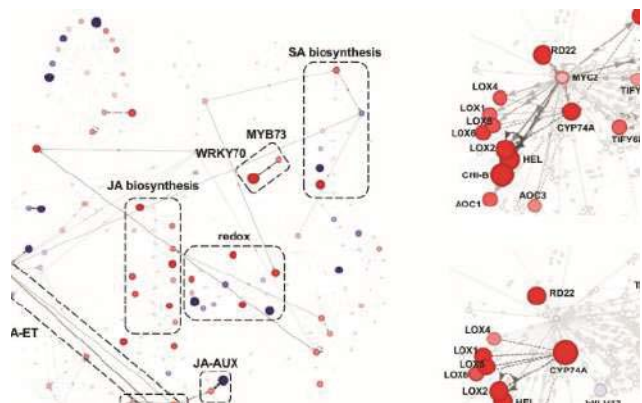


Figure: Network analysis of genes involved in growth restriction in response to insect pheromone production in plants.

## LEJA PERNE

has contributed to significant advancements in the field of lipid biochemistry over the past year with a publication in the FEBS Journal. In her research, she was the first in the world to demonstrate lipid droplet oxidation using BODIPY C11 staining and confocal microscopy in live cells—a crucial component of ferroptosis, a form of programmed cell death. Her work highlighted the distinct metabolic heterogeneity of lipid droplet oxidation across various cancer cell models, which directly impacts their survival and underscores the risks of generalising findings based on a single model. She presented these findings at the international EMBO Lipid Droplets conference in Spain, where she received an honorable mention for her poster presentation. Her attendance was supported by travel grants from both the Slovenian Biochemical Society and EMBO.

DOI: <https://doi.org/10.1111/febs.70467>



Figure: Leja Perne (left) with fellow award recipients at the EMBO Workshop "Lipid Droplets: Cell-Biological Control of Metabolism" in Spain (2025).

## ANA KRAŠ

as the first author together with co-authors, published five scientific articles in reputable journals with a high impact factor (J. Electrochem. Soc 3.3, Corros Sci. 8.5, Electrochim. Acta 5.6 and npj Mater. Degrad. 7.6), which deal with the study of the corrosion mechanism of three important technological metals, steel, aluminium alloy and zinc, upgraded with the study of the formation mechanism of protective zirconium conversion coatings. The starting point was the development of equilibrium diagrams for zirconium species in aqueous solutions, which enabled the selection of appropriate experimental conditions for the deposition of zirconium conversion coatings. Based on thermodynamic calculations and experimental confirmation of the formed species, a statistical tool was used to assess the influence of various experimental parameters on the effectiveness of the zirconium conversion coating for corrosion protection. Both the scope of experimental work and the depth of scientific discussion in the students' work were exceptional and significantly improved the understanding of the formation of conversion coatings and their subsequent transfer to industrial applications. The most citations (26) so far were received by the article published in 2023 in the J. Electrochem. Soc., which also has more than 6000 downloads. In total, these articles have already achieved 60 citations (Google Scholar data). Ana Kraš is the recipient of the Travel Grant Award for participation at the 248th Conference of the Electrochemical Society in Chicago, USA. At the same conference, she also delivered an invited keynote lecture titled "Zirconium Conversion Coatings: Understanding and Optimisation through Speciation and Multimodal Characterization".

DOI: <https://iopscience.iop.org/article/10.1149/1945-7111/acb9c2/meta>

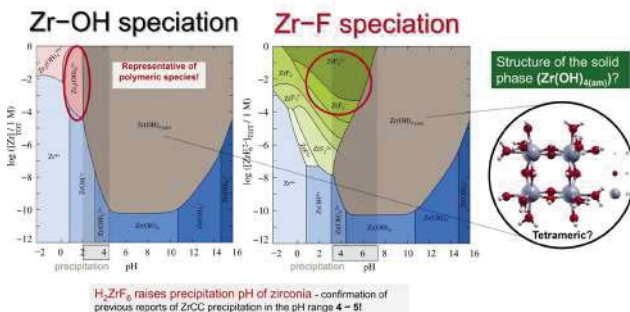
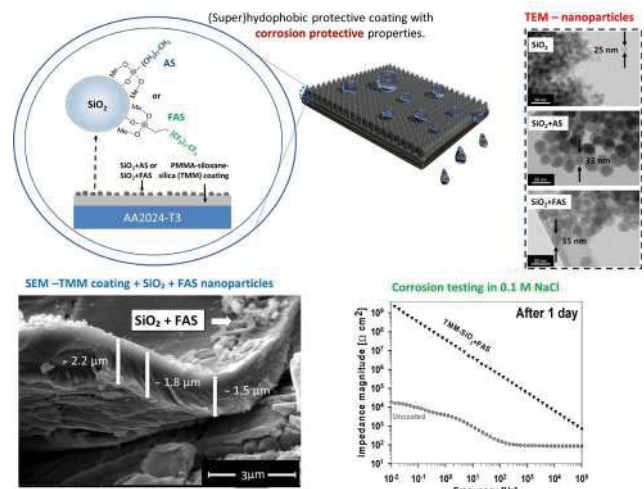


Figure: Potential-pH diagrams with the distribution of Zr-OH and Zr-F species in aqueous solutions and the structure of Zr(OH)<sub>4</sub> with the tetrameric Zr<sub>4</sub>(OH)<sub>8</sub><sup>8+</sup> building blocks.

## NINA KOVAČ

received several international recognitions for her research work in the field of protective coatings and corrosion science. In 2025, she was awarded the Best Poster Award at the 2nd International Electronic Conference on Metals, the CIC2025 Best Poster Award at the 4th Coatings and Interfaces Conference, and the Outstanding Poster Award at the Twentieth International Symposium on Electroanalytical Chemistry (20th ISEAC), the latter presented by Elsevier. Her research focuses on the development and optimisation of hybrid sol-gel coatings for corrosion protection of magnesium alloys, with an emphasis on improving long-term durability and multifunctional surface protection. By incorporating fluoromethacrylates and other functional additives into the coating matrix, she aims to enhance corrosion resistance and anti-aging properties under demanding conditions.

DOI: <https://doi.org/10.3390/polym17020195>,  
<https://doi.org/10.1016/j.surfin.2025.106089>



Source: <https://www.mdpi.com/2073-4360/17/2/195#>

## ŽAN GOSTENČNIK

published an article titled "Microstructure, Mechanical, and Corrosion Properties of Reactively Sputtered (TiVCrZrNbMo)N High-Entropy Nitride Coatings" in the Q1 scientific journal Surface and Coatings Technology. He has developed a novel material that has not yet been published. The (TiVCrZrNbMo)N was deposited as a thin coating using magnetron sputtering technology. Subsequently, he performed a comprehensive characterisation, including analysis of its microstructure, chemical composition and bonding states, as well as evaluation of its mechanical properties and corrosion resistance. He also presented this research at the International Conference on Metallurgical Coatings and Thin Films in San Diego.

DOI: <https://doi.org/10.1016/j.surcoat.2025.132772>

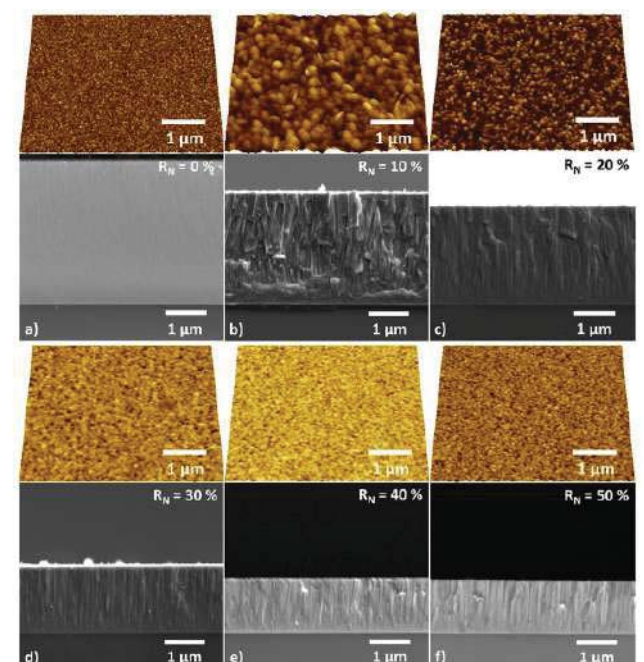


Figure: Top-view topography obtained by AFM and cross-section morphology obtained by SEM for TiVCrZrNbMo and (TiVCrZrNbMo)N coatings deposited on Si substrate at different nitrogen flow ratios.

# ICT STUDENT ACHIEVEMENTS

## MARGARITA ANTONIOU

Her research work explores bilevel and min-max optimisation with evolutionary algorithms. It introduces a  $\delta$ -perturbation technique to navigate optimistic and pessimistic bilevel formulations and presents a novel MMNDE-EDA algorithm for min-max problems. Both approaches are validated through comprehensive computational experiments. These contributions have been recognised through peer-reviewed publications in the journals Operations Research Perspectives and Mathematics, and conference papers presented at international conferences such as the International Bilevel Optimisation Conference and EMO 2025. M. Antoniou, A. Sinha, and G. Papa, "An evolutionary approach to pessimistic bilevel optimisation problems", International Conference on Bilevel Optimisation: conference book, p. 58, 2023, Winner of 3rd Prize for the Poster Competition.

DOI: <https://doi.org/10.1016/j.orp.2024.100315>

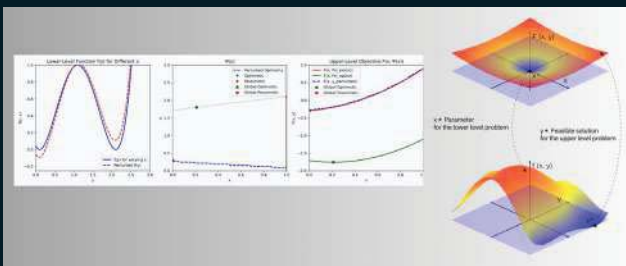


Figure:  $\delta$ -perturbation in bilevel optimisation. Left: lower-level function, mapping, and upper-level objective. Right: conceptual bilevel structure.

## GJORGJINA CENIKJ

worked on the development, implementation, and evaluation of methodologies for constructing and learning features in the field of single-objective optimisation, as well as their comprehensive assessment in the context of automated algorithm selection. More specifically, she developed a representation learning approach in which features of an optimisation problem are learned using a transformer-based model and applied for accurate prediction of algorithm performance. She also proposed new features, which model search trajectories between problems and algorithms and conducted an extensive comparative study of the newly proposed features against all state-of-the-art features for single-objective continuous optimisation.

DOI: <https://doi.org/10.1016/j.swevo.2025.101894>

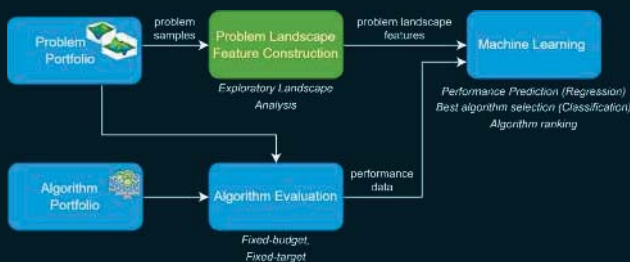


Figure: Overview of a methodology for an automated algorithm selection framework.

## GAŠPER PETELIN

completed his PhD and works in the areas of time series analysis and optimisation. His research focuses on methods for modeling, forecasting, and optimisation in data analysis. He has authored or co-authored multiple scientific publications in international journals and conference proceedings in the fields of machine learning and data analysis. Some of these papers were nominated for best paper awards at conferences.

DOI: <https://doi.org/10.1016/j.swevo.2023.101448>

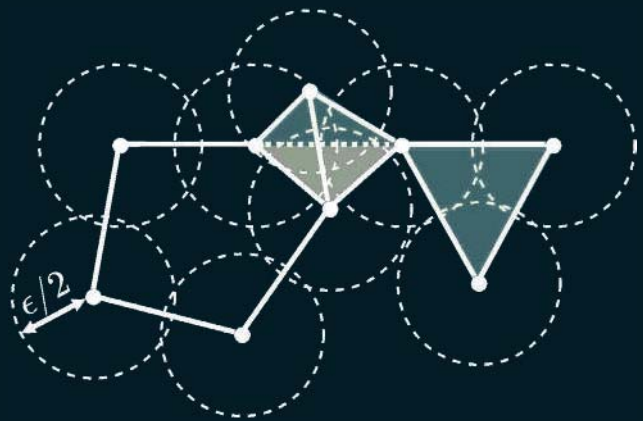


Figure: Example of a Vietoris–Rips complex constructed from 9 points. Points are connected if their  $\epsilon$ -neighborhoods (dotted lines) intersect. Such a topological structure can be used for feature construction in single-objective continuous optimisation.

## JURE VREČA

His research work examines hardware implementation of neural networks with ultra-low latency constraints, on the order of a few microseconds. Such implementations are useful in specific applications, such as the triggering system at CERN, where real-time data filtering is crucial. Because of the high data acquisition frequency, buffers can quickly overflow. Another example use case for such circuits is network intrusion detection. To achieve these low latency constraints, it is essential that all parameters are stored on-chip and that processing is heavily parallelised. However, because on-chip memory capacity is limited, two model compression techniques are used: quantisation and pruning.

DOI: [10.3390/electronics14050849](https://doi.org/10.3390/electronics14050849)

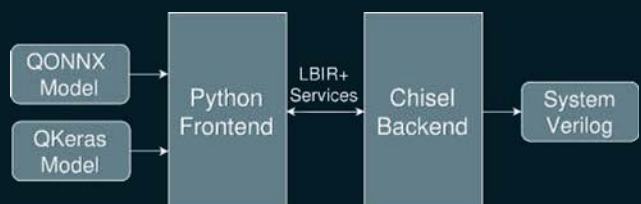


Figure: High-level software architecture of chisel4ml developed in the thesis.

## GREGA MORANO

developed, implemented and evaluated several innovative methods that integrate accurate localisation and sensing into low-power IoT communication networks. By embedding distance and angle estimation into the IEEE 802.15.4 TSCH protocol, the solution reaches sub-meter positioning accuracy without disrupting the communication functionalities. The proposed solutions address real-world challenges including noise, interference, and hardware constraints, enabling practical prototypes built on affordable platforms and validated through extensive experiments. The outcomes include open-source software and publicly available datasets that support international research collaboration and future technology development. This achievement contributes to next-generation energy-efficient, self-aware wireless networks with applications in smart environments, industry, and autonomous systems.

DOI: [10.1109/JIOT.2023.3330933](https://doi.org/10.1109/JIOT.2023.3330933),  
[10.3390/s24123925](https://doi.org/10.3390/s24123925),  
[10.1109/JSEN.2025.3620118](https://doi.org/10.1109/JSEN.2025.3620118)

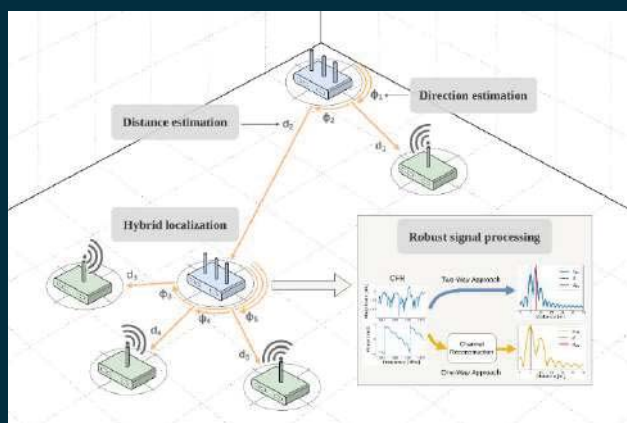


Figure: Integration of localisation functionality into industrial Internet of Things wireless technology.

## ECO STUDENT ACHIEVEMENTS

### HELENA PLEŠNIK IN ŽAN REKAR

are recipients of the ARIS "Excellent in Science 2025" award for their paper "Nontargeted Urinary Profiling Strategy for Endocrine-Disrupting Chemicals in Women with Ovarian Malignancies", recognised within the activities of the Slovenian Research and Innovation Agency promoting outstanding scientific achievements. Published in *Environmental Science & Technology*, the work highlights the value of non-targeted exposomics for uncovering complex patterns of environmental exposure beyond conventional targeted analysis and provides an important foundation for future hypothesis-driven research on environmental determinants of disease.

DOI: [doi/10.1021/acs.est.4c13290](https://doi.org/10.1021/acs.est.4c13290)



Figure: Helena Plešnik receiving the "Excellent in Science 2025" award at ARIS Day 2025, presented by ARIS.

### LARA ROPİČ BIZJAK

is the recipient of the Krka Award (55th Krka Awards) for her outstanding master thesis entitled "Development of Analytical Method for Determination of Chemical Exposure Biomarkers in Hair". In her research, she developed and validated an advanced UHPLC-MS/MS method for the determination of chemical exposure biomarkers in hair, representing an important contribution to the advancement of biomonitoring and to a better understanding of the effects of environmental pollutants on human health.

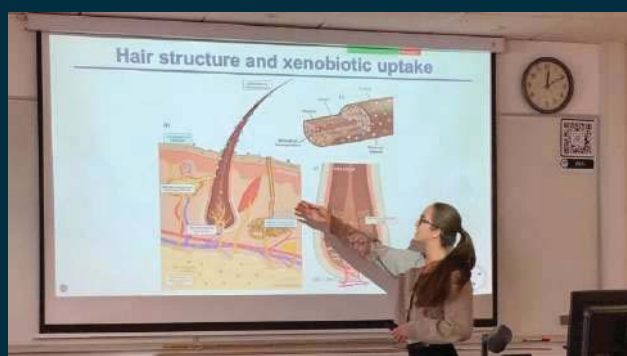


Figure: Defense of the master thesis entitled "Development of Analytical Method for Determination of Chemical Exposure Biomarkers in Hair" on 9 October 2025.

### JANKO STANKIČ

attended the International Society of Exposure Science Europe Workshop, held between the 20th and 22nd of October 2025 in Lisbon, where he presented the results of the second Slovene national human biomonitoring programme, focusing on the urinary polycyclic aromatic hydrocarbon level, its potential associations with lifestyle data and the comparison with identical parameters from the first Slovene national human biomonitoring programme, which focused on primiparous lactating women and men of similar age. The poster which he created to present his work was awarded the first prize.



Figure: Receiving of the Best Poster Award.

## HARSHIT SAHAI

investigated the interactions between micro- and nanoplastics and pesticides in modern agricultural systems. His research elucidated sorption and desorption processes of pesticides in biodegradable mulch films, significantly improving the understanding of their environmental behavior. In experimental studies, he quantified nanoplastic uptake and distribution in edible plants (*Lepidium sativum*), demonstrating their translocation to roots, stems, and leaves. The findings contribute directly to food chain risk assessment and sustainable use of plastic materials in agriculture. His work integrates advanced analytical chemistry with environmental toxicology and regulatory relevance.

DOI: [10.1016/j.scitotenv.2023.168903](https://doi.org/10.1016/j.scitotenv.2023.168903),  
[10.1016/j.chemosphere.2024.141183](https://doi.org/10.1016/j.chemosphere.2024.141183)

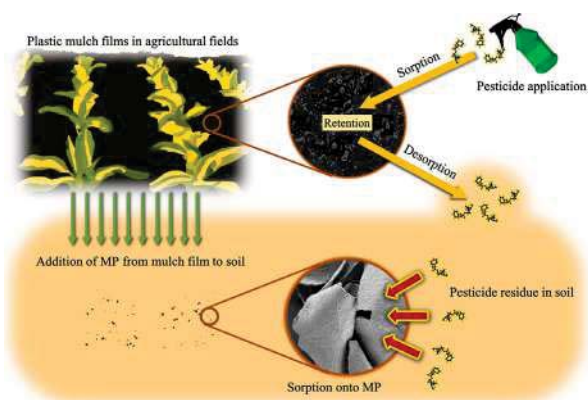


Figure: Graphical presentation of sorption/desorption processes of pesticides in biodegradable mulch films used in agriculture.

## ALLWIN MABES RAJ

achieved outstanding results during his doctoral studies, focusing on nanotechnology-enabled biosensors for ultrasensitive detection of environmental contaminants, particularly methylmercury. A key outcome of his research is the development of a novel protein-based electrochemical biosensor that integrates nanomaterials, enzymatic biorecognition, and electrochemical signal transduction, enabling detection of methylmercury in the femtogram range. This innovation led to a European patent application (EP25187683.5) titled "A detection system and a method for methylated-mercury detection", demonstrating strong potential for applications in environmental monitoring, food safety, and regulatory control. He completed his PhD with an excellent average grade of 9.8/10 and authored four first-author scientific publications, including in *TrAC – Trends in Analytical Chemistry* (2025). His research was carried out within the Horizon 2020 Marie Skłodowska-Curie project GMOS-Train and contributed to the ARIS project on electrochemical biosensors. Among his recognitions are the Best Poster Award at Microtech Week and a FEMS Travel Grant, which supported his invited lecture at an international conference.

DOI: [10.3390/ijms241210072](https://doi.org/10.3390/ijms241210072),  
[10.1016/j.trac.2025.118157](https://doi.org/10.1016/j.trac.2025.118157)

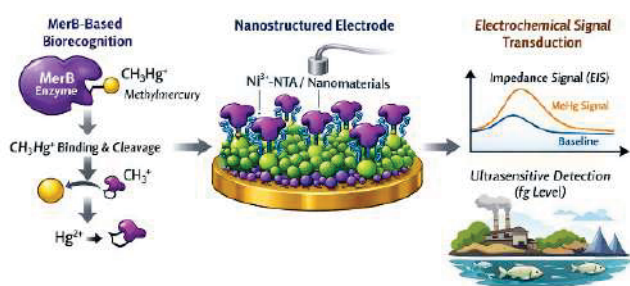


Figure: A detection system and a method for methylated-mercury detection.

## IVANO VASCOTTO

studied the ecology of phytoplankton in the Northern Adriatic, mainly through statistical modelling of phytoplankton communities. Using various approaches in the field, laboratory, and data processing, he investigated phenology, biomass distribution, cell size, periodicity, connectivity of nearby environments, and environmental impacts at the mesoscale. His results revealed the importance of pelagic habitat connectivity and the influence of environmental drivers on phytoplankton community succession. His updated conceptual model of coastal marine phytoplankton is valuable to both the scientific community and policy makers. In addition, he contributed to the development of methodological approaches for interpreting long-term ecological research datasets and validating biodiversity indices across the Mediterranean. He also contributed to molecular marker validation for diatom metabarcoding. His work supports marine environmental monitoring and ecosystem-based management. He received the Miroslav Zei award for outstanding doctoral dissertation in the NIB's field.

DOI: [10.1016/j.scitotenv.2023.169814](https://doi.org/10.1016/j.scitotenv.2023.169814),  
[10.3389/fmicb.2023.107137](https://doi.org/10.3389/fmicb.2023.107137)

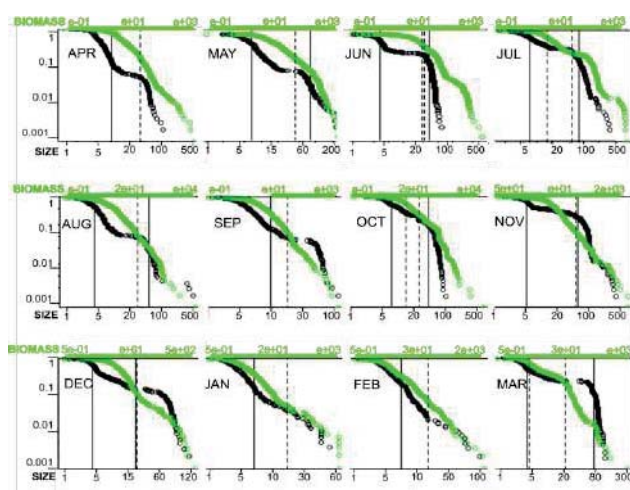


Figure: Importance of phytoplankton morphological traits: distribution plots for individual cell size ( $\mu\text{m}$ , black) and individual cell biomass ( $\text{pg C}$ , green).

## JAN GNIDOVEC

synthesised novel polymeric organofluorosilicates and organofluorogermanates, as well as imidazolium-based pentacoordinated silicon and germanium salts. His research advanced the understanding of coordination chemistry and structural stability of fluorinated anionic species. The synthesised compounds represent significant progress in inorganic and fluorine chemistry. Structural characterisation was supported by advanced spectroscopic and crystallographic techniques. The work holds potential applications in materials science and catalysis. He received the Krka award in 2025.

DOI: [10.1016/j.jfluchem.2024.110332](https://doi.org/10.1016/j.jfluchem.2024.110332),  
[10.1039/d3dt00421j](https://doi.org/10.1039/d3dt00421j)

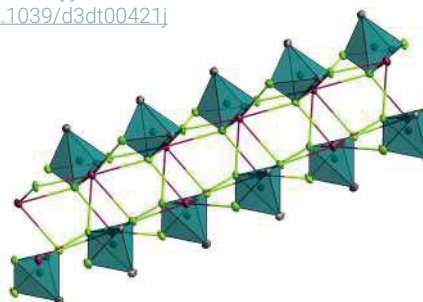


Figure: The crystal structure of  $[\text{Cs}][\text{Ph}_2\text{GeF}_3]\cdot\text{THF}$  represents a novel class of organofluorogermanium polymers, characterised by a network interconnected through alkali metal ions.

## MAJDA NIKEZIĆ

investigated the applicability of strontium (Sr) isotopic composition and multi-element analysis as tools for tracing the geographic origin of natural materials. Within two projects, Majda studied the origin of the protected Graviera Naxos cheese from the Greek island of Naxos and of Norway spruce timber from the Eastern Carpathians in Romania. She found that the Sr isotopic fingerprint in final products reflects a complex interaction of geological, soil, water, and biological factors, not merely the parent bedrock. The results contributed to improving isotopic distribution maps (isoscapes) for parts of Europe and opened new possibilities for protecting the geographic origin of Carpathian timber and Naxos cheese. The dissertation fills a gap in the understanding of Sr isotope transfer through environmental chains and has important implications for forensics, archaeology, and the protection of food authenticity.

DOI: [10.3390/foods13162540](https://doi.org/10.3390/foods13162540)

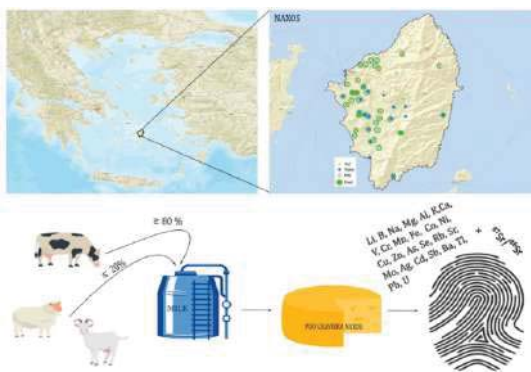


Figure: Sampling design and analytical approach for tracing the geographic origin of PDO Graviera Naxos.

## NEŽA PALIĆ

investigated the influence of genetic polymorphisms (ALAD, APOE) on internal lead and mercury levels in pregnant women with newborns and in men in their reproductive years. Her work demonstrated that genetic variability significantly affects metal distribution even at low environmental exposure levels. She contributed to the development and profiling of the mother-child(ren) and men exposure cohort, integrating environmental exposure and biological response data. The results provide insight into individual vulnerability and personalised risk assessment. For instance, in the case of a female fetus, the  $\epsilon 2$  allele of the apolipoprotein E gene was found to be associated with higher (cord)blood Pb in the studied population. Her research has strong implications for preventive public health strategies and environmental health policy related to elevated lead and/or mercury exposure levels.

DOI: [doi.org/10.1016/j.envres.2023.115226](https://doi.org/10.1016/j.envres.2023.115226)

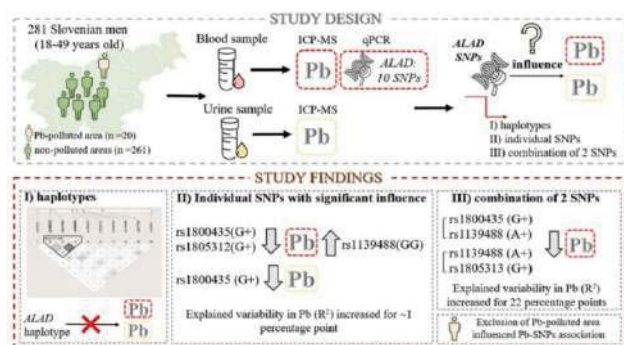


Figure: The impact of ALAD gene single-nucleotide polymorphisms on lead (Pb) kinetics at low exposure levels.

## TJAŠA ŽERDONER

investigated the sources of lead (Pb) in airborne particulate matter PM<sub>10</sub> from the Upper Meža Valley, an area heavily contaminated due to long-standing mining, smelting, and secondary Pb processing activities. Tjaša optimised an analytical method for determining the Pb isotopic composition by MC ICP-MS in various environmental samples, as well as a method for the extraction of nanoparticles from PM<sub>10</sub> samples by single particle (sp)ICP-MS. The results showed that the Pb isotope ratios in PM<sub>10</sub> differ from the local background and point to a dominant anthropogenic source, secondary lead processing, which contributes 56–69% of total Pb in PM<sub>10</sub>. Through nanoparticle analysis, she identified Zn- and Pb-containing nanoparticles, which further confirmed the pollution sources and enabled an assessment of potential health risks.

DOI: [10.1039/d5an00480b](https://doi.org/10.1039/d5an00480b)

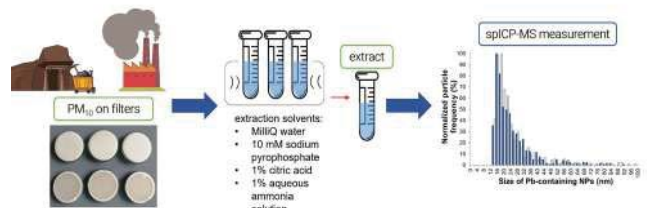


Figure: Analytical design for determining Pb nanoparticles in PM<sub>10</sub> particles.

## KLARA ŽAGAR

Her research significantly advances the understanding of the hydrological cycle and bridges isotope hydrology and hydrogeochemistry to support better water resource management. A city-wide study of stable water isotopes of precipitation, surface water, and groundwater across the Slovenian capital was undertaken to trace the various sources contributing to the city's drinking water supply. Research data permitted the identification of changes in contributions of local precipitation and river water to the two main drinking water supply aquifers and in mean residence times of groundwater in relation to climate characteristics. The results of isotopic research indicate changes in the dynamics of groundwater recharge in the last decade and suggest that future climate change could significantly affect water resources in the Ljubljana area and thus the public drinking water supply.

DOI: [10.1016/j.jhydrol.2024.130892](https://doi.org/10.1016/j.jhydrol.2024.130892)

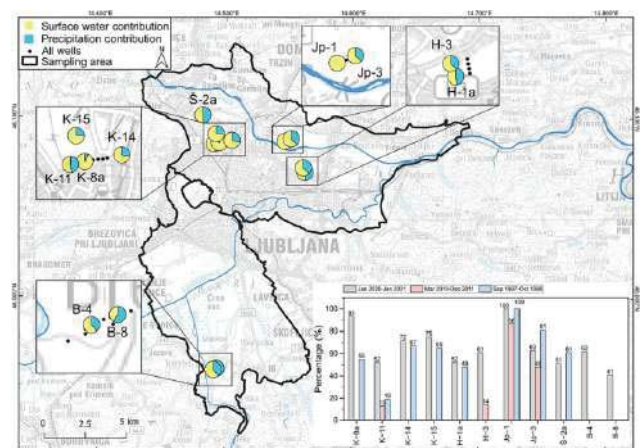


Figure: Contributions of local precipitation and river water to groundwater in Ljubljana. The inserted graph represents the comparison to previous investigations.

## ANŽE TESOVNIK

investigated the process of producing lightweight aggregates from biomass ash. Through alternative binding using alkali activation and controlled carbonation, a stable highly porous structure was achieved, enabling CO<sub>2</sub> sequestration and exhibiting favourable leaching properties. The work was carried out in collaboration with the Technical University of Denmark within the framework of the European AshCycle project. The research demonstrates the potential use of underutilised biomass ashes for the production of artificial construction aggregates, insulating composites, or CO<sub>2</sub> sequestration media. The innovation received recognition for development activities in the SRIP Circular Economy call, while the oral presentation at the ECI conference in Finland was awarded Best Presented Contribution. In 2025, documentation for a Slovenian patent application was submitted.

DOI: <https://doi.org/10.1016/j.cscm.2025.e05014>



Figure: Receiving awards for the best presentation at the ECI conference and for innovation recognition within the SRIP Circular Economy call.

## SENSOR TECH STUDENT ACHIEVEMENTS

### VICTOR REGIS

a fourth-year PhD student of Sensor Technologies, received the award for the best student pitch for his work "Preparation and characterization of multicaloric composites". The student was awarded at the ISAF 2025 conference held in Graz, Austria. In the pitch competition, the student had to present his work in a convincing and succinct manner within 90 seconds.



Figure: a) Announcement of the award winner at the auditorium and b) the student with the award.

### LANA VOGRINEC

investigated the viruses of aquatic plants, an ecologically significant group, whose viral communities remain unexplored. This gap is particularly relevant for ornamental aquatic plants, which can become invasive and may harbour viruses potentially threatening native plant populations. Together with her co-authors, she addressed this issue by utilising different approaches to identify viral sequences in aquatic plants ranging from algae to angiosperms. The study revealed an extensive diversity of viruses, including important crop pathogens, in both wild and ornamental aquatic plants, highlighting the risks associated with their unregulated trade. As the first author, she published these findings in the journal *Environmental Microbiome* (5-year IF = 6.4) and presented them at the International Advances in Plant Virology 2025 conference in Murcia, Spain, where she was awarded second place for the best PhD student oral presentation.

DOI: <https://doi.org/10.1186/s40793-025-00783-6>



Figure: Aquariums with virus-infected aquatic plants, from left to right: *Sagittaria latifolia*, *Alternanthera reineckii*, *Lindernia rotundifolia*, *Ludwigia repens*.

### ŽIGA BERTALANIČ

was awarded a runner-up place in the poster competition for his poster titled "Fabrication of Solid Oxide Fuel Cells" at the IEEE ISAF 2025 conference, held in Graz in July 2025. In his work, he described the fabrication of solid oxide fuel cells (SOFCs), such as tape casting and screen printing, as well as the techniques used for their characterisation. These are primarily scanning electron microscopy and focused ion beam microscopy. Using energy-dispersive X-ray spectroscopy, he confirmed the formation of resistive phases between individual layers of the fuel cell, which contribute to enhanced degradation. In his work, he concluded that the densification of the barrier layer component is vital for the long-term stability of SOFCs.

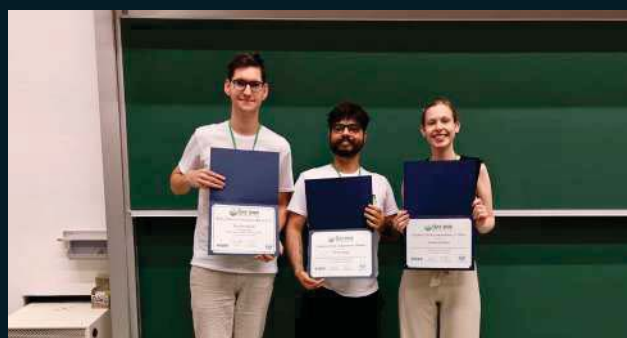


Figure: Žiga Bertalanč (left) and his colleagues posing with their respective awards at the IEEE ISAF 2025 conference.

## KATARINA ŽIBERNA

received several recognitions for her research on the local mechanical behaviour of perovskite oxide ferroelectrics. In 2024, she was awarded the Best Student Oral Presentation Award at the Nanobrücken 2024 conference in Lyon, the Best Poster Award in the field of materials at the 5th Slovenian Microscopy Conference in Rogla, and first place in the Young Researchers Competition at the 29th International Conference on Materials and Technologies in Portorož. Her research focuses on the investigation of the local mechanical properties of lead-free ferroelectric materials, including the  $(\text{K},\text{Na})\text{NbO}_3$  single crystal and  $\text{BiFeO}_3$  ceramics. In addition to measuring mechanical properties such as elastic modulus and hardness, she studied structural and microstructural defects formed in the material as a result of mechanical loading, providing insight into the mechanisms of plastic deformation during indentation.

DOI: [10.1016/j.jeurceramsoc.2024.05.011](https://doi.org/10.1016/j.jeurceramsoc.2024.05.011)



## JANINA ROKNIČ

a first-year doctoral student in Sensor Technologies, received an award at the 17th Jožef Stefan International Postgraduate School Students' Conference for her presentation titled "Polarization Mapping in Potassium Sodium Niobate by 4D STEM, Multi-Slice Simulations, and First-Principles Calculations". By combining microscopy experiments with first-principles calculations, she identified niobium displacements and was able to link them to local spontaneous polarisation in ferroelectric potassium sodium niobate. The observed displacements of niobium opposite to oxygen, along directions consistent with orthorhombic symmetry, were validated by simulations.



Figure: Janina Roknić, a first-year PhD student, receiving the Award at the 17th Jožef Stefan International Postgraduate School Student's Conference, "From Research to Reality", in May 2025 at Mekinje Monastery, Kamnik.

## IVANA GORIČAN

a third-year PhD student of Sensor Technologies, received the third award for the Student Pitch Competition at the IEEE ISAF conference, which took place in Graz from July 13 to 18, 2025. The title of the contribution was »Functional properties of  $0.5\text{BaZr}_0.2\text{Tl}_0.8\text{O}_3-0.5\text{Ba}_0.7\text{Ca}_0.3\text{TlO}_3$  thick films prepared by aerosol deposition«. In her contribution, Ivana highlighted the powder aerosol deposition method, which she used to prepare functional thick films at room temperature. The energy storage properties of the prepared samples were determined. The results showed that the properties of these thick films are stable over a wide temperature range. In addition, the samples exhibited good energy storage performance even after 100 million applied electrical pulses, which opens up potential for use in pulsed systems.



Figure: Ivana Goričan receiving the award at the Student Competition at the IEEE ISAF 2025 conference in Graz.



# Social Life at IPS

- Opening of the academic year,
- Dean's Day and IPS Picnic,
- Diploma Ceremony,
- IPS Day,
- IPS Open Day,
- Participation at the Jožef Stefan Days,
- Participation at the Researchers' Night.



# Quality Study and Research Support

## ONLINE SUPPORT AND COMMUNICATION

After the IPS website was updated in 2018, in August 2021, the school started updating the IPS information system which is used to help the administration, students (e-Student) and professors (e-Professor). The talks regarding the update included all the interested parties, i.e. employees of the specialist services, and representatives of students and professors, who actively took part in setting up the new information system with their suggestions. As it is a complex and an overall demanding project, the work continued in 2022 as well. With the new system the students gained a better overview of the activities related to their studies (timetable and list of enrolled courses, exam dates, completed courses, documents they need during their studies). Professors gained a better overview of the implementation of the study process (information on students enrolled in a particular course, establishing direct communication with students, editing study materials, overview of the completed activities).

## IPS OFFICE

Employees of the IPS Office were available to students and professors in person, via email and over phone. By introducing a more efficient information system, the employees were able to issue documents related to the study process more easily (enrolment certificates, transcripts of records, graduation certificates, exam applications, documents for the defence of seminars and theses, etc.), and the students thus received those documents much faster. In the 2024/2025 academic year, the study process and educational work were carried out without interruptions, ensuring that students and professors had access to all necessary information and documents. The lectures, consultations and defences were conducted in person or in a hybrid format.

## ERASMUS EXCHANGE PROGRAMMES

In the reporting period, a total of 48 Erasmus+ mobilities of staff and students were carried out, of which 8 staff mobilities and 40 student mobilities. The mobilities took place across a diverse range of countries, demonstrating the strong international engagement of the institution. Participants visited Austria (8), Italy (7), Portugal (7), the Netherlands (5), Spain (3), United Kingdom (3), Czechia (2), Germany (2), Serbia (2), Sweden (2), France (1), Greece (1), Hungary (1), North Macedonia (1), Taiwan (1), and the United States (1). In addition, one mobility was hosted in Slovenia, reflecting both outgoing and incoming mobility activities within the programme.

The total duration of all mobilities amounted to 1,125 days, with an average mobility duration of 23.44 days per participant. While most mobilities were short-term, five mobilities lasted more than 50 days, and two of them exceeded 100 days, indicating that several participants engaged in longer-term international exchanges. These mobility programmes significantly contribute to strengthening international cooperation, expanding research networks, and enhancing the international experience of both students and staff.

## RESEARCH EQUIPMENT

Within their research and educational programme, the IPS students have access to state-of-the-art research equipment within the framework of the founding and partner institutes (JSI, IMT, and NIB) and especially within the centres of excellence, in particular:

- the Centre of Excellence on Nanoscience and Nanotechnology (CENN Nanocentre),
- the Centre of Excellence for Integrated Approaches in Chemistry and Biology of Proteins (CE CIPKeBiP), and
- the Centre of Excellence for Advance Materials for the Future (CE NAMASTE).

In the scope of the projects designed for industrial partners, the IPS students are also directly involved in their respective research laboratories. The IPS also established its own research laboratory for developing measuring instruments for selective proximity detection of materials.

In this context, the IPS students have access to modern research equipment to work on their research tasks and are provided the expertise of highly qualified research instructors within the framework of expert groups from responsible institutions.

## ALUMNI CLUB

In the 2024/2025 academic year, the IPS Alumni Club continued its active involvement in the life of the school. The club contributed to the content and organisation of the annual IPSSC conference, continued the revised procedures for alumni membership, and promoted the use of the online application form. Throughout the year, the club focused on actively recruiting former students and encouraging graduates to join the alumni community, further strengthening the IPS alumni network. Several coordination meetings of the Alumni Club Council were held, during which preparations for upcoming council elections were also carried out. In addition, the club established and distributed its first alumni newsletter, aimed at improving communication with graduates and keeping them informed about IPS activities and opportunities for engagement.

## CAREER CENTRE

The Career Centre at IPS plays an essential role in complementing educational activities by connecting students with industry, research institutions and society challenges. It helps students gain insights into real-sector business, acquire practical experience, and access employment opportunities in reputable companies, while also engaging in research tasks related to current economic and society challenges. The Career Centre serves as a key link between students, the school, alumni, and employers, supporting study decisions, international exchanges, career planning, and keeping students informed about job openings, postdoctoral positions, and scholarships via the Student Council, website, and social media. It also facilitates student mobility, with interest growing each year, and collaborates with the Student Council and Alumni Club on events to gather feedback from current and former students. All services offered by the Career Centre are free of charge.

Career Centre has actively contributed to national and international projects in pedagogy, higher education, and skills development, including Erasmus+ projects. Within IGNITE project, we analysed student learning preferences to develop visually rich, engaging, and personalised learning nanomodules as a new self-learning approach. The RESPO application was optimised to track competence development and now includes an AI-based e-advisor. Through projects like IGNITE, GreenLead and Proact-STEM, we implemented new learning nanomodules, applied RESPO application, organised workshops on sustainability, innovation, and STEM skills, and conducted studies on student competencies to inform targeted learning paths, enhancing both career readiness and faculty teaching development.

IPS



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### SUMMARY OF SELF-EVALUATION REPORT FOR 2024/25 ACADEMIC YEAR

Jožef Stefan International Postgraduate School

Content: IPS

Photos: Arne Hodalič, Katja Bidovec, Marjan Verč, Miran Kambič, Tomaž Rosa, Radojko Jačimović, JSI archives, IPS archives, gov.si, tromba.si

Photos of the Students' Conference: IPS

Design: Lenka Trdina

Editor: Assist. Prof. Andreja Abina