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# Remodeling of Curricula in Informatics

at

Faculty of Sciences and Mathematics  
in Niš

Miroslav Ćirić

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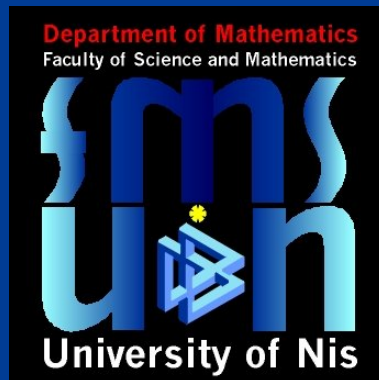
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# University of Niš

## Faculty of Sciences and Mathematics



# Department of Mathematics and Informatics

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[www.pmf.ni.ac.yu](http://www.pmf.ni.ac.yu)



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# About the Department



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- founded in 1971
- until 1999 – a part of **Faculty of Philosophy**
- since 1999 – a part of **Faculty of Sciences and Mathematics**

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<b>Staff</b>	<b>44</b>
<b>Teaching staff</b>	<b>41</b>
<b>Teachers</b>	<b>24</b>
<b>Teaching assistants</b>	<b>17</b>
<b>Computer labs staff</b>	<b>3</b>



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## Chairs

**Algebra, Logic and Discrete Mathematics**

**Mathematical Analysis**

**Geometry and Topology**

**Mathematical Statistics and Applications**

**Informatics (Computer Science)**



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# Chair of Informatics

<b>Staff</b>	<b>20</b>
<b>Teaching staff</b>	<b>17</b>
<b>Teachers</b>	<b>9</b>
<b>Teaching assistants</b>	<b>8</b>
<b>Computer labs staff</b>	<b>3</b>

carries out courses in area of Informatics at departments of

- \* **Mathematics and Informatics (32)**
- \* **Physics (1)**
- \* **Chemistry (1)**
- \* **Biology and Ecology (1)**
- \* **Geography (2)**



# Teaching Majors



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	founded	courses
<b>Theoretical Mathematics and Applications</b>	<b>1971</b>	<b>27</b>
<b>Informatics (Computer Science)</b>	<b>1990</b>	<b>27</b>
<b>Educational Mathematics and Informatics</b>	<b>1999</b>	<b>26</b>
<b>Mathematical Economics</b>	<b>2001</b>	<b>25</b>

+ diploma thesis

- duration of study – 4 years or 8 semesters
- most of the courses are two-semester courses



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# Theoretical Mathematics



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provides a broadly-based understanding of the theoretical fundamentals of the major mathematical disciplines and a detailed training in broad applications of mathematical methods in practice and other branches of science.

- 2 courses in area of Informatics, giving knowledge in
  - \* programming fundamentals and programming languages
- possibly 1 elective, giving knowledge in
  - \* programming (advanced) or information technologies



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# Informatics

provides theoretical and practical knowledge needed to design and operate mathematical software, computer systems, system software, database systems etc.

- 14 courses in narrower area of Informatics, giving knowledge in
  - \* programming fundamentals, programming languages
  - \* algorithm design and analysis, computability
  - \* architecture and organization, operating systems
  - \* data structures, database systems
  - \* computer graphics and visualization
  - \* computing methodologies (modeling and simulation, numerical, symbolic and algebraic computing, parallel computing, optimization etc.)



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# Educational Mathematics and Informatics

focused on pedagogical, psychological and methodical training needed for a career in teaching of mathematics and informatics.

## Components

Mathematics

Informatics

Didactics

- 7 courses in area of Informatics, covering
  - \* programming fundamentals, programming languages
  - \* data structures, database systems
  - \* application software, especially software packages included in elementary and secondary school curricula
  - \* information technologies and their application in education



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# Mathematical Economics

provides broad instruction in mathematics and information technologies directly applicable in economical sciences

## Components

Mathematics

Informatics

Economics

- 8 courses in area of Informatics, covering
  - \* programming fundamentals, programming languages
  - \* data structures, database systems
  - \* business software, e-commerce
  - \* other software packages
  - \* security systems and cryptography, etc.



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# Curricula in Informatics

- only minor changes of curricula since 1990
  - \* a few new courses
  - \* a few reconstructed courses
  - \* occasional innovations in methodology of teaching

## numerous reasons

- complicated procedure for changing of curricula
- bad faculty and university regulations
- antagonistic personal interests of teachers
- bad working conditions (the lack of equipment, classrooms)
- the lack of teaching staff, etc.



# Equipment and Classrooms



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- very bad state of computer equipment until 2001
- in 2001/2002 academic year the state is partly improved
  - \* new Software Engineering Laboratory
  - \* new Multimedia Computer Laboratory
  - \* new Gigabit Local Area Network

## Old computer laboratory (1998)

- \* 15 computers (Pentium I)
- \* used by first-year students of all departments



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## Software Engineering Laboratory (2001)

- \* donation of German Ministry of Education and Science through Humboldt University, Berlin
- \* in function of the project Software Engineering Education and Reverse Engineering (DAAD project – Stability Pact for Souteastern Europe, coordinated by Institute of Informatics, Humboldt University, Berlin
- \* 12 computers (AMD Athlon, 1.2GHz, 19", and Pentium IV, 1.5GHz, 19")

## Multimedia Computer Laboratory (2002)

- \* donation of Austrian Ministry of Foreign Affairs through World University Service Austria
- \* 6 multimedia computers (AMD Athlon XP, 1.6GHz, 19", Web camera ...), multimedia projector, etc.





## Gigabit Local Area Network (2002)

- \* donation of German Ministry of Education and Science through Max Planck Institut für Physik, München
- \* pilot phase of biggest projects: SINYu (Scientific Information Network Yugoslavia) and SINSEE (Scientific Information Network South Eastern Europe), that have to be financed by EU
- \* about 250 terminal units
- the biggest problem – the lack of classrooms
  - \* the faculty building is under reconstruction
  - \* small number of adequate classrooms
  - \* great number of students, especially on Departments of Geography and Biology



# Teaching Staff



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- there was **the lack of teachers** in area of informatics
- several teachers from FEEN were engaged
- **the problem of teachers will be solved soon**
  - \* several teaching assistants received Ph.D. degree and became teachers
  - \* several teaching assistants will receive it soon
- **the lack of teaching assistants** in area of informatics
- too much classes, especially at other departments (Geography, Biology, Chemistry etc.)
- employment of young teaching assistants is limited – from **financial reasons**



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# Law of Higher Education

- Law of Higher Education from 2002 – only a slightly modified Law from 1992
  - \* the only news – it allows three-year studies
- the Law limits university reform from many aspects:
  - \* it does not allow full engagement of foreign teachers
  - \* by the Law, the number of classes per week for students must be greater than 24, etc.
- **financial regulations** (for financing faculties) are also very bad and limit university reform
  - \* convenient only for faculties working with big groups of students (Economics, Law etc.)
  - \* force great number of classes per week for students
  - \* no adequate financing of postgraduate studies, etc.







## University Reform

- neither the Government nor the universities have a vision of the future University
- there is no global plan of reform
- the reform is left to faculties to start it, what is **very wrong**

## Organization of the University

- the present organization of the University does not favor the reform of the higher education system
- organization of the University has to be changed first



# Our Plans



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we have analyzed

- Computing Curricula 2001 – Computer Science
- new curricula in informatics at related faculties
  - \* Faculty of Sciences and Mathematics in Novi Sad, Institute of Mathematics and Informatics
  - \* Faculty of Sciences and Mathematics in Skopje, Institute of Informatics
- curricula in informatics at foreign faculties
- the conditions (good and bad) at our faculty



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# Computing Curricula 2001 – the starting point?

## implementation strategy?

- **Introductory level**
  - \* Imperative first or objects first approach (or something else)?
- **Intermediate level**
  - \* Topic-based approach?
- **Advanced level**
  - \* How much electives?
  - \* limitations – workspace and teaching staff
  - \* Novi Sad and Skopje – not so much electives
- **Mathematics**
  - \* Mathematics : Informatics ratio?



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## other questions:

- Project Courses
- Professional Practice
- innovations in teaching methodology, etc.



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