

Strengthening Teaching Competences  
in Higher Education  
in Natural and Mathematical Sciences



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UNIVERSITY OF NIS,  
FACULTY OF SCIENCES  
AND MATHEMATICS:

Organisation, programs  
and activities

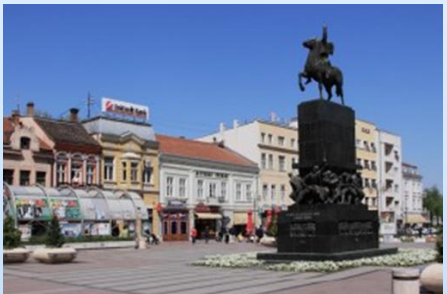
Aleksandra Zarubica  
University of Niš, Serbia



Kick-off Meeting, Niš, January 15-17, 2019

# CITY OF NIS

## “EAST – WEST GATE”



- Nis is the third largest city in Serbia and the administrative center of the Nisava District. According to the 2011 register, the urban area of Nis has a population of 187544 inhabitants, while the administrative area has a population of 260237 inhabitants.



- It is one of the oldest cities on the Balkans and Europe, and has been considered a gateway between the East and the West.



- Today, Niš is the city of about 350000 inhabitants, at a distance of about 230 km from Belgrade to the south of Serbia.



- Niš is an important industrial center in Serbia, especially in the field of electronics, modern IT sector, mechanical engineering, tobacco and (textile) industry. It is also a significant social, cultural, educational, academic, sport and tourist center of Serbia.

- Constantine the Great Airport is an international airport. In 2013, the City hosted a celebration of 1700 years of Constantine's Edict of Milan.



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# CITY OF NIS

## “EAST – WEST GATE”

- The town was named after the Nisava River, which flows through the city and was named *Navissos* by the Celtic in the 3rd century BC; from this term comes the Roman *Naissus*, Byzantine *Nysos* and Slavic *Nis*.
- One legend has it that Nis was founded by Prince Nisa, who built it using the nearby Humska Cuka stone. It was called The Emperor's City.
- The name is sometimes rendered as *Nish* or *Nissa* in English.
- After all, the etymology of the city's name remains unknown, although there are stories about the Celtic myth according to which the city was named “the city of fairies” after “the fairy river”. The name Naissus was first mentioned in the mid 2nd century by Claudius Ptolemy, who stated that this was the largest city in Dardania.
- It is also called the Imperial City, because Constantine the Great was born here.
- The city was devastated during its long history (Romans, Byzantines, Ottomans), but nowadays it is a modern city, with great opportunities.



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# CITY OF NIS HISTORY

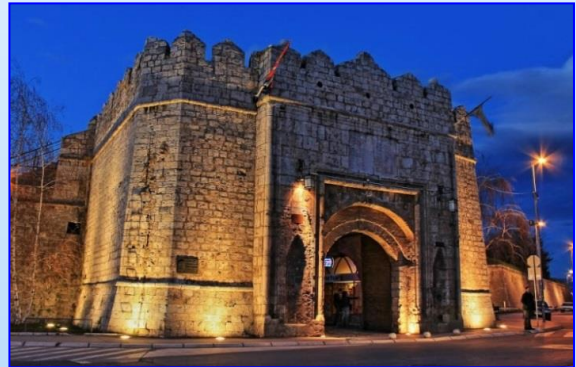
- It is often referred to as the “Gateway between the East and the West”, and Nis has a long history since the prehistoric times. As one of the oldest cities in Europe, Nis is a rich source of historical treasures, some of which date from the very beginnings of civilization.
- Constantine the Great was Roman Emperor from 306 to 337. He was the son of Flavius Valerius Constantinus, a Roman army officer of Illyrian origin. His mother Helena was Greek. His father became Caesar, the deputy emperor in the west in 293. Constantine was sent east, where he rose through the ranks to become a military tribune. Constantine was recognized as an emperor by the army at Eboracum (modern-day York) after his father's death in 306, and he emerged victorious in a series of civil wars (against Emperors Maxentius and Licinius) to become the sole ruler of both west and east by 324.
- Mediana is an important archeological site from the late Roman period, located in the eastern suburb of the City of Nis. It represents a luxurious residence with a highly organized economy. The residence dates to the term of Constantine the Great, 306 to 337. Although Roman artifacts can be found scattered all over the area of present-day Nis, Mediana represents the best-preserved part of Roman Naissus. In 1979, Mediana was added to the Archeological Sites of the Exceptional Importance list, protected by the Republic of Serbia.



# CITY OF NIS HISTORY

- Nis Fortress is a fortress in the City of Nis. It is a complex and important cultural and historical monument. It rises on the right bank of the Nisava River, overlooking the area inhabited for more than two millennia. It was protected by law in May 1948 as it was declared a cultural site of great significance. The current state of the fortress lists it as one of the best preserved fortifications of this kind in Serbia as well as on the Balkan Peninsula. The existing fortification is of Turkish origin, dating from the first decades of the 18<sup>th</sup> century, 1719-1723.

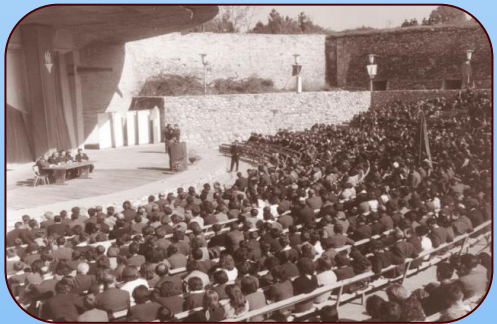
- Skull Tower is a stone structure embedded with human skulls located in the City of Nis. It was built after the Battle of Cegar in May 1809. Serbian rebels under the command of Stevan Sindjelic were attacked by the Ottomans on Cegar Hill, near Nis. Knowing that he and his fighters would be impaled if captured, Sindjelic detonated a powder magazine within the rebel entrenchment, killing himself, his fellow rebels and the encroaching Ottoman soldiers. Vizier Pasha ordered that a tower be made from the skulls of the fallen rebels. The tower is 4.5 m high, and originally contained 952 skulls embedded on four sides in 14 rows.



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# University of Nis History



- The University of Nis is the only university in the South-East part of Serbia, serving the population of about two million people.
- The University of Nis was founded on June 15, 1965, from the faculties that were part of the University of Belgrade.
- With the establishment of the University of Nis, a significant period in the recent history of the city is beginning to be completed, beginning in 1960 with the formation of the first Nis faculties under the auspices of the University of Belgrade. They were the Faculty of Law and Economics, the Faculty of Medicine and the Faculty of Engineering, the nurses from which the increasingly complex and comprehensive physiognomy of the University of Nis was systematically developed in accordance with the possibilities and demands of time.
- In the year of its establishment, the university had 234 teachers and associates and 6000 students. The increase in the number of students, the development of new scientific disciplines, but also the growing needs of the economy and social activities, have temporarily led to the reorganization of existing and the establishment of new faculties.



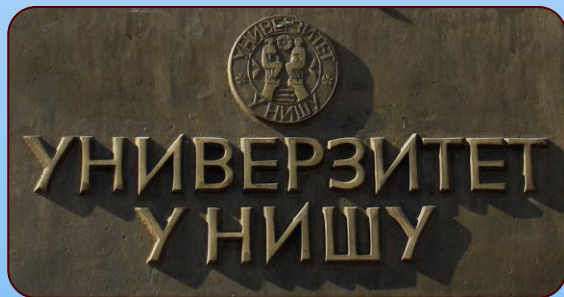
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# University of Nis Today

The University of Nis has following 14 faculties:

- Faculty of Sciences and Mathematics
- Faculty of Civil Engineering and Architecture
- Faculty of Electronic Engineering
- Faculty of Mechanical Engineering
- Faculty of Occupational Safety
- Faculty of Technology in Leskovac
- Faculty of Law
- Faculty of Economy
- Faculty of Philosophy
- Faculty of Education in Vranje
- Faculty of Fine Arts
- Faculty of Sport and Physical Education
- Faculty of Medicine
- Faculty of Agronomy in Krusevac.



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# University of Nis Today

- In the school year 2017/2018, 1601 teachers and associates performed classes, of which 1182 teachers and 419 associates at the faculties of the University of Nis.
- A total of 24625 students studied at the faculties of the University of Nis at all levels of the school year 2017/2018.
- Out of this number, 20341 students, including 63 students from abroad, attended basic vocational/(professional), basic academic and integrated studies.
- Master academic studies were attended by 2858 students, specialist vocational studies 28, and doctoral academic studies of 1297 students.
- Since the establishment of the University of Nis to date, 70589 students have graduated (of this number, according to the programs of the Bologna process - 10724 students). The academic title of Master of Science has gained 2602 postgraduates. Master academic studies finished 4864 students, and the title Doctor of science gained 2458 candidates (2097 according to the old program, while 361 are in Doctoral academic studies programs).



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# University of Nis

## Today

### Study programs



- The University of Nis was firstly accredited on January 31, 2009 in the third cycle of accreditation of higher education institutions in Serbia, in which the universities in Belgrade and Novi Sad are also accredited. After five years, a new accreditation procedure was conducted, and the Decision on accreditation was received by the University of Nis on November 14, 2014.
- The faculties of the University of Nis are also accredited in accordance with the Law on Higher Education, the decisions of the Commission for Accreditation and Quality Control of the Republic of Serbia.
- At the university and faculties of the University of Nis, a total of 130 study programs were accredited at all levels of study. Of this, nine study programs for teaching in both the Serbian and English languages.
- High-education process is realized through academic and vocational study programs.
- The first study level: basic academic and basic vocational study programs.
- The second study level: master academic, integrated academic and specialist academic program.
- The third study level: doctoral academic study program.



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# University of Nis Science and Research

- At all faculties of the University of Nis, scientific research is carried out in the field of basic, applied and developmental research, in order to develop science and creativity, to improve the activities of higher education, that is, to improve teaching, to improve scientific knowledge, to introduce students into scientific work, as well as to supply material and financial conditions for the work and development of faculties as a whole.
- In the last period, scientific research has taken place through the participation of teaching and research staff in the realization of scientific and research projects of national and international character, publication of articles in scientific journals and participation in scientific conferences in the country and abroad. Activities on the realization of projects financed by the Ministry of Education, Science and Technological Development of the Republic of Serbia represent the basic aspect of scientific research at faculties and a significant source of funds.



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# University of Nis Science and Research

- A large number of teaching staff of our faculties were engaged in such projects. Many faculties of the University of Nis, within their organizational units, research laboratories and innovation centers, engage in the provision of professional and technical support and other services in the field of their scientific research, which led to the realization of close cooperation with the industry and economy.
- All faculties of the University were organizers or co-organizers of numerous scientific meetings at national level and international conferences. Every year, increasing number of teachers and associates of all faculties of the University of Nis take an active part in various scientific meetings/conferences at the national and international level.



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# University of Nis

## University Building - Banovina

- The University of Nis works in one of the most representative buildings in the city, a building built in the late 19th century, which in 1979 was proclaimed a cultural asset of great importance.
- In the center of the city, on the right bank of Nisava, it was built distant in 1887 for the needs of the district at that time. The monumental building was built in a neo-Renaissance style, according to a project of an unknown Vienna architect, and in its long history it was the seat of the Court, the Principality and the Capetania, and from July 26, 1914 to October 6, 1915 (when Nis was the war capital of Serbia) the place of the Cabinet of the Government and the Ministry of Foreign Affairs.
- Since 1967 it has been allocated for permanent use to the University of Nis.

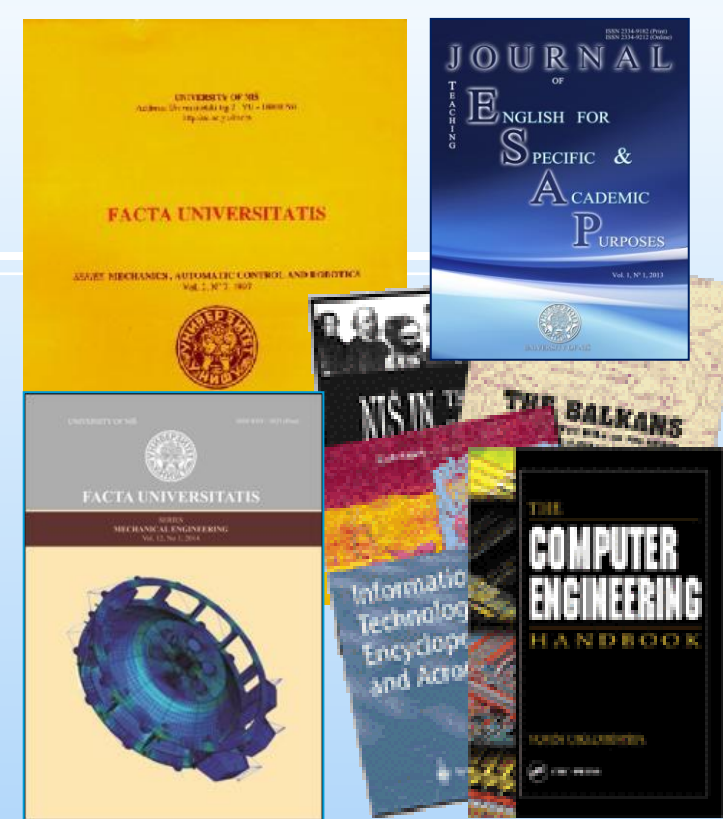


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# University of Nis Publishing activity

- The publishing activity of the University of Nis has a tradition of four decades. The beginning of these activities was in 1970, when the first three textbooks of university professors in Nis were published. Today, the publishing of the University of Nis comprises a rich and diverse production of works, both in print and electronic form. The publishing unit of the University independently prepares and publishes: books and journals, monographs and studies, scientific journal "Facta Universitatis", "Themes" - Journal of Social Sciences, "Review of lectures" and "Glasnik Univerziteta u Nisu", compact discs, audio and video publications.
- Textbooks, manuals, supplementary textbooks, monographs, chamber works and informers have been published at the University of Nis since 1970, and so far over 170 publications have been published. Since 2002 two ACADEMIA libraries have been established (textbooks, supplementary textbooks and manuals) and SCIENCIA (monographs). Parallel to printed publications, magazines and other publications, they are published in electronic form. "Facta Universitatis", "Themes", as well as some of the publishing works of the University of Nis, have their own Internet edition for about ten years.



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# University of Nis Support Services



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- **Networking – University Information system - JUNIS**
- **University Library “Nikola Tesla”**



<u>Networking</u>	<u>University Library</u>
University of Nis Information System - JUNIS	“Nikola Tesla”
Administrative, Scientific and Educational IS	Founded in 1967
IT Training (JUNIS school)	80.000 volumes, 12.000 periodicals
IT support to project implementation	Fully automated
Desk-top and electronic publishing	Digital libraries
Efficient logistics, tele-conferencing	E-services



# University of Nis International Cooperation



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- **MEMBERSHIP IN INTERNATIONAL ACADEMIC ASSOCIATIONS (EUA, IUC, IIE...)**
- **COOPERATION UNDER INTERNATIONAL PROGRAMS AND PROJECTS:**

TEMPUS,

FP7,

CEEPUS,

ERASMUS+,

ERASMUS MUNDUS,

HORIZON 2020,

MEVLANA.

- **STRENGTHENING CAPACITIES FOR CROSS-BORDER COOPERATION PROGRAMMES (Registered PADOR)**
- **CONTRACT-BASED COOPERATION WITH FOREIGN UNIVERSITIES**



Европа





# University of Nis

## Future perspectives



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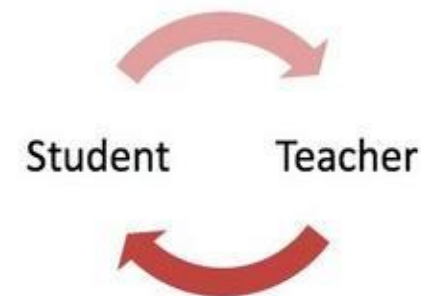
- **Internationalization and cooperation** – two key processes in joining the European higher education area.

### Main issues are:

- Harmonization of Serbian study programs with EU programs of study
- Application of credit system (ECTS)
- Student and staff mobility
- Collaboration in quality assurance
- Promotion of European Higher Education area
- Life-long learning
- Student participation in university governance
- Career Guidance Development
- Promotion of European HE area.

### Final goal is:

- **Full integration into EU Higher Education area**







# Faculty of Sciences and Mathematics History



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- The Faculty of Sciences and Mathematics has begun its life within the Faculty of Philosophy in Nis.
- The Faculty of Philosophy (founded in 1971) - initially consisted of several departments, three of which were:
  - Department of Mathematics,
  - Department of Physics,
  - Department of Chemistry.
- These three departments expanded into the Faculty of Sciences and Mathematics in 1999. The Faculty was founded by the Decision of the Government of the Republic of Serbia on the establishment of the Faculty of Science(s) and Mathematics in Nis (published in "Sluzbeni glasnik of the RS" No. 40/1999) in September 20<sup>th</sup>, 1999.



# Faculty of Sciences and Mathematics Today



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- Then, the Faculty was composed of five Departments: Mathematics, Physics, Chemistry, Geography and Biology with Ecology.
- Today, the Faculty of Sciences and Mathematics consists of six Departments:
  - Department of Computer Science,
  - Department of Mathematics,
  - Department of Physics,
  - Department of Chemistry,
  - Department of Biology and Ecology and
  - Department of Geography.
- The Faculty of Sciences and Mathematics is an educational and scientific institution that carries out Academic study programs and develops scientific and research work in all areas of the educational and scientific field in natural science(s).
- Since the establishment of the Faculty of Sciences and Mathematics to date, over 5000 students have completed all levels of study. The teaching and research process at the Faculty is conducted by 133 teachers, 22 associates and 56 researchers.

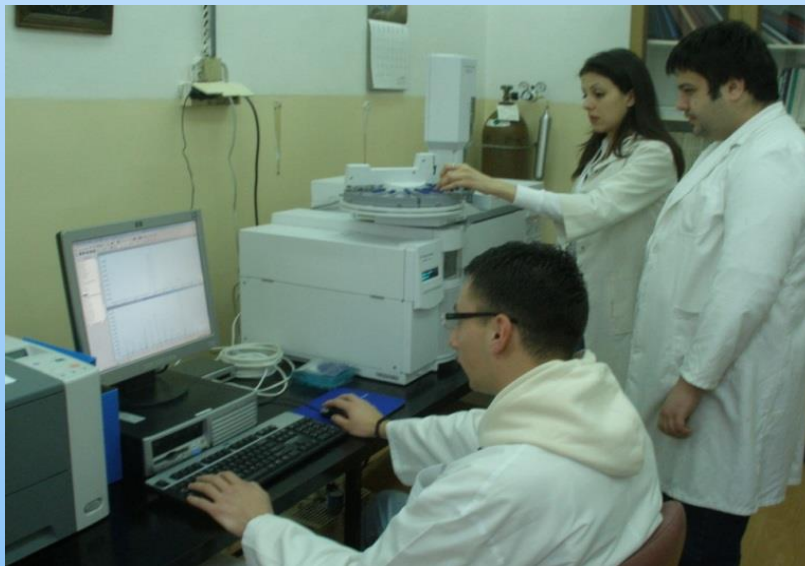


# Faculty of Sciences and Mathematics

## Organisation - structure



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- All educational and research activities at the Faculty of Sciences and Mathematics are realized through:
  - ❖ Departments and Laboratories,
  - ❖ Center for Advanced Study in Natural and Mathematical Science(s),
  - ❖ IT Center.
  
- Research activities are realized in the:
  - ❖ Research laboratories,
  - ❖ Computer classrooms,
  - ❖ Center for Advanced Study in Natural and Mathematical Science(s).

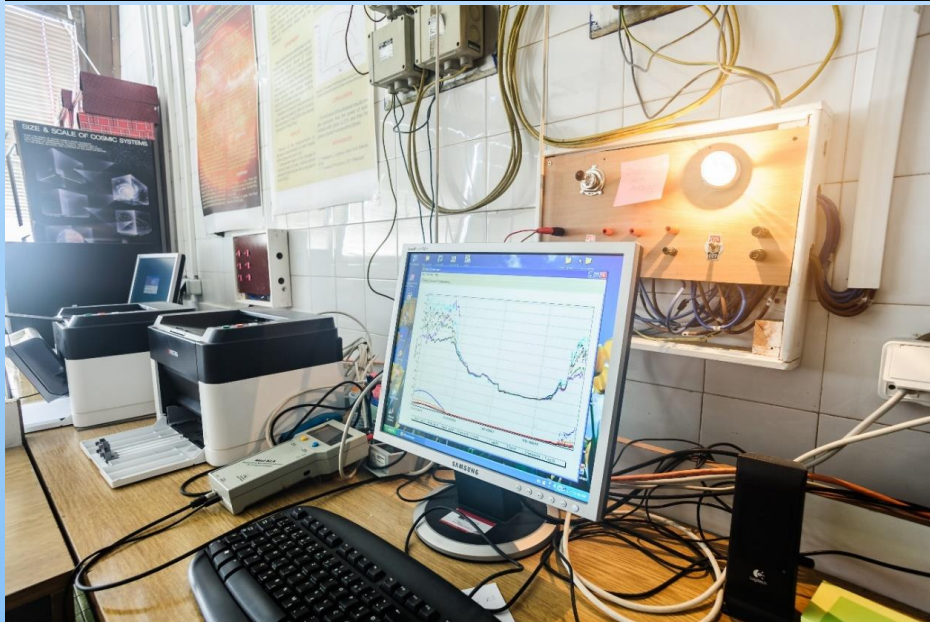
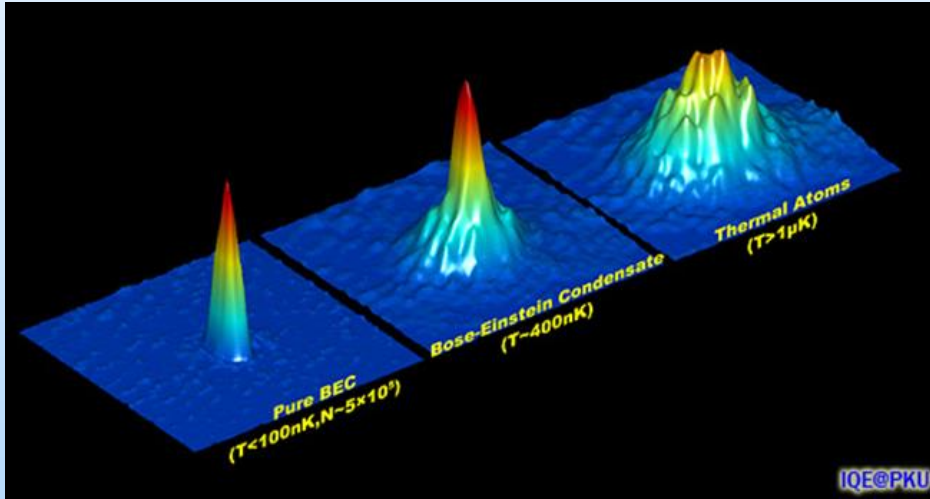


# Faculty of Sciences and Mathematics

## Organisation - structure



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- The Center itself comprises eight divisions:
  - ❖ Division of Computer Science,
  - ❖ Division of Mathematics,
  - ❖ Division of Theoretical Physics,
  - ❖ Division of Experimental and Applied Physics,
  - ❖ Division of Chemistry,
  - ❖ Division of Biology and Ecology,
  - ❖ Division of Geography, and
  - ❖ Division of Environmental Protection.
- Research activities are also performed in:
  - The Office of the SEENET-MTP Network and
  - The Botanical Garden that are parts of the Centre.



# Faculty of Sciences and Mathematics

## Educational activity



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### ▪ The first level academic study - Bachelor

(Bachelor Academic studies - three-years studies) are organized according to the following Study programs:

- Bachelor Academic studies in Mathematics,
- Bachelor Academic studies in Computer Science,
- Bachelor Academic studies in Physics,
- Bachelor Academic studies in Chemistry,
- Bachelor Academic studies in Biology,
- Bachelor Academic studies in Geography.



# Faculty of Sciences and Mathematics

## Educational activity



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### ▪ The second level academic study - Master

► Master Academic studies two-years studies are organized according to the following Study programs:

- Master Academic studies in Mathematics (modules: General Mathematics, Mathematical Models in Physics, Probability, Statistics and Financial Mathematics),
- Master Academic studies in Computer Science (modules: Software development, Information management),
- Master Academic studies in Physics (modules: General Physics, Applied Physics, Physics-Informatics),
- Master Academic studies in Chemistry (modules: Research and Development, Professor of Chemistry),
- Master Academic studies in Applied Chemistry (modules: Applied chemistry, Chemistry of the Environment),
- Master Academic studies in Biology,
- Master Academic studies in Ecology and nature protection,
- Master Academic studies in Geography,
- Master Academic studies in Tourism.



# Faculty of Sciences and Mathematics

## Educational activity



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### ▪ The third level academic study - Doctoral

► Doctoral Academic studies three-years studies are organized according to the following study programs:

- Doctoral Academic Studies in Mathematics,
  - Doctoral Academic studies in Computer Science,
  - Doctoral Academic Studies in Physics,
  - Doctoral Academic Studies in Chemistry,
  - Doctoral Academic studies in Biology.
- The Faculty educates teaching staff in the fields of mathematics, information science, physics, chemistry, biology and geography for work in primary and secondary schools, scientific staff for work at faculties, scientific institutes and other scientific research institutions, industry experts, state bodies, public companies, insurance companies, stock exchanges, banks and other financial institutions, companies dealing with information and communication technologies, travel agencies and organizations, and elsewhere.

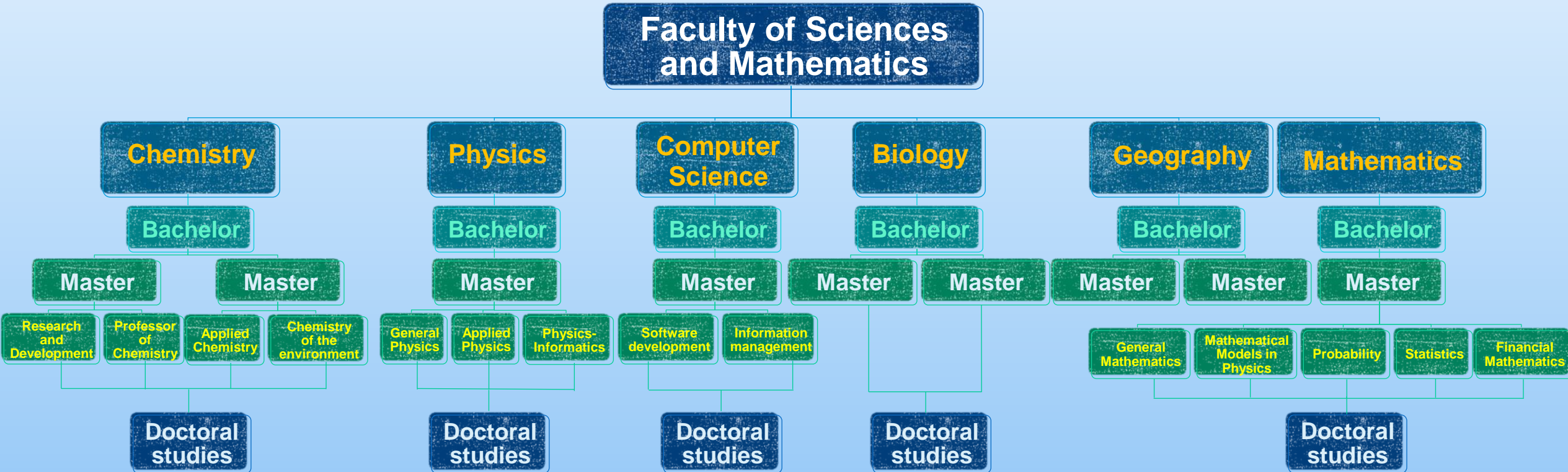


# Faculty of Sciences and Mathematics

## Educational activity



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**3 years (BSc) + 2 years (MSc) + 3 years (PhD)**  
**180 ECTS + 120 ECTS + 180 ECTS**





# Faculty of Sciences and Mathematics

## Scientific research



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- Scientific work, in addition to the teaching process, is the main activity of the Faculty of Science and Mathematics. It is realized through the organized activities of certain Departments on the development of a large number of scientific projects. At the Faculty, 46 national and international projects are currently being implemented. Teachers and associates of the Faculty participate in seminars, scientific and professional conferences in the country and abroad, and they are themselves organizers of significant scientific meetings. The Faculty cooperates with universities, institutes and other faculties in the country and abroad.
- Research methods and research findings are integrated into the academic programs of doctoral studies.
- The academic staff is engaged in various projects and cooperates with the industry.
- The quality of research is indicated by the fact that the University of Nis is ranking at the Shanghai Academic Ranking of World Universities among 500 Universities in the Academic Fields: Chemical Engineering and Mathematics thanks to research activities of Professors of Department of Chemistry, Department of Mathematics and Department of Computer Science of the Faculty of Science and Mathematics in Nis.
- Additionally, for example, only during the last year, more than 300 research articles in the international journals have been published by the academic staff of the Faculty.



# Faculty of Sciences and Mathematics

## International cooperation



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- The following are some of the International partners that the Faculty has established cooperation with in several areas:
  - International Centre for Theoretical Physics (ICTP) Trieste, Italy,
  - Institutes MAX PLANCK Munich, UNESCO Paris and UNESCO-BRESCE Venice as partners in South-eastern European Network in Mathematical and Theoretical Physics (SEENET-MTP),
  - Faculty of Natural Sciences and Mathematics, St. Cyril and Methodius University, Skopje, Macedonia,
  - Bulgarian Academy of Sciences, Sofia, Bulgaria,
  - CEBAS-CSIC, Campus Universitario de Espinardo, Murcia, Spain,
  - National Institute for Agricultural Research (INRA-SPO), Montpellier, France,
  - School of Pharmacy and Pharmaceutical Sciences, Trinity College Dublin, College Green, Dublin, Ireland,
  - Department of Chemistry, Norwegian University of Science and Technology (NTNU), Trondheim, Norway,
  - Faculty of Pharmaceutical Sciences, Tokushima Bunri University, Tokushima, Japan,
  - University “Marie et Pierre Curie”, Paris, France,
  - School of Science, University of Greenwich,
  - Faculty of Chemistry and Mineralogy, Leipzig University, Leipzig, Germany
  - Institute of Mathematics, Leipzig University, Leipzig, Germany, etc.



# Faculty of Sciences and Mathematics

## Publishing activity



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- The scientific work of teachers and associates is closely followed by publishing activity.
- The Faculty of Natural Sciences and Mathematics publishes the journal *Filomat* (IF = 0.635), which publishes papers in the field of mathematics and informatics.
- Also in this area are published *Functional Analysis, Approximation and Computation (FAAC)*, *Applied Mathematics and Computer Science*, as well as the journal *Mathematics and Informatics*.
- In the field of biology, the Faculty publishes the journal *Biologica Nyssana*, in the field of geoscience *Serbian Journal of Geosciences*, and in the field of chemistry journal *Chemia Naissensis*.
- Teachers and associates of the Faculty participate in the issue of *Facta Universitatis, Physics, Chemistry and Technology*, as well as *Mathematics and Informatics*.
- In order to stimulate the efficiency of teaching, about 150 books, workbooks, as well as monographs were published by the Faculty's academic staff.





# Faculty of Sciences and Mathematics Library



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- A significant base of scientific and teaching work is a library with a rich collection of scientific literature from the country and abroad. The library currently has over 41000 titles of books, journals and all kinds of finishing works.
- It contains large collections of textbooks, professional and scientific literature and reference books used for all Study programs at the Faculty.
- The Library owned over 36050 bibliographic units primarily in the area of natural and mathematical sciences, all of which served to provide and further improve the educational process during last ten years.





# Faculty of Sciences and Mathematics

## Future and Perspectives



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- **MISSION** is to deliver top-notch education in areas of natural and mathematical sciences:
  - producing qualified teachers, researchers, professionals and programmers
  - to be able to respond to constant growing scientific, technological and research challenges.
- **VISION** is to reach the level of the most developed higher education institutions with the same fields of study:
  - to achieve the quality that guarantees the Faculty status of the most developed higher education European institutions
  - to get the chance to become a leading scientific center in the region.



# University of Nis and Faculty of Sciences and Mathematics Future and Perspectives



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