

Development of a new undergraduate study program of Informatics


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Overview

- Introduction
 - Reasons and motivation for changing study program
- Structure of the study program
- Conclusion



Introduction – reasons for new (modified) study program

- First single-major undergraduate study program in Informatics (at our Department) was launched in 2005/2006.
 - It was aligned with the principles of the Bologna Declaration (the introduction of three cycles of studying based on ECTS credit point system).
 - In its proposed form, with minor modifications introduced in 2012/2013, the study program was implemented until the 2018/2019
- Project The logo for the project 'St@nd4INFO' features the text 'St@nd4INFO' in a stylized font. 'St' is in red, '@' is in blue, 'nd' is in red, '4' is in blue, and 'INFO' is in orange.
- Study programme satisfaction surveys
 - Possibility to gain practical competencies
 - Elective courses offering
 - Training for jobs in the profession

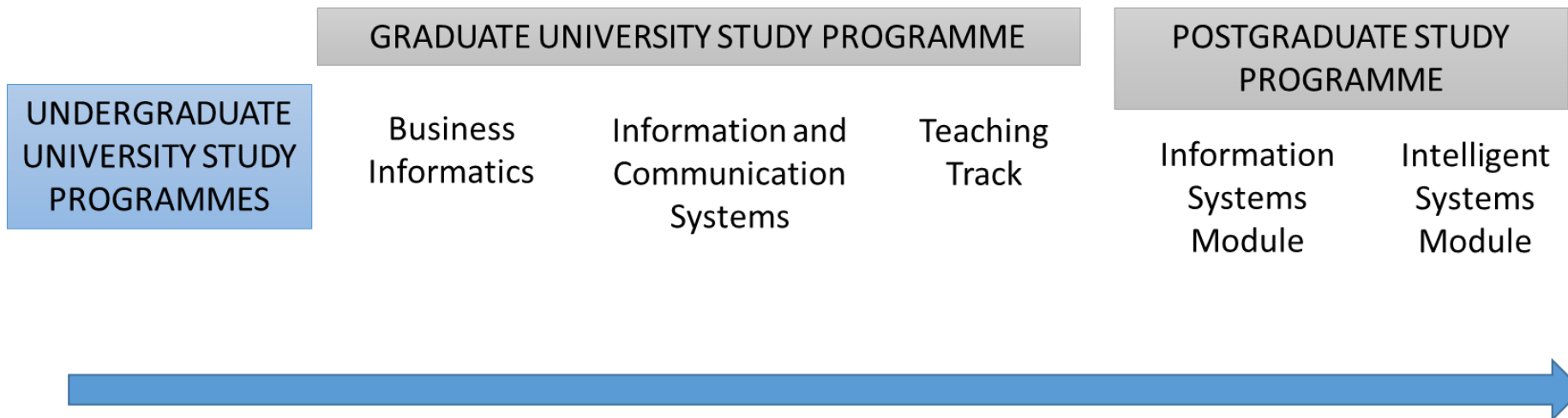
Introduction - motivation

- Changes of the existing study program were needed in order to:
 - align it with the labor market's needs (due to rapid developments in the ICT industry)
 - increase the quality and modularity of the study program
- The goal was to adjust the study program to meet the standard qualification *University's Bachelor of Informatics* which is to be registered within the Croatian Qualifications Framework (CROQF) – one of the results of Stand4INFO project



Introduction - motivation

- The percentage of modified ECTS credits is rather high, but the objectives of the majority of courses within the existing study program have not changed significantly, so we can talk about the modernisation of the existing program



Structure of the study program

- Proposed study program consists of:
 - Mandatory part which is the same for all students (1st and 2nd year of study)
 - Elective modules which students choose according to their preferences and interests
- Mandatory subjects, Bachelor Thesis and Student Traineeship have their learning outcomes adjusted to meet the requirements for the Bachelor of Informatics qualification and as well as related knowledge assessment procedures
- This qualification conforms to the occupation of Programming Engineer registered under the Croatian Qualifications Framework (CROQF)

Program structure - modules

- Modules are introduced at the 3rd year of study
 - Modules cover a wide range of IT subspecialties, reflecting the skills found in the labor market for Programming Engineers who have completed the Bachelor of Informatics
 - Moreover, modules enable students to choose and specialize in areas of study according to their preferences
- Proposed 4 modules:
 - **Software Development**
 - **Communication Systems**
 - **Multimedia Systems**
 - **Information Systems**



1st YEAR OF STUDY			2nd YEAR OF STUDY		
	Total hours	ECTS points		Total hours	ECTS points
COURSE			COURSE		
Mathematics 1	60 (2+2)	6	Mathematics 3	60 (2+2)	5
Programming 1	60 (2+2)	6	Business Processes Analysis	60 (2+2)	5
Fundamentals of Informatics	60 (2+2)	5	Object oriented programming	60 (2+2)	5
Multimedia Systems	60 (2+2)	5	Multimedia Systems	60 (2+2)	5
Introduction to Economics for Information Technology Students	60 (2+2)	5	Computer Network	60 (2+2)	5
English Language for IT	60 (2+2)	4	Databases	60 (2+2)	5
Physical Education 1			Introduction to Engineering Programming	60 (2+2)	5
Mathematics 2	60 (2+2)	5	Operations Research	60 (2+2)	5
Programming 2	60 (2+2)	5	Introduction to Web Programming	60 (2+2)	5
Operating Systems	60 (2+2)	5	Algorithms and Data structures	60 (2+2)	5
Dana modeling	60 (2+2)	5	IT Project Management	60 (2+2)	5
Computer Organization and Architecture	60 (2+2)	5	Information Systems Development	60 (2+2)	5
Probability and Statistic	60 (2+2)	4	ICT Safety and Security	60 (2+2)	5
Physical Education 2					
Total ECTS points		31+29	Total ECTS points		30+30

3rd YEAR OF STUDY - Software Development Module			3rd YEAR OF STUDY – Information Systems Module		
	Total hours	ECTS points		Total hours	ECTS points
COURSE			COURSE		
Programming Paradigms and Languages	60 (2+2)	5	Database Administration and Security	60 (2+2)	5
Code Optimization	60 (2+2)	5	User Interface and Interaction Design	60 (2+2)	5
Web Programming	60 (2+2)	5	Information Systems for Specific Purposes	60 (2+2)	5
Elective course	60 (2+2)	5	Elective course	60 (2+2)	5
Elective course	60 (2+2)	5	Elective course	60 (2+2)	5
Elective course	60 (2+2)	5	Elective course	60 (2+2)	5
Desktop and Mobile App Development	60 (2+2)	5	Introduction to Data Visualisation and Analysis	60 (2+2)	5
Declarative programming languages	60 (2+2)	5	New generation databases	60 (2+2)	5
Elective course	60 (2+2)	5	Elective course	60 (2+2)	5
Elective course (mutual UNIRI elective course / course from different module / mutual elective course)	60 (2+2)	3	Elective course (mutual UNIRI elective course / course from different module / mutual elective course)	60 (2+2)	3
Student Traineeship	60	4	Student Traineeship	60	4
Bachelor's Thesis	60	8	Bachelor's Thesis	60	8
Total ECTS points		30+30	Total ECTS points		30+30

3rd YEAR OF STUDY – Communication Systems Module			3rd YEAR OF STUDY – Multimedia Systems Module		
	Total hours	ECTS points		Total hours	ECTS points
COURSE			COURSE		
Communication Networks	60 (2+2)	5	Multimedia Technologies	60 (2+2)	5
Network and Mobile Operating Systems	60 (2+2)	5	Computer Graphics	60 (2+2)	5
Social Media Analysis	60 (2+2)	5	Computer Animation	60 (2+2)	5
Elective course	60 (2+2)	5	Elective course	60 (2+2)	5
Elective course	60 (2+2)	5	Elective course	60 (2+2)	5
Elective course	60 (2+2)	5	Elective course	60 (2+2)	5
Introduction to Built-in Systems and IoT	60 (2+2)	5	Introduction to Computer Games Development	60 (2+2)	5
Computer Systems Management	60 (2+2)	5	Multimedia Design	60 (2+2)	5
Elective course	60 (2+2)	5	Elective course	60 (2+2)	5
Elective course (mutual UNIRI elective course / course from different module / mutual elective course)	60 (2+2)	3	Elective course (mutual UNIRI elective course / course from different module / mutual elective course)	60 (2+2)	3
Student Traineeship	60	4	Student Traineeship	60	4
Bachelor's Thesis	60	8	Bachelor's Thesis	60	8
Total ECTS points		30+30	Total ECTS points		30+30

MUTUAL ELECTIVE COURSES		
	Total hours	ECTS points
COURSE		
System Dynamics	60 (2+2)	5
Programming for Data Science	60 (2+2)	5
Introduction to Theoretical Computer Science	60 (2+2)	5
Combinatorics	60 (2+2)	5
Numerical Mathematics	60 (2+2)	5
Mathematical Logic	60 (2+2)	5
Programming for Complex Problem Solving	60 (2+2)	5
Discrete Mathematics	60 (2+2)	5
Set Theory	60 (2+2)	5



Learning outcomes - example

- Upon completion of all the course components, students will be able to:
 - Explain the main terms and concepts related to database theory and relational model
 - Compare query execution using both theoretical and database query language
 - Apply logical design methods in order to build and arrange given logical model (avoiding database anomalies)
 - Design development environment of the database management system with the incorporation of database security principles using the user role permissions
 - Derive a physical design for a database from its logical design using given database management system
 - Ensure entity and referential integrity in the implemented database
 - Edit existing database using the given query language and execute simple and complex queries to extract information from database
 - Implement a programming solution within the given programming environment based on relational database

Procedure for assessing learning outcomes - example

- Assessment of learning outcomes is done through the use of mid-term tests (both theoretical and practical tests and quizzes), written test and computer work
 - Theoretical test is used to assess student's understanding of theoretical database and relational model concepts (LO1), and the ability to combine and compare query execution using theoretical and database query language (LO2). Example: Describe primary key limitations, or given SQL query translate into the relational algebra, and vice versa.
 - Written test is used to assess student's ability to derive a logical data model based on existing conceptual model by applying appropriate rules, to recognize the normal form of the existing relational scheme, and to perform database normalization process. Example: Translate entity relationship diagram into relational data model, or to convert the given relational schema to third normal form (LO3).
 - ...



Competencies obtained by students (1)

- Competencies that conform to the occupation of Programming Engineer registered under the Croatian Qualifications Framework (CROQF)
 - Cooperation and communication within application development
 - Enhancing and modeling business processes
 - Database design
 - Software development
 - Design of ICT technical and communication infrastructure and platform
 - Writing software documentation
 - Information system integration



Competencies obtained by students

(2)

- Testing information system components
- Components and software maintenance
- Enhancing development and workload organization related to informatics
- Personal and professional development related to informatics



Main professions

- The following list consists of the main professions that conform to the occupation of Programming Engineer listed under the CROQF
 - Software components development and testing
 - Application integration and testing
 - Developing, configuring and maintaining applications
 - Supporting developing activities within informatics
 - Writing software and application documentation



Conclusion – the main modifications

- Modules are introduced in the third year
- More variety of choice in terms of course selection
- The number of mandatory Mathematics courses lowered from 8 to 4 (other available as elective courses)
- New course on economics for IT professionals
- Mandatory Student Traineeship introduced in sixth semester
- Study programme based on learning outcomes
- Adjusted to the standard qualification University's Bachelor of Informatics, related to the Programming Engineer profession, registered under the Croatian Qualifications Framework (CROQF)



- <https://www.inf.uniri.hr/en/study-programmes/undergraduate-study-programmes.html>
- www.inf.uniri.hr → Study programmes → Undergraduate study programmes



**Thank You for your
attention!**

