REPUBLIC
OF CROATIA

REPUBLIC OF CROATIA
UNIVERSITY OF ZAGREB
FACULTY OF SCIENCE

University of Zagreb

FACULTY
OF SCIENCE

DIPLOMA

FILIP BOŠNJAK

born on 25 November 1996 in Zagreb, Republic of Croatia, having fulfilled all academic requirements and passed all of his exams, completed the integrated undergraduate and graduate university study programme in PHYSICS AND COMPUTER SCIENCE EDUCATION on 4 March 2022. In the course of his integrated undergraduate and graduate study he obtained a total of 300 ECTS credits. Therefore, he has earned the academic title of

MASTER IN PHYSICS AND COMPUTER SCIENCE EDUCATION

comprising all the related rights prescribed by law.

No. 64-12-104/2022.
in Zagreb, 21 May 2022

Dean

Full Professor Mirko Planinić, PhD

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DIPLOMA SUPPLEMENT

This Diploma Supplement model was developed by the European Commission, Council of Europe and UNESCO/CEPES. The purpose of the supplement is to provide sufficient independent data to improve the international 'transparency' and fair academic and professional recognition of qualifications (diplomas, degrees, certificates etc.). It is designed to provide a description of the nature, level, context, content and status of the studies that were pursued and successfully completed by the individual named on the original qualification to which this supplement is appended. It should be free from any value judgements, equivalence statements or suggestions about recognition. Information in all eight sections should be provided. Where information is not provided, an explanation should give the reason why.

FACULTY
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1 INFORMATION IDENTIFYING THE HOLDER OF THE QUALIFICATION

1.1	family name(s)	Bošnjak
1.2	given name(s)	Filip
1.3	date, place and country of birth	25 November 1996, Zagreb, Republic of Croatia
1.4	student identification number or code	0119032845

2 INFORMATION IDENTIFYING THE QUALIFICATION

2.1	name of qualification and (if applicable) title conferred (in original language)	magistar edukacije fizike i informatike; mag. educ. phys. et inf.
2.2	main field(s) of study for the qualification	Physics and Computer Science Education
2.3	name and status of awarding institution and study programmes accreditation act	Sveučilište u Zagrebu, Prirodoslovno-matematički fakultet. Public higher education institution. Accreditation issued by the Ministry of Science, Education and Sports on October 7, 2004. Accreditation for the Integrated Undergraduate and Graduate University Programme in Physics and Computer Science Education issued by the Ministry on June 21, 2005.
2.4	name and status of institution (if different from 2.3) administering studies	—
2.5	language(s) of instruction/examination	Croatian

3 INFORMATION ON THE LEVEL OF THE QUALIFICATION

3.1	level of qualification	Integrated undergraduate and graduate university programme - first and second cycle
3.2	official length of programme	Five-year programme, 300 ECTS credits
3.3	access requirement(s)	Completed a four-year secondary school

4 INFORMATION ON THE CONTENTS AND RESULTS GAINED

4.1 **mode of study** Full-time programme

4.2 **programme requirements and learning outcomes**

The Integrated Undergraduate and Graduate University Programme in Physics and Computer Science Education offers the entire five-year mandatory pre-service university education of experts specialized in the teaching of physics and computer science in lower and upper secondary education (upper classes of primary school and secondary school, i.e. ISCED levels 2 and 3, according to the ISCED 1997 classification). The Integrated Undergraduate and Graduate University Programme in Physics and Computer Science Education offers a university education in the fields of physics and computer science. Competencies in the field of physics primarily include the entire problematics of the classical physical areas of mechanics, electromagnetism, wave phenomena, thermodynamics, and optics; with an emphasis on the constituent parts of traditional physical disciplines with modern relativistic and quantum concepts, as well as the theory of electromagnetic radiation. In addition, students will also become acquainted with some advanced physics contents (the physics of materials and solid state, astronomy, and astrophysics), gain insight into the application of physics in other sciences and professions (biophysics, medical physics). During the course of the study program, these competencies are developed by means of theoretical lectures, numerical exercises, and practical lab work. Computer science competencies include the knowledge, skills, and ability to design and analyse algorithms, structural and object-oriented programming, and databases; familiarity with the computer architecture, computer networks, operating systems, and some of the advanced concepts of computer science (computer graphics, multimedia systems, computability theory), as well as the social socio-ethical and professional implications of ICT. This programme also offers the didactical-methodological and pedagogical-psychological competencies necessary for the successful realization of all educational programmes in the fields of physics and computer science at the primary- and secondary-school level. It also trains students to teach all types of physics and computer science classes - regular, additional, elective, and remedial, as well as work with children with special needs - ranging from work with children who have developmental difficulties to work with those who are gifted in physics and/or computer science. In addition, students also gain general competence in working within the educational system and the school as an organization, and in all the tasks included among the obligations of teachers (being a class teacher, keeping pedagogical records, working in cooperation with parents and professional services, etc.). Finally, this programme trains students for further self-education (life-long learning) in the areas of the computer sciences, physics, education, and other sciences.

	hours	ECTS credits	date of examination	grade	subject
1	75	6.0	25/09/17	2	Introduction to Computer Science
2	90	7.0	25/09/17	2	Mathematical Analysis 1
3	60	4.0	25/09/17	2	Linear Algebra 1
4	30	3.0	19/02/18	2	Word processing and spread sheets
5	120	10.0	25/09/17	2	Fundamentals of Physics 1
6	30	0.0		+	Physical Education and Health Culture 1
7	75	7.0	09/07/18	3	Fundamentals of Programming
8	90	7.0	25/09/17	2	Mathematical Analysis 2
9	45	3.0	25/09/17	2	Fundamentals of Physics Measurements
10	90	8.0	27/06/18	4	Fundamentals of Physics 2
11	60	5.0	25/09/17	2	Linear Algebra 2
12	30	0.0		+	Physical Education and Health Culture 2
13	75	7.0	09/02/18	3	Mathematical Methods in Physics 1
14	30	0.0		+	Physical Education and Health Culture 3
15	60	3.0	26/06/18	4	Multimedia Presentations
16	30	0.0		+	Physical Education and Health Culture 4
17	75	6.0	28/06/18	2	Mathematical Methods in Physics 2
18	105	9.0	15/02/19	5	Fundamentals of Physics 3
19	45	4.0	13/02/19	4	Classical Mechanics 1
20	60	5.0	21/02/19	4	Computer Structure
21	60	5.0	04/02/19	3	Data Structures and Algorithms
22	60	5.0	17/06/19	4	Object Oriented Programming
23	105	9.0	28/06/19	4	Fundamentals of Physics 4
24	30	4.0	12/07/19	5	Classical Mechanics 2
25	45	3.0	17/06/19	5	Energy and Ecology
26	60	3.0	29/01/19	4	Laboratory in Fundamental Physics A
27	60	3.0	17/06/19	4	Laboratory in Fundamental Physics B
28	45	3.0	10/07/19	4	Physics and Philosophy
29	60	6.0	21/02/20	2	Operating Systems
30	60	6.0	28/02/20	4	Advanced Programming
31	60	4.0	04/02/20	4	Numerical Methods
32	45	0.0		+	Computer networks
33	105	8.0	09/07/20	4	Electrodynamics
34	45	4.0	22/07/20	4	Statistical Physics
35	60	5.0	17/06/20	3	Databases
36	45	3.0	21/07/20	5	User interfaces
37	45	6.0	29/06/20	4	Computer networks
38	90	9.0	10/07/20	4	Quantum Physics
39	90	8.0	10/02/20	5	Educational Psychology
40	60	6.0	05/02/20	3	Laboratory in Physics Education 1
41	45	6.0	07/02/20	3	Astronomy and Astrophysics
42	60	6.0	07/07/20	3	Laboratory in Physics Education 2
43	60	6.0	18/06/20	4	Computers in Education
44	60	6.0	24/06/20	2	General Pedagogy
45	60	6.0	01/09/20	4	Didactics
46	90	10.0	04/02/21	2	Selected Topics in Nuclear and Particle Physics
47	60	6.0	13/07/21	5	Fundamentals of Electronics
48	75	8.0	01/02/21	4	Computer Science Education
49	60	7.0	10/02/21	3	Physics Education 1
50	60	4.0	11/02/21	4	Teaching Practice in Physics 1
51	45	5.0	08/02/21	5	Physics of Surfaces and Nanostructures
52	60	7.0	12/07/21	3	Physics Education 2
53	60	4.0	26/06/21	5	Teaching Practice in Computer Science
54	60	4.0	24/06/21	2	Teaching Practice in Physics 2
55	—	15.0	04/03/22	4	Thesis Research
56	45	6.0	31/01/22	4	Laboratory in Fundamentals in Electronics

additional ECTS credits

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total ECTS credits 300

beginning of the study–end of the study 1 October 2017–4 March 2022

diploma number 64-12-104/2022.

master thesis; mentor; defended on Galactic morphology classification using algorithms in programming language Python; Associate Professor Goranka Bilalbegović, PhD; 4 March 2022

4.4 **grading scheme and, if available, grade distribution guidance**

In all courses student work is continually assessed. Each required activity, such as regular class attendance, homework, laboratory work, partial tests, and final exam is evaluated. The grading scheme consists of five grades with numerical equivalents: izvrstan - 5 (excellent); vrlo dobar - 4 (very good); dobar - 3 (good); dovoljan - 2 (sufficient); nedovoljan - 1 (insufficient - fail). The minimum passing grade is dovoljan - 2 (sufficient). Some courses are not graded, but their requirements must be met. Such courses are marked with a "+" in the academic transcripts. The courses that are held during two semesters appear twice. The "+" sign at the first mention of the course in the transcripts signifies that the student has fulfilled all of the course requirements.

4.5 **average grade and overall classification of the qualification**

Cumulative grade point average: 3.44

5 INFORMATION ON THE FUNCTION OF THE QUALIFICATION

5.1 **access to further study**

After completing this graduate university programme, students are qualified for postgraduate (doctoral) programmes at the Department of Physics in accordance with the enrolment conditions of those programmes for the academic year in which they apply. The graduate's received knowledge and acquired skills should also qualify her or him for continued study in related postgraduate (doctoral or specialist) programmes at other higher education institutions. The conditions for enrolment in postgraduate programmes at other higher education institutions are determined by those institutions.

5.2 **employability and professional status, if applicable**

Holders of the degree of Master in Physics and Computer Science Education are qualified for employment as teachers of physics and/or computer science and ICT in primary school and in all types of secondary school. Besides employment in education, they are also qualified for various types of intellectual employment in industry, the state administration, and the public sector that call for analytical thinking; fundamental and advanced knowledge in the field of physics and computer science; a capacity for modelling and solving different types problems; a knowledge of statistics; the ability to organize, analyse, and present all types of data (character, numerical, audio, visual, multimedia, etc.); and the application of ICT. Finally, they are also qualified for jobs in research and/or higher education institutions.

6 ADDITIONAL INFORMATION

6.1 **additional information**

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6.2 **further information sources**

Ministry of Science, Education and Sports, http://www.mzos.hr; University of Zagreb, http://www.unizg.hr; Faculty of Science, Department of Physics, http://www.pmf.hr/phy

7 CERTIFICATION OF THE SUPPLEMENT

7.1 **place and date**

Zagreb, 21 May 2022

7.2 **name and signature**

Full Professor Mirko Planinić, PhD

7.3 **capacity**

Dean

7.4 **official stamp or seal**

8.1 Types of institutions

UNIVERSITIES (*sveučilišta*) are higher education institutions which deliver university study programmes in at least two scientific and/or art areas in a greater number of fields. Exceptionally, universities may also deliver professional study programmes. Universities may have constituent higher education institutions which are legal entities and are called FACULTIES (*fakulteti*), ART ACADEMIES (*umjetničke akademije*) or DEPARTMENTS (*odjeli*). Universities and their constituents deliver study programmes and conduct scientific research and other professional and art activities.

POLYTECHNICS (*veleučilišta*) and SCHOOLS OF PROFESSIONAL HIGHER EDUCATION (*visoke škole*) are higher education institutions which deliver professional study programmes. These two types of institution differ in the scope of the programmes they offer: polytechnics are those schools of professional higher education which deliver professional study programmes in three or more scientific fields.

Public universities are established by a law, public polytechnics and schools of professional higher education are established by a decree of the Croatian Government, while private higher education institutions are established by a resolution of the founder.

8.2 Types of programmes

UNIVERSITY STUDY PROGRAMMES allow students to work in science and higher education, private and public sectors, as well as in wider society. Graduates from university study programmes are also educated to apply and develop scientific and professional knowledge at the appropriate level.

PROFESSIONAL STUDY PROGRAMMES provide students an appropriate level of knowledge, skills and competences to work in applied professions, and to join any work process immediately after graduation.

Detailed information on types of studies is available on the web page of the Ministry of Science and Education: https://mzo.hr

8.3 Accreditation of higher education institutions and study programmes

Act on Quality Assurance in Science and Higher Education was enacted in April 2009, tasking the Agency for Science and Higher Education with external quality assurance processes in Croatia in line with the European Standards and Guidelines for Quality Assurance in the European Higher Education Area. Both higher education institutions (HEIs) and study programmes must undergo an evaluation process in order to be accredited for operation in Croatia. Study programmes delivered at public universities are self-accredited by university senates. Programmes delivered by private higher education institutions, polytechnics or schools of professional higher education undergo a process of initial accreditation. The National Council for Higher Education appoints an expert committee which, in cooperation with the Agency for Science and Higher Education, performs evaluation of the proposed study programme or higher education institution and recommends to the minister to issue or deny an accreditation. Agency for Science and Higher Education is also in charge of the re-accreditation of higher education institutions.

8.4 Organisation of university study programmes

Since 2005, all study programmes in Croatia express student workload in terms of ECTS credits. As such, a student can accumulate 60 ECTS credits in one academic year with the exception of postgraduate programmes, where higher education institutions autonomously determine the use of ECTS credits.

UNDERGRADUATE UNIVERSITY PROGRAMMES – FIRST CYCLE (*preddiplomski sveučilišni studiji*) normally take three years in which students are required to earn 180 ECTS credits. A minority of undergraduate university programmes in Croatia are offered as four-year programmes in which students are required to earn 240 ECTS credits. Upon completion students are awarded a diploma and the academic degree of University Bachelor (*sveučilišni prvostupnik*) with an indication of the field of study. Students graduating in technical sciences receive the academic degree of University Bachelor in Engineering (*sveučilišni prvostupnik inženjer*) with an indication of the field of study. Students holding a first cycle university degree can apply for admission to graduate university programmes or specialist graduate professional programmes, or enter the labour market.

GRADUATE UNIVERSITY PROGRAMMES – SECOND CYCLE (*diplomski sveučilišni studiji*) normally take two years in which students are required to earn 120 ECTS credits. A minority of graduate university programmes in Croatia are offered as one-year programmes in which students are required to earn 60 ECTS credits. The total number of credits earned in the first and second cycle programmes must be at least 300. Upon completion students are awarded a *diploma* and the academic degree of Master of (*magistar struke*) with an indication of the field of study. Students graduating in technical sciences receive the academic degree of Master in Engineering (*magistar inženjer*) with an indication of the field of study. Students holding a second cycle university degree can continue their studies in postgraduate university programmes or enter the labour market.

INTEGRATED UNDERGRADUATE AND GRADUATE UNIVERSITY PROGRAMMES – FIRST AND SECOND CYCLES (*integrirani preddiplomski i diplomski sveučilišni studiji*) normally take five or six years in which students are required to earn 300 or 360 ECTS credits respectively. Upon completion students are awarded a *diploma* and the academic degree of Master of (*magistar struke*) with an indication of the field of study. Upon completion of integrated first and second cycle programmes in medicine, dentistry and veterinary medicine students receive the academic degree of Doctor (*doktor struke*) with an indication of the field of study (e.g. Doctor of Medicine, etc.) Students with this degree can continue their studies in postgraduate university programmes or enter the labour market.

POSTGRADUATE UNIVERSITY PROGRAMMES – THIRD CYCLE (*poslijediplomski sveučilišni studiji*) normally take three years. Upon completion students are awarded a *diploma* and the academic degree of Doctor of Philosophy (or Doctor scientarum), or Doctor of Fine Art (*doktor znanosti* or *doktor umjetnosti*), with an indication of the academic field or art form.

POSTGRADUATE SPECIALIST UNIVERSITY PROGRAMMES (*poslijediplomski specijalistički studiji*) normally take one or two years in which students are required to earn 60 or 120 ECTS credits respectively. Upon completion students receive a *diploma* and the academic degree of University Specialist (*sveučilišni specijalist*) with an indication of the field of study.

8.5 Organisation of professional study programmes

SHORT CYCLE PROFESSIONAL PROGRAMMES (*kratki stručni studiji*) normally take two or two-and-a-half years, in which students are required to earn between 120 and 150 ECTS credits respectively. Upon completion students receive a diploma (*svjedodžba*) and a Short-Cycle Professional Degree (*stručni pristupnik*) with an indication of the field of study. Students holding a short-cycle professional degree can apply for admission to higher levels of professional study programmes, or enter the labour market.

UNDERGRADUATE PROFESSIONAL PROGRAMMES – FIRST CYCLE (*preddiplomski stručni studiji*) normally take three years in which students are required to earn 180 ECTS credits. A minority of professional programmes in Croatia are offered as four-year programmes in which students are required to earn 240 ECTS credits. Upon completion students are awarded a diploma and the professional degree of Professional Bachelor (*stručni prvostupnik*) with an indication of the field of study. Students graduating in technical sciences receive the professional degree of Professional Bachelor in Engineering (*stručni prvostupnik inženjer*) with an indication of the field of study. Students holding a first cycle professional degree can apply for admission to specialist graduate professional programmes, or to second cycle graduate university programmes under conditions determined by the university, or to enter the labour market.

SPECIALIST GRADUATE PROFESSIONAL PROGRAMMES – SECOND CYCLE (*specijalistički diplomski stručni studiji*) normally take two years in which students are required to earn 120 ECTS credits. A minority of specialist graduate professional programmes in Croatia are offered as one-year programmes in which students are required to earn 60 ECTS credits. The total number of credits earned in first and second cycle programmes must be at least 300. Upon completion of specialist graduate professional programmes students are awarded a diploma and the professional degree of Professional Specialist (*stručni specijalist*) with an indication of the field of study. Students graduating in technical sciences receive the professional degree of Professional Specialist in Engineering (*stručni specijalist inženjer*) with an indication of the field of study, and students graduating in the fields of medicine, dentistry or veterinary medicine receive a diploma professional degree (*diplomirani*) with an indication of the field of study. Students holding a second cycle professional degree can enter the labour market, or they can also apply, under conditions determined by universities, for transfer to a graduate university study programme (with the proviso of taking differential exams) and admission to a postgraduate university programme.

8.6 Educational requirements for admission into study programmes

The minimum educational requirement for admission into first cycle study programmes are set by higher education institutions. Normally, the minimum requirement for admission into first cycle study programme is the completion of a four-year secondary school and as of academic year 2010/2011 student enrolments are based on the results of State matura. The admission process to first cycle programmes is administered through a central online application system.

The minimum educational requirement for enrolment into graduate university programmes is the completion of an undergraduate university programme. Universities can allow students who have completed a professional programme to also enrol graduate university programmes, but they are allowed to set special requirements in these cases.

The minimum educational requirement for enrolment into specialist graduate professional programmes is the completion of an undergraduate university programme or a professional programme (First cycle). The minimum educational requirement for enrolment into postgraduate programmes is the completion of an appropriate graduate programme. Normally, the requirement for enrolment into a postgraduate university programme is the completion of a graduate university programme. Students who have completed the pre-Bologna undergraduate programmes (*sveučilišni dodiplomski studij*) with a duration of minimum four academic years are allowed to apply for Bologna postgraduate programmes as well.

8.7 Grading scheme

The Croatian national grading scheme consists of five grades with numerical equivalents: *izvrstan* – 5 (outstanding); *vrlo dobar* – 4 (very good); *dobar* – 3 (good); *dovoljan* – 2 (sufficient); *nedovoljan* – 1 (insufficient - fail). The minimum passing grade is *dovoljan* - 2. There are no intermediate grades in the Croatian grading scheme. The majority of higher education institutions in Croatia do not use a ranking system in assigning grades to students. Some institutions, however, may also use the ranking system and thus the ECTS grading scale in addition to the national grading scheme.

8.8 National Qualifications Framework

The Croatian Qualifications Framework (CROQF) is an instrument for regulating the system of qualifications in the Republic of Croatia. It guarantees transparency, access to acquiring qualifications, reliable acquiring of qualifications, progression and high-quality qualifications, as well as relating the levels of qualifications in the Republic of Croatia to the levels of qualifications of the EQF and QF-EHEA, and to the national qualifications frameworks of other countries. The implementation of the CROQF is regulated by the Croatian Qualifications Framework Act (the Official Journal of the Republic of Croatia no. 22/2013).

Further information about the CROQF is available at http://www.kvalifikacije.hr