





Faculty of Natural Sciences and Mathematics

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MARIBOR -UNIVERSITY CITY

Maribor is **the second largest city in Slovenia** with approximately 110,000 inhabitants. It is the economic, cultural and educational centre of the north-eastern part of Slovenia. It lies at the intersection of transport routes from central to south-eastern Europe and from western central Europe to the Pannonian Plains. The earliest settlements in the Maribor area date back nearly a thousand years ago, but the city began to develop faster **in the middle of the 18th century**.

The University of Maribor is the second largest and second oldest university in Slovenia. Around 14,000 students and 2,000 employees of the University make Maribor a university city in all respects. Students give it a youthful vibrancy and promising prospects for the future, while professors bring their academic and professional excellence.

Maribor boasts a rich and diverse cultural tradition; in 2012, it was the **European Capital of Culture**. It is the site of the **world's oldest vine**, which is over 400 years old. It has beautiful green surroundings. The Pohorje mountain range has a ski centre that regularly hosts FIS World Cup races in skiing. Maribor is also a centre of congress tourism. Many men of note have passed through or lived here, including the pioneer of space research Herman Potočnik Nordung, and Nikola Tesla.



FACULTY OF NATURAL SCIENCES AND MATHEMATICS

The Faculty of Natural Sciences and Mathematics (FNM) boasts one of **the oldest traditions** at the University of Maribor. It was founded from the Faculty of Education, which was a founding member of the University.

FNM is distinguished by exceptional research excellence and above-average students' evaluation of the work performed by academic staff. We are proud of our positive employee and student relations, and especially of our tutoring system, which is particularly important. FNM is the only member of the University of Maribor that has been ranked among the top in the world in two study areas, according to the Times Higher Education World University Rankings.

There are four departments at the faculty: Biology, Physics, Mathematics and Computer Sciences, and Technology. 13 study programs are available at all three levels of the Bologna Process framework. All of them enable students to acquire an in-depth understanding of theoretical backgrounds, as well as practical skills and competences. This provides them with excellent employment opportunities and a great competitive advantage in the labour market. We are the only faculty in Slovenia with a teacher training Uniform Master's study program, which opens doors to the graduates' employment in primary and secondary schools. We are proud of all our BA, MA and PhD graduates, as well as our employees, who perform their work at the highest, globally comparable level. Ever since its inception, but especially in the past year, the actions of FNM have demonstrated to the wider community that a powerful sense of mission underpins all our fields of study.

Dean of FNM prof. dr. Blaž Zmazek



Pursuing Our Vision:

Creating professions of the future.

To be the leading educational, research and development centre in the region in the field of basic natural sciences and mathematics, as well as being the leading centre in Slovenia for the education of teachers in all fields of science, mathematics, and technical professions at all levels of education.



EDUCATION

FNM offers teacher training and non-teacher training study programs in the fields of Biology, Ecology with Nature Conservation, Physics, Mathematics, Computer Sciences, Technology, and Chemistry. We are the first and only one in Slovenia to offer a five-year teacher-training Uniform Master's program. Our doctoral study programs lay the groundwork for high-quality in-depth research in the sphere of promising and established scientists.

Most important educational goals include the placement of graduates onto the labour market, their links to possible employers, the quality of education provided, as well as adequate staffing and a favourable ratio of assistants and professors in relation to students. FNM cares for a constant development of teaching and research competences in our lecturers, while students are encouraged towards creative competitiveness, international mobility, and lifelong learning.

In the academic year 2021/22, **153 students were enrolled** in the first year of study:

- 96 BSc students,
- 24 MSc students of 5-year program
- **30** MSc students and **3** PhD students.

In total, **457 students are studying** at the faculty, of which there are:

- 245 BSc students,
- 89 MSc students of 5-year program,
- 197 MSc students and 26 PhD students.

In 2021, 98 students graduated, of which there were:

- 54 BSc diplomas,
- **39** MSc diplomas,
- 1 MSc 5-year program graduate, and
- 3 PhD graduates.

Vice-Dean for Education Affairs Prof. dr. Sonja Škornik





RESEARCH

Scientific research at FNM has a long and rich tradition. Most recently, as many as three of our researchers received the Zois Award (the highest recognition of the Republic of Slovenia for scientific research), one received the Puch Award, and seven FNM researchers received the Zois Certificate of Recognition. Given all our researchers' outstanding achievements, it is no coincidence that FNM regularly ranks among the best in various evaluations of the research work performed by the University of Maribor, as well as international research work. In 2018, the University of Maribor was ranked among the top 300 world universities by the Times Higher Education World University Rankings in the fields of Mathematics, Statistics, Physics, Astronomy, Chemistry, Geology and Environmental Sciences. The study programs of Mathematics and Physics/Astronomy were ranked by the prestigious QS World University Rankings in 2017; Physics in 2017, 2018 and 2019, and Mathematics in 2017 and 2020.

FNM has participated successfully in completing more than 30 R&D projects so far and is currently involved in 6 research programs. We are the leading organisation for the research program *Computationally Intensive Complex Systems*. In addition, 11 other basic research projects are currently underway, with FNM as the leading organisation for *Preventing Heat Stress in Urban Systems under Climate Change, and Phase Transitions towards Coordination in Multilayer Networks*. At the moment, 3 target research projects are being carried out, with FNM as the coordinator for the projects *Designing, Testing and Preparing a Result-Oriented Agri-Environmental Action 'Colorful Meadow' for High Nature Value Grasslands in Slovenia, and Landscape Heterogeneity and the Forthcoming Agricultural Policy Measures in Slovenia.*

In the international arena, we are leaders or partners in projects from most research-relevant countries around the world. Research activity is reflected in postgraduate studies, where students are actively and successfully involved in the research work.



The visibility of our research work is

remarkable, as evidenced by the ten-year trend of the index of citations of research articles at FNM (in 2020, the number exceeded 40.000):

Vice-Dean for Scientific Research and International Affairs Prof. dr. Aleksander Vesel

COOPERATION WITH THE COMMUNITY

In the field of both research and education, FNM cooperates with the community either directly within the framework of shared employee recruitments or as a participant in joint projects. Cooperation outside the university environment is also very important.

Partner companies

FNM cooperates closely with companies from the fields of statistical and algorithmic data processing and modelling, physics-based analyses and modelling of natural phenomena, machine construction, and mapping and nature protection-based evaluation of habitat types.

Partner schools

Pre-service teacher education students perform lesson observations and teaching trials as part of their study process. This brings them into contact with their future work environments, and at the same time they become the first ambassadors to present our faculty to future generation students.

Secondary school students and teachers are invited to presentations, such as science days, research camps, open days at the faculty, vivarium visits, and more. Our goal is to create a motivating atmosphere for learning about science, mathematics, and technology, and provide prospective students with an opportunity to turn their personal interests into a formal study at FNM.

FNM highly appreciates and encourages the ambition and creativity of our students, and therefore actively involves them in professional, developmental, and scientific research projects, as well as in socially responsible work and intergenerational support.



fiziko



Participation in Organizations, Bodies and Commissions

Employees and students participate actively in different expert bodies and commissions at all levels, such as the Council of Experts of the Republic of Slovenia for General Education, the Slovenian Research Agency (ARRS), the Society of Mathematicians, Physicists and Astronomers of Slovenia (DMFA), the Biological Society of Slovenia, etc. through which they influence policy reforms, promote the development of scientific knowledge, and raise awareness about the importance of these skills in the contemporary society. As an act of exercising social responsibility, in this year 5 of our colleagues have taken up positions at the Slovenian Ministry of Education, Science and Sport. All of them took on new challenges with the goal of contributing their own field-specific expertise and energy for the benefit of the entire country's higher education system.

Popularization of Science

Activities performed at FNM are highly visible in the community, such as thematic days and specialist lectures for secondary schools/gymnasia and other interested public, competitions in physics, biology and constructing, publication of articles or media broadcasts on the latest scientific discoveries, etc. These do not go unnoticed by the expert community, who have regularly awarded our employees with the *Prometheus of Science* award.

Career Centre

Through a network of companies students systematically gather informal knowledge through personal consultations and enrich their experiences. We provide employers with access to prospective candidates.

Natural Sciences and Mathematics Club

With the foundation of the Academy of Natural Sciences and Mathematics, the club set out to create an environment which will provide additonal support to the most talented pupils and students.

Centre for Lifelong Learning

The Centre offers opportunities for further education to FNM alumni, especially in relation to the national teaching community. It implements programs of continuous professional development for teachers, various forms of non-formal education and training, and an upskilling program for teaching science in primary schools.

Dean of FNM prof. dr. Blaž Zmazek

TEACHER TRAINING PROGRAMS

At FNM, teacher training programs are the ones with the longest tradition. They are closely intertwined with other programs, especially in terms of common subject-specific subjects, and especially through those elective subjects whose content represents an important upgrade of acquired knowledge and skills regarding communication with colleagues in a real work environment.

As anywhere else in the world, in 2021, the work of FNM was radically shaped by the effects of the pandemic. Great innovation was required to provide hands-on teaching experience for our students. Divergent thinking, and scepticism, which arise in such situations, were overcome with highly constructive suggestions that enabled teaching trials and compulsory practical training in the same manner, in which primary and secondary school lessons took place. A different approach to teacher training work gave students an insight into the new reality; they were considering the same situations as their mentors, which is, in fact, one of the purposes of practical teacher training.

Collaboration with the Industry

We have been aware of the importance of cooperation with the industry from the very beginning. In 2021, this kind of collaboration was formalized and on the increase. Two major shifts were observed in this area: overall, the society expects more collaboration between the scientific rese-



arch sphere and the industry, because such collaborations generate positive synergy effects. Secondly, there is a need to increase the absorptive capacity of the economy for scientific research findings. Both observations indicate the importance of intensifying such collaborations and demonstrate that the time is ripe to implement them. At FNM, we are aware that collaborations with the industry are not always possible in the exact field in which our researchers are engaged, but in order to create mutual interests, this can be overcome by means of divergent and interdisciplinary approaches.

International Relations

The extremely diversified cooperation with the rest of the world at the level of scientific research continues to run virtually uninterrupted, as well as teacher training collaborations performed remotely. More ingenuity was required in carrying out visits of foreign experts to Slovenia and vice versa. Especially noteworthy is the exemplary cooperation with the Natural Sciences and Mathematics Club, which helped to organize, select candidates, and participate in the 3rd Balkan Physical Olympiad led by the Balkan Physical Union, where participants from FNM achieved excellent results.

Vice Dean for Cooperation with the Industry, International Relations and Teacher Training Programs **Prof. dr. Robert Repnik**



Matej Maček, Honorable Mention at the 3rd Balkan Physics Olympiad 2021



Tian Strmšek, with mentor Matjaž Črček

STUDENTS

Student Council

Students interests and opinions are represented by the Student Council, the only formal body consisting exclusively of students, led by a Student Vice-Dean, and operating under the motto "By Students and for Students". Members of the Student Council discuss about strategies for successful studying, improving the quality of studies, suggestions, and possible issues, and in particular about students' rights and obligations. Various events are organized as part of the Council, with a view to reinforcing the relationships between students in a relaxed atmosphere.

- *Spring Greeting with a Healthy Breakfast*, to remind students about the importance of healthy eating.
- Study visits; getting to know potential employers and visiting viable companies that employ our graduates.
- Student mixer events and department picnics, for making new friends and acquaintances, for all generations.
- Post-exam parties, a great opportunity to relax after a busy exam period.
- *Trivia night*, an interfaculty competition between FNM, the Faculty of Arts (FF) and the Faculty of Education (PeF).

Tutors

Tutors are successful students who help other students with advice. They also facilitate the adaptation of newcomers to the university environment and help to increase the transition of students to the next year of study.

Society of Natural Science Students

Connecting FNM students of biology, ecology with nature conservation and other natural sciences. We share the desire for practical field work and specialist lectures on natural science topics.

Student Vice-Dean for Student Affairs Melani Potrč





IMPORTANT EVENTS AND ACHIVEMENTS



Prof. dr. Nataša Vaupotič received the University of Maribor Award for research, artistic and educational work.

Prof. dr. Boštjan Brešar in prof. dr. Sandi Klavžar became co-authors of a scientific monograph published by Springer International Publishing.

Prof. dr. Nataša Vaupotič, in collaboration with researchers from the University of Warsaw and the University of Aberdeen, published an important discovery of a photonic band gap in nonchiral liquid crystals.

In 2021, we celebrated the 15th anniversary of the founding of the Faculty of Natural Sciences and Mathematics of the University of Maribor.

Prof. dr. Boris Kryštufek received the Zois Certificate of Recognition.

FNM IN FIGURES

FNM employs 99 full-time and part-time employees and 85 external staff. A total of 457 students are currently studying at the faculty.

The average age of employees is 45 years, which indicates that FNM has an optimal ratio of young power to experienced staff. The total budget of the faculty is \in 5.1 million, out of which \in 3.7 million is funded by the competent Ministry (MIZŠ), and \in 1.4 mio from other sources.









FACULTY BODIES

DEAN: prof. dr. Mitja SLAVINEC (until 9 February 2021);

ACTING DEAN: prof. dr. Blaž ZMAZEK (from 10 February 2021 to 16 January 2022)

ACADEMIC ASSEMBLY: president: doc. dr. Bojan HVALA

SENATE OF THE FACULTY: prof. ddr. Boris ABERŠEK, prof. dr. Boštjan BREŠAR, prof. dr. Mitja KA-LIGARIČ, prof. dr. Iztok BANIČ, prof. dr. Franc JANŽEKOVIČ, prof. dr. Aleksander VESEL, prof. dr. Nataša VAUPOTIČ, prof. dr. Robert REPNIK, prof. dr. Sonja ŠKORNIK, dean (by function), Luka BEN-KOVIČ, Jaša DIMIČ and Mo LIPOVEC.

MANAGEMENT BOARD:

- Dean (by function)
- Vice-Dean for Student Affairs (by function)
- Secretary-General (by function)
- doc. dr. Aleš FAJMUT
- prof. dr. Marko JAKOVAC
- doc. dr. Nenad MUŠKINJA
- doc. dr. Nataša PIPENBAHER

DEPARTMENT CHAIRS:

DEPARTMENT

Department of Biology Department of Physics Department of Mathematics and Computer Science Department of Technical Education

HEADS OF INSTITUTES: INSTITUTE

Institute of the Dept. Of Mathematics and Computer Science Institute for Biology, Ecology and Nature Conservation Institute for Physics Institute of Contemporary Technologies Science and Research Centre



CHAIR

doc. dr. Tina Klenovšek doc. dr. Eva Klemenčič prof. dr. Marko Jakovac doc. dr. Andrej Flogie

HEAD

prof. dr. Boštjan Brešar prof. dr. Franc Janžekovič prof. dr. Matjaž Perc prof. ddr. Boris Aberšek prof. dr. Drago Bokal

STUDENT COUNCIL:

- Melani POTRČ, Vice-Dean for Student Affairs
- Ana PALČIČ, president of the council (2nd year)
- Blažka GOLOB PLEUNIK, member of the council (2nd year)
- Mojca OPRČKAL, president of the council (3rd year)
- Tina VERHNJAK, member of the council (3rd year)
- Patricia JAGARINEC, president of the council (4th year)
- Darin LAH, member of the council (4th year)
- Brina LUKEŽ, president of the council (5th year)
- Jaša DIMIČ, member of the council (5th year)
- \bullet Luka BENKOVIČ, president of the student council for senior year students
- Ana ŠTAMPAR, member of the student council for senior year students

FNM UM PROGRAM COUNCIL:

Igor AKRAPOVIČ	Akrapovič d. d.
Franc CIPOT	CEROP
akad. prof. dr. Igor EMRI	Science Europe
mag. Benjamin JOŠAR	management board president of Triglav Skladi d. o. o.
dr. Vinko LOGAJ	National Education Institute Slovenia
mag. Marjan PENŠEK	Gorenje d.d., Energygor, d.o.o.
Andrej TUMPEJ	DEM
prof. dr. Aleksander VESEL	Vice-Dean of FNM
prof. dr. Sonja ŠKORNIK	Vice-Dean of FNM
prof. dr. Blaž ZMAZEK	Vice-Dean of FNM (until 9 February 2021)
prof. dr. Robert REPNIK	Vice-Dean of FNM
prof. dr. Nataša VAUPOTIČ	FNM
Simona KALIGARIČ	Zavod RS za varstvo narave
1	Zavod RS za varstvo narave

FNM PROGRAM COUNCIL FOR TEACHER TRAINING PROGRAMS

mag. Alenka AMBROŽ JURGEC	Srednja gradbena šola Maribor
Roman ČINČ	Gimnazija Murska Sobota
Zvonko KUSTEC	Gimnazija Franca Miklošiča Ljutomer
Marija LEŠER	III. Gimnazija Maribor
dr. Marko JAGODIČ	II. Gimnazija Maribor
Herman PUŠNIK	Prva gimnazija Maribor
dr. Samo REPOLUSK	Zavod Antona Martina Slomška Maribor
Ludvik SUKIČ	Srednja poklicna in tehniška šola Murska Sobota
Boštjan ŠERUGA	Gimnazija Ptuj
doc. dr. Andrej FLOGIE	FNM UM
prof. dr. Robert REPNIK	prodekan FNM



Fakulteta za naravoslovje in matematiko





FNM DEPARTMENTS





Faculty of Natural Sciences and Mathematics

Department of



Department of



Department of

Mathematics and Computer Science

Department of

Technical Education



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Department of

Biology and Chemical Education

STUDY PROGRAMS

- **BACHELOR PROGRAM BIOLOGY** (3 years, 180 ECTS)
- BACHELOR PROGRAM ECOLOGY WITH NATURE CONSERVATION (3 years, 180 ECTS)
- MASTERS PROGRAM BIOLOGY AND ECOLOGY WITH NATURE CONSERVATION (2 years, 120 ECTS)
- UNIFIED BACHELOR + MASTERS PROGRAM TEACHER OF BIOLOGY AND*; TEACHER OF CHEMISTRY AND*
 * Biology, Chemistry, Mathematics, Physics, Design and Technology, Computer Scienc (5 years, 300 ECTS)
- PhD PROGRAM ECOLOGICAL SCIENCES (3 years, 180 ECTS)
- Iarge number of different field excursions
- involvement of students in research and R&D projects already at bachelor and masters level
- innovative and interdisciplinary elective courses
- flexible MSc and PhD programme structure
- possibility of internship and student exchange

RESEARCH AREAS

- Vegetation Ecology of Grasslands, Flora of Slovenia
- Coastal Habitats, Archaeobotany, Landscape ecology
- Zoology, Animal Behaviour
- Basic and Applied Ecology
- Biodiversity and Nature Conservation
- Microbiology
- Plant and Animal Physiology
- Biology and Chemistry Didactics



The study of life at the **Department of Biology UM** embraces many areas of biological interest to expand our knowledge of biodiversity and its conservation.

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Department of Physics

STUDY PROGRAMS

- BACHELOR PROGRAM PHYSICS (3 years, 180 ECTS)
- UNIFIED BACHELOR + MASTERS PROGRAM TEACHER OF PHYSICS AND* (5 years, 300 ECTS) * Mathematics, Chemistry, Biology, Design and Technology, Computer Science
- MASTERS PROGRAM PHYSICS (2 years, 120 ECTS)
- PhD PROGRAM PHYSICS, BIOPHYSICS, EDUCATIONAL PHYSICS (3 years, 180 ECTS)
- theory and application oriented programs
- involvement of students in research and R&D projects already at bachelor and masters level
- innovative and interdisciplinary elective courses
- possibility of internship and student exchange

RESEARCH AREAS

- Physics of Complex Systems
- Soft Matter Physics
- Biophysics
- Applied Physics
- Physics Education



ESSENTIAL SCIENCE INDICATORS - THOMSON REUTERS:

"The University of Maribor has entered the top 1% of institutions in the field of Physics - and it did so with the highest number of citations." http://archive.sciencewatch.com/inter/ins/08/08mayMaribor/

www.fizika.fnm.um.si

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Department of

Mathematics and Computer Science

STUDY PROGRAMS

- BACHELOR PROGRAM MATHEMATICS (3 years, 180 ECTS)
- UNIFIED BACHELOR + MASTERS PROGRAM TEACHER OF MATHEMATICS AND*; TEACHER OF COMPUTER SCIENCE AND* * Mathematics, Computer Science, Biology, Physics, Chemistry, Design and Technology (5 years, 300 ECTS)
- MASTERS PROGRAM MATHEMATICS (2 years, 120 ECTS); EDUCATIONAL MATHEMATICS (2 years, 120 ECTS)
- PhD PROGRAM MATHEMATICS (3 years, 180 ECTS)
 - educating experts with knowledge of mathematics and computer science to work in the economy, financial sector and research institutes
 - educating mathematicians, future teaching assistants and university professors
 - educating teachers of mathematics
 - educating teachers of computer science

RESEARCH AREAS

- Algebra
- Applied Mathematics
- Differential Equations
- Discrete Mathematics
- Geometry
- Mathematics Education
- Computer Science Education and E-learning
- Topology

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Department of Technical Education

STUDY PROGRAMS

- UNIFIED BACHELOR + MASTERS PROGRAM TEACHER OF DESIGN AND TECHNOLOGY AND* (5 years, 300 ECTS)
 * Biology, Chemistry, Computer Science, Mathematics, Physics
- MASTERS PROGRAM EDUCATIONAL DESIGN AND TECHNOLOGY SINGLE MAJOR (2 years, 120 ECTS)
- PhD PROGRAM EDUCATION IN TECHNOLOGY AND ENGINEERING (3 years, 180 ECTS)
- education of design and technology teachers
- the link between theory and practice in pedagogical terms
- innovative and interdisciplinary elective courses
- possibility of internship and student exchange



RESEARCH AREAS

- Development of Teaching Models
- Cognitive Neuroscience and Philosophy of Mind
- Intelligent Tutoring Systems and Smart Learning Environments
- Integration of Technical Sciences and Knowledge Thransfer to Education

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Link to MA and PhD theses



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