SELF-EVALUATION

UNIVERSITY OF ZAGREB
FACULTY OF SCIENCE

March 2021

University of Zagreb
Faculty of Science

Zagreb, 25 March 2021

CLASS: 602-04/20-01/73
REG NO: 251-58-10203-21-8

Compiled by: Associate Professor Dr. **Martina Jakovčić**

Name of higher education institution	University of Zagreb Faculty of Science
Year of establishment	1946
Seat of higher education institution	Horvatovac 102a 10 000 Zagreb
Telephone	++385 (0)1 4606 012
Fax	++385 (0)1 4606 013
E-mail	dekanat@dekanat.pmf.hr
Website	www.pmf.unizg.hr
Title, name and surname of head of higher education institution	Dean Professor Dr. Mirko Planinić
Bank and account number	Zagrebačka banka d.d. Giro account: 2360000-1101522208 IBAN: HR5823600001101522208
OIB	28163265527
MB	03270149
Registry no. of scientific organisation (registry number)	119

CONTENTS

1. INTRODUCTION

On 4 November 2020, the Faculty of Science, University of Zagreb (hereinafter: Faculty or PMF) received the decision of the Agency for Science and Higher Education that the reaccreditation procedure for higher education institutions would take place in May 2021. With that decision, preparations began to draft the self-evaluation of the Faculty for the period from the 2015/16 to 2019/20 academic years. In collaboration with the Agency, the 2019/20 academic year and the 2020 calendar year were selected as the assessment year. Staff of the faculty participated during the preparation of the Self-evaluation within four training sessions / workshops. The first workshop was held in 27 October 2020 and was entitled "Training for drafting the self-evaluation for representatives of higher education participating in the reaccreditation process in the 2021 Plan of Higher Education Reaccreditation". The second workshop was held on 8 December 2020 and was entitled "MOZVAG – webinar for higher education coordinator", and 10 MOZVAG coordinators took part. The third and fourth workshops were held on 16 and 17 December 2020, and were intended for the staff of libraries and administrators of the POIROT and CROSBI databases.

This Self-evaluation was compiled in accordance with the guidelines for drafting the self-evaluation as published on the website of the Agency for Science and Higher Education, and in the Evaluation Standards of the quality of universities and university constituents in the reaccreditation process of higher education institutions. This Self-evaluation is divided into eight sections, as follows: Introduction, Authors, Short description of the Faculty, Internal quality assurance and the social role of the higher education institution, Study programmes, Teaching processes and student support, Teaching and institutional capacities, and Scientific activities. The Analytical appendix from MOZVAG is appended as an integral part of this document.

The text also provides links to the appropriate evidence that are available online, or with the file code in the Self-evaluation appendix. File code names are in the form A_B_C_D, where A is the ordinal number of the topic, B is the ordinal number of the standard in the topic, C is the ordinal number of the element of the standard, and D is the ordinal number of the evidence. The appropriate files in the directories with appendices begin with that code. Link codes are also provided in the same format. At the end of this Self-evaluation is a list of acronyms, website links to relevant documents and evidence.

This document was adopted at the session of the Faculty Council on 25 March 2021.

This translation consists of:
1 page / 2 sheets
No: 6/2021
Date: 1 April 2021

Certified translation
from Croatian to English

Letterhead of the Faculty of Science, University of Zagreb

CLASS: 602-04/20-01/73
NUMBER: 251-58-10203-21-7
Zagreb, 26 March 2021

The Faculty Council of the Faculty of Science, University of Zagreb, pursuant to Article 63, paragraph 6 of the Act on Scientific Activity and Higher Education (Official Gazette 123/03, 198/03, 105/04, 174/04, 02/07, 46/07, 45/09, 63/11, 94/13, 139/13 and 101/14, 60/15, 131/17), Article 43, paragraph 1, item 9 of the PMF Statute, and Article 9, paragraph 1 of the Ordinance on quality assurance at PMF, at the proposal of the Faculty Collegium of 23 March 2021, at its session of 25 March 2021, adopted the

DECISION

The Self-analysis of the Faculty of Science, University of Zagreb, for the period from the academic year 2015/16 to the academic year 2019/20 is hereby adopted for the purpose of the procedure for the forthcoming reaccreditation of the Faculty in May 2021.

The PMF Self-analysis for the period from the academic year 2015/16 to the academic year 2019/20 is attached and is an integral part of this Decision.

DEAN OF THE FACULTY

Professor Mirko Planinić, PhD

This decision is delivered to:

1. Associate Professor Martina Jakovčić, PhD, main co-ordinator for preparation of the PMF Self-analysis
2. Dean's Office, here
3. Archives, here

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END OF TRANSLATION

I, the undersigned, Linda Natasha Zanella, sworn court interpreter for the English language appointed by Decision 4 Su-415/2019 of 30 March 2019 of the County-Commercial Court in Zagreb, confirm that the above translation fully corresponds to the original Croatian text.

In Zagreb, 1 April 2021
No: 6/2021

Linda N. Zanella, MSc
Certified Court Interpreter

STALNI SUDSKI TUMAČ ZA ENGLESKI JEZIK
Linda Natasha Zanella
dipl. ing.
Orahovac 22
ZAGREB
COURT INTERPRETER

2. AUTHORS

The coordinators for compilation of the Self-evaluation of the Faculty of Science, University of Zagreb for the period 2015/16 to 2019/20 were appointed by virtue of a decision of the Dean, at the proposal of the Faculty Collegium. The working group consisted of the following members:

- Associate Professor Dr. Martina Jakovčić, Vice-dean for international cooperation, main coordinator
- Professor Dr. Višnja Vrdoljak, chairperson of the Committee for Quality Control, Faculty of Science, University of Zagreb, coordinator for the topic: Internal quality assurance and the social role of the higher education system
- Professor Dr. Mladen Vuković, Vice-dean for teaching, coordinator for the topic: Study programmes
- Assistant Professor Dr. Ružica Vuk, Assistant Department Head of the Department of Geography for study programmes, coordinator for the topic: Teaching processes and student support
- Assistant Professor Dr. Ivana Herceg Bulić, Vice-dean for finance, coordinator for the topic: Teaching and institutional capacities
- Assistant Professor Dr. Marijana Đaković, Vice-dean for science, coordinator for the topic: Scientific activities.

With the coordinators for compiling the Self-evaluation of the Faculty, on 16 November 2020, the Dean also appointed departmental coordinators responsible for organising the collection of data within the departments for the needs of compiling the Self-evaluation, and for the organisation of the reaccreditation visit.

The following were appointed to this working group:

- Professor Dr. Dubravka Hranilović, Department of Biology
- Professor Dr. Krešimir Kumerički, Department of Physics
- Assistant Professor Dr. Ružica Vuk, Department of Geography
- Associate Professor Dr. Maja Telišman Prtenjak, Department of Geophysics
- Professor Dr. Damir Bucković, Department of Geology
- Assistant Professor Dr. Dominik Cinčić, Department of Chemistry
- Assistant Professor Dr. Matija Bašić, Department of Mathematics.

The working groups were divided by topic as listed in the Standards for Evaluation of Quality of Universities and University Constituents in the Process of Reaccreditation of Higher Education Institutions:

- Topic 1: Internal quality assurance and the social role of the higher education institution – Professor Dr. Višnja Vrdoljak, Professor Dr. Damir Bucković, Associate Professor Dr. Danko Radić, Associate Professor DR. Giuliana Verbanac, Asociate Professor Dr. Vesna Petrović Peroković, Professor Dr. Višnja Besendorfer, Associate Professor Dr. Maja Telišman Prtenjak, Assistant Professor Dr. Marko Erceg, Assistant Professor Dr. Vuk, Marija Kozina, Zrinko Jurić, Dr. Ernest Meštrović
- Topic 2: Study programmes – Professor Dr. Mladen Vuković, Professor Dr. Aleksandra Čižmešija, Associate Professor Dr. Renata Matoničkin Kepčija, Associate Professor Dr. Mihael Makek, Assistant Professor Dr. Ružica Vuk, Assistant Professor Dr. Karmen Fio Firi, Associate Professor Dr. Vesna Petrović Peroković, Assistant Professor Dr. Slaven Kožić.
- Topic 3: Teaching process and student support – Assistant Professor Dr. Ružica Vuk, Assistant Professor Dr. Sara Essert, Associate Professor Dr. Davor Horvatić, Dr. Antun Marki, Assistant Professor Dr. Luka Valožić, Assistant Professor Dr. Zorica Petrinec, Professor Dr. Željka Soldin, Assistant Professor Dr. Mea Bombardelli.
- Topic 4: Teaching and institutional capacities – Associate Professor Dr. Ivana Herceg Bulić, Assistant Professor Dr. Sandra Hudina, Assistant Professor Dr. Željko Skoko, Dr. Miroslava Pasarić, Professor Dr. Aleksandar Toskić, Professor Dr. Gordana Medunić, Assistant Professor Dr. Ivan Kodrin, Professor Dr. Eduard Marušić Paloka, Selmira Šećibović, Gordana Stubičan Ladišić.
- Topic 5: Scientific activity – Associate Professor Dr. Marijana Đaković, Associate Professor Dr. Ivana Ivančić Baće, Professor Dr. Hrvoje Buljan, Assistant Professor Dr. Željko Večenaj, Assistant Professor Dr. Dubravka Spevec, Assistant Professor Dr. Katarina Gobo, Associate Professor Dr. Dominić Cinčić, Professor Dr. Luka Grubišić, Professor Dr. Ita Gruić Sovulj.

The staff of the Human Resources Department, Accounting Department, Procurement Office, Office for International Cooperation and Project Monitoring, and the Library Board all participated in the collection of data. Coordinators of the MOZVAG system for each department, and the main coordinator for the compilation of the Self-evaluation entry of data into the MOZVAG 2 system.

3. SHORT DESCRIPTION OF THE FACULTY

3.1. DEVELOPMENT OF THE FACULTY OF SCIENCE

The teaching of the natural sciences, mathematics and geography has a long history at the University of Zagreb. The first records of teaching in physics and geography can be found in the period of the highest education studies introduced by the diploma of Leopold I in 1669. Continuous scientific and teaching work in the sciences is evident following the restoration of the University of Zagreb in 1874, when the Parliament adopted the Act on the Organisation of the University. As part of that newly established Faculty of Philosophy, new departments and sections were established. Among others, the Natural Science and Mathematics Department was established in 1876. The first organised scientific and teaching work was started by the professors and department heads in the newly founded departments and sections for geology and minerology (Gjuro Pilar), botany (Bohuslav Jiruš), physics (Vinko Dvořak), mathematics (Karel Zahradnik), chemistry (Aleksandar Veljkov) and zoology (Spiridon Brusina). In 1883, teaching began in the fields of geography (Petar Matković), and in 1893 in the field of geophysics (Andrija Mohorovičić).

On 8 June 1946, a Decree of the Government of the National Republic of Croatia, the Faculty of Science was separated from the Faculty of Philosophy and began its operations independently as the Faculty of Science. In 1948, the Faculty consisted of the Department of Biology, Department of Geography, Department of Chemistry and Department of Mathematics and Physics, which also included the Geophysics Institute. During the early development of the Faculty, it also included separate institutes, such as the Department of Biology and Physics, and from 1961 to 1975 the Geographic Institute, which later became the Institute for Geography of the University of Zagreb. With the abolition of the institutions in the Faculty structure, departments were introduced. The Department of Mathematics and Physics was divided to form the Department of Mathematics and the Department of Physics, where the latter continued to include the Geophysics Institute. Stronger scientific and teaching development resulted in further organisational changes, and since the 1980s, the Faculty has included seven departments: Biology, Chemistry, Geography, Geology, Geophysics, Mathematics, and Physics.

With the new Statute in 1995, the departments were awarded greater autonomy in their scientific and teaching work. More recent statutes, particularly the newest adopted in 2020, further emphasize autonomy in scientific activities and teaching.

Today, the Faculty is comprised of seven departments, with the Botanical Garden (as an organisational unit of the Department of Biology), the Seismological Service (as an organisational unit of the Department of Geophysics), the Centre for Climate Research, and the Career Centre.

Over the past 15 years, the Faculty has significantly improved its scientific activities. Scientific research at the Faculty today includes both experimental and theoretical work, and the results are published in the world's leading scientific journals. Scientific projects are financed from

domestic and European sources of funding (European structural investment funds, H2020, UKF, ESF, etc.), and scientific research is also conducted as a part of doctoral studies. In order to strengthen international cooperation, the mobility of scientists and lecturers, and project activities, the Office for International Cooperation was opened in 2009. Alongside scientific activities, in recent years, there has been a strong increase in expert activities, as seen in the series of expert projects implemented at the Faculty, particularly in the fields of sustainable development, environmental protection, and projects in cooperation with local and regional governments, industry and the economy. Cooperation with industry and the economy enables the strengthening of applied research and technology transfer.

Over the past 15 years, PMF has also experienced significant changes in teaching activities. The implementation of the Bologna Process in 2005 resulted in a complete reorganisation of study programmes, and these are subject to ongoing modernisation. The most recent step forward was the launch of the new graduate study programme *Biomedical Mathematics*. Its preparation was financed within the framework of the Operational programme Effective Human Resources of the European Social Fund. A wide range of student activities are also associated with these changes, as seen in numerous student projects financed by the Student Council, some of which have even won the Rector's Award. With the aim of assisting students during their studies, and in their further professional development, the Career Centre was established in 2020 as part of the project *ProSper*, financed by the European Social Fund. An important activity is also the many popularisation activities aimed at popularising science and STEM fields, making them more attractive to youth and the general public. These activities include the *PMF Day and Night* event, *WISe*, and others.

The past year has been marked by the strong earthquake that hit Zagreb on 22 March 2020, in which all Faculty buildings were affected, and three were proclaimed temporarily unihabitable (buildings of the Departments of Biology and Geography, and the faculty building at Zvonimirova 8). Significant financial investments will be required to repair the damages, and this unfortunately will be a limiting factor in the forthcoming period.

3.2. ORGANISATIONAL STRUCTURE OF THE FACULTY

The Faculty of Science has a complex structure. The Faculty bodies are: Dean, Faculty Council and Faculty Collegium. The organisational units of the Faculty are its departments, which are registered as branches of the Faculty:

- Department of Biology
- Department of Chemistry
- Department of Geography
- Department of Geology
- Department of Geophysics
- Department of Mathematics
- Department of Physics.

The Department of Biology also includes the Botanical Garden and the Vrlika Ecological Station. The Department of Geophysics includes the Seismological Survey, which performs seismological tasks pursuant to special laws.

Within each department are divisions, laboratories, chairs, centres, libraries and other organisational units. Each department is led by a department head, while each division is run by a division head. Certain departments also contain collections. For example, the Department of Biology houses the Collection of the Department of Zoology, the Herbarium Collection, the Croatian National Collection of Diatoms and the Entomological Collection. The Department of Geography houses the Cartography Collection, while the Department of Geology houses the Geological and Paleontological Collection.

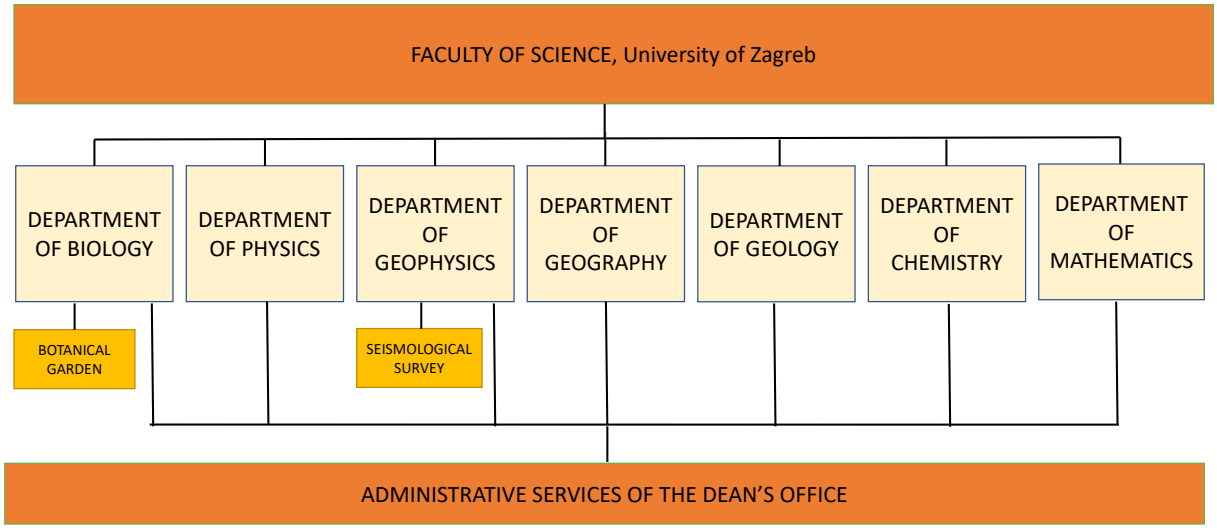

FIGURE 1. ORGANISATIONAL STRUCTURE OF THE FACULTY OF SCIENCE

The **Department of Biology** is the Faculty branch organised for performing activities of higher education, science and expert work in the field of biology. The Department of Biology consists of:

- Division of Botany
- Botanical Garden
- Division of Zoology
- Division of Animal Physiology
- Division of Molecular Biology
- Division of Microbiology
- Chair for Didactics in Biology
- Chair for Physical and Health Education of PMF
- Vrlika Ecological Station.

The **Department of Physics** is the branch of the Faculty organised for performing activities of higher education, science and expert work in the field of physics. The Department of Physics consists of:

- Division of Experimental Physics
- Theoretical Physics Division of Condensed Matter
- Theoretical Physics Division of Particles and Fields
- Division of Theoretical Physics.

The **Department of Geophysics** is the branch of the Faculty organised for performing activities of higher education, science and expert work in the field of geophysics. The Department of Geophysics consists of:

- Andrija Mohorovičić Geophysical Institute
- Seismological Survey of the Republic of Croatia.

The **Department of Geography** is the branch of the Faculty organised for performing activities of higher education, science and expert work in the field of geography. The Department of Geography consists of:

- Division of Physical Geography
- Division of Social Geography
- Division of Regional Geography and Methodic
- Cartographic Technical Centre.

The **Department of Geology** is the branch of the Faculty organised for performing activities of higher education, science and expert work in the field of geology. The Department of Geology consists of:

- Division of Geology and Palaeontology
- Division of Minerology and Petrography.

The **Department of Chemistry** is the branch of the Faculty organised for performing activities of higher education, science and expert work in the field of chemistry. The Department of Chemistry consists of:

- Division of Organic Chemistry
- Division of Physical Chemistry
- Division of General and Inorganic Chemistry
- Division of Analytical Chemistry
- Division of Biochemistry.

The **Department of Mathematics** is the branch of the Faculty organised for performing activities of higher education, science and expert work in the field of mathematics and computer science. The Department of Mathematics consists of:

- Division of Algebra and Fundamental Mathematics
- Division of Geometry
- Division of Mathematical Analysis
- Division of Numerical Mathematics and Scientific Computation
- Division of Applied Mathematics
- Division of Probability Theory and Mathematical Statistics
- Division of Topology
- Division of Computer Science
- Chair for Didactics in Mathematics and Computer Science.

The professional services of the Faculty are performed by the Administrative Services of the Dean's Office, and the administrative services of each individual department. The Administrative Services of the Dean's Office perform the joint legal, personnel, accounting, bookkeeping, administrative, technical, general and auxiliary tasks for the needs of the Faculty and its departments that are necessary for the successful performance of the Faculty activities, and successful execution of teaching and scientific research work of the Faculty and its departments.

3.3. STRUCTURE OF THE FACULTY MANAGEMENT

Pursuant to the Statute of the Faculty of Science (hereinafter: Faculty Statute), the Faculty Management consists of the Dean, Faculty Council and Faculty Collegium. The Dean is the head of the Faculty, and his authorities are laid down by the University Statute, Faculty Statute and laws pertaining to science and higher education. The Dean had a mandate of two years. In accordance with the Statute adopted at the 3rd regular session on 17 December 2020, the Dean will be appointed to a mandate of three years. The authorities of the Dean are laid down in Article 19 of the Faculty Statute (ev. 0_0_0_1).

The Faculty Collegium is composed of: the Dean, Vice-deans and Department heads of all faculty departments. The General Secretary and representative of the Student Council of the Faculty also participate as non-voting members of the Faculty Collegium. The authorities of the Faculty Collegium are laid down in Article 37 of the Faculty Statute.

The Vice-deans of the Faculty are: Vice-dean for teaching, Vice-dean for finance, Vice-dean for international cooperation, Vice-dean for science and doctoral studies, and Vice-dean for investments and development. In accordance with the new Statute, the Vice-deans of the Faculty are: Vice-dean for teaching, Vice-dean for finance and operations, Vice-dean for science, projects and commercial cooperation, Vice-dean for international cooperation, and Vice-dean for investments and development. The authorities of the vice-deans are laid down in Article 28 of the Faculty Statute.

The Faculty Council is the expert council of the Faculty, and is organised based on a delegate system, comprised of: eight representatives of the employees holding scientific and teaching ranks from each of the Departments of Biology, Physic, Geography, Geology, Chemistry and Mathematics, four representatives of the employees holding scientific and teaching ranks from the Department of Geophysics, one representative of employees in teaching and associate ranks from each department; the dean and vice-deans, student representatives and employee representatives pursuant to the provisions of the Labour Act. The authorities of the Faculty Council are laid down in Article 32 of the Faculty Statute.

Certain areas of activity of the Faculty are covered by specialised committees, that have a mandate of four years as a rule. They are appointed by the Faculty Collegium based on a delegate system. As required, additional committees may be formed for the drafting of ordinances, strategies, etc. The permanent committees at the Faculty are:

- Committee for teaching
- Committee for teaching methodologies
- Committee for publishing activities
- Committee for quality assurance
- Ethics Committee
- Disciplinary Committee.

Each faculty department consists of the following bodies: Department Head, Department Council and Department Collegium. The Department Head leads and organises the activities and operations of their faculty department. Their authorities are prescribed by Article 40 of the Faculty Statute and faculty ordinances. The Faculty Council is chaired by the Department Head. The authorities of the Department Council are laid down in Article 46 of the Faculty Statue and department ordinances. The Department Collegium consists of the: department head, deputy department head, division heads and other persons as laid down in the department ordinances. The authorities of the Department Collegium are laid down in Article 50 of the Faculty Statute and department ordinances.

The division is an organisational unit of the faculty department established for the organisation and improvement of scientific, research and expert work, on the basis of benchmarks of connected scientific and work processes unfolding within the division, and the mutual connections of its scientists. The work of the division is managed by the division head.

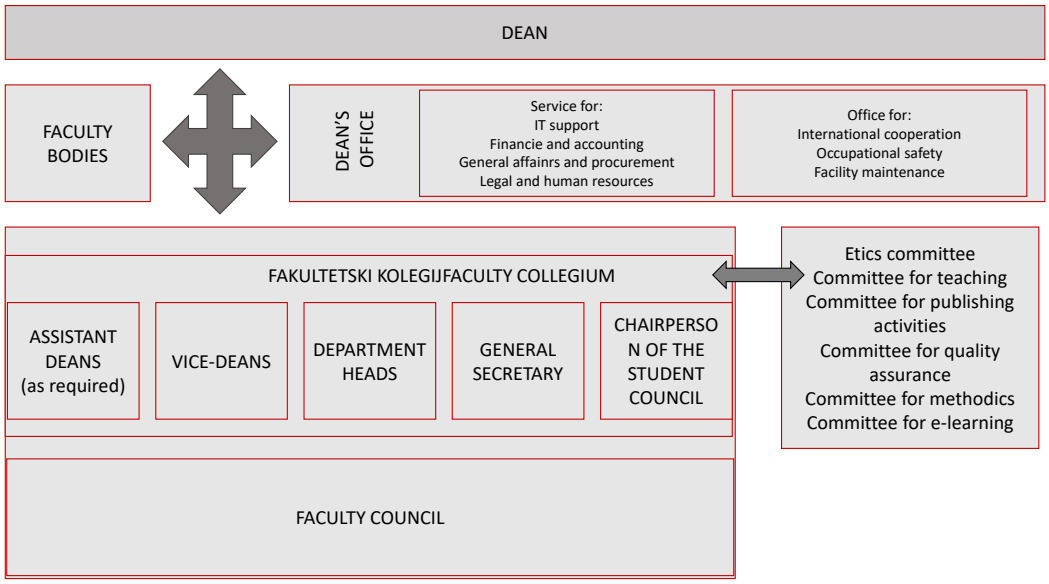

FIGURE 2. FACULTY MANAGEMENT STRUCTURE

3.4. FACULTY MISSION AND VISION

The Faculty mission is to promote and develop the natural sciences, mathematics and geography at the University of Zagreb and beyond, through participation in internationally relevant and competitive fundamental, applied and development research, to implement and improve innovative, research-based teaching programmes, and to contribute to the overall scientific, teaching and professional activities in the science and education system in the Republic of Croatia, European Union and beyond.

The Faculty vision is to continue to be an international recognisable and relevant centre of excellence for scientific, teaching and expert work in the fields of the natural sciences, mathematics and geography, in which our scientists, professors, associates and students are equal participants in the European Research Area.

3.5. STUDY PROGRAMMES

The Faculty of Science is entered into the Register of Scientific Organisations, under entry no. 119 in the field of the Natural sciences (ev. 0_0_0_2). The process of accreditation is underway for the scientific area of the Interdisciplinary area of science, field of Geography. The need for new accreditation is the result of changes to the legislation and the adoption of the new Ordinance on scientific areas, fields and branches.

The Faculty executes study programmes at the undergraduate, graduate, integrated (undergraduate + graduate) and postgraduate levels. All study programmes are executed as regular single-subject study programmes. At PMF, there are currently nine three-year undergraduate university study programmes (180 ECTS credits), eight five-year integrated undergraduate and graduate university study programmes (300 ECTS credits), 18 two-year graduate study programmes (120 ECTS credits), seven three-year postgraduate university study programmes (180 ECTS credits) and 1 two-year postgraduate specialist study programme (120 ECTS credits). The structure of the study programmes is outlined below. Certain study programmes are executed independently by the departments, while some programmes are executed in cooperation of two departments, while the Interdisciplinary undergraduate university study programme *Environmental Science* and the graduate programme with the same name are jointly executed by the Departments of Biology, Geography and Geology. The integrated undergraduate and graduate university study of Biology and Chemistry Education is jointly executed by the Departments of Biology and Chemistry, while the Integrated undergraduate and graduate university study programme of Physics and Computer Science Education and the Integrated undergraduate and graduate university study programme of Physics and Mathematics Education are executed jointly by the Departments of Physics and Mathematics. The Integrated undergraduate and graduate university study programme of Geography and History Education is executed jointly by the Department of Geography and the Department for History, Faculty of Philosophy. The postgraduate university study of Mathematics is executed as a joint doctoral programme by the mathematics departments of

four universities: University of Zagreb, Josip Jurje Strossmayer University in Osijek, University of Rijeka, and University of Split, making this a unique programme in the Republic of Croatia.

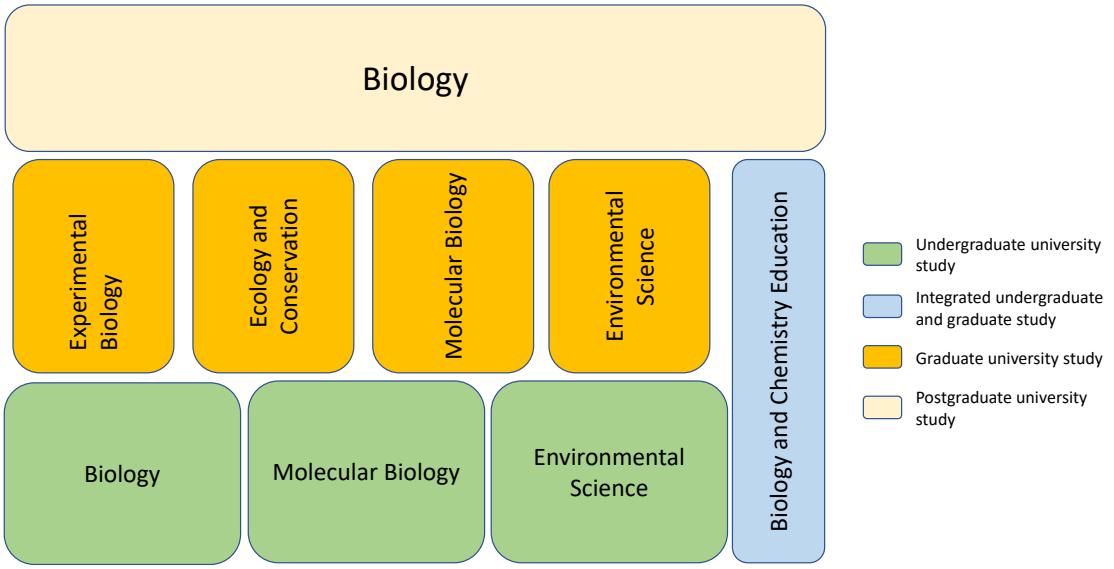

FIGURE 3. STUDY PROGRAMMES AT THE DEPARTMENT OF BIOLOGY

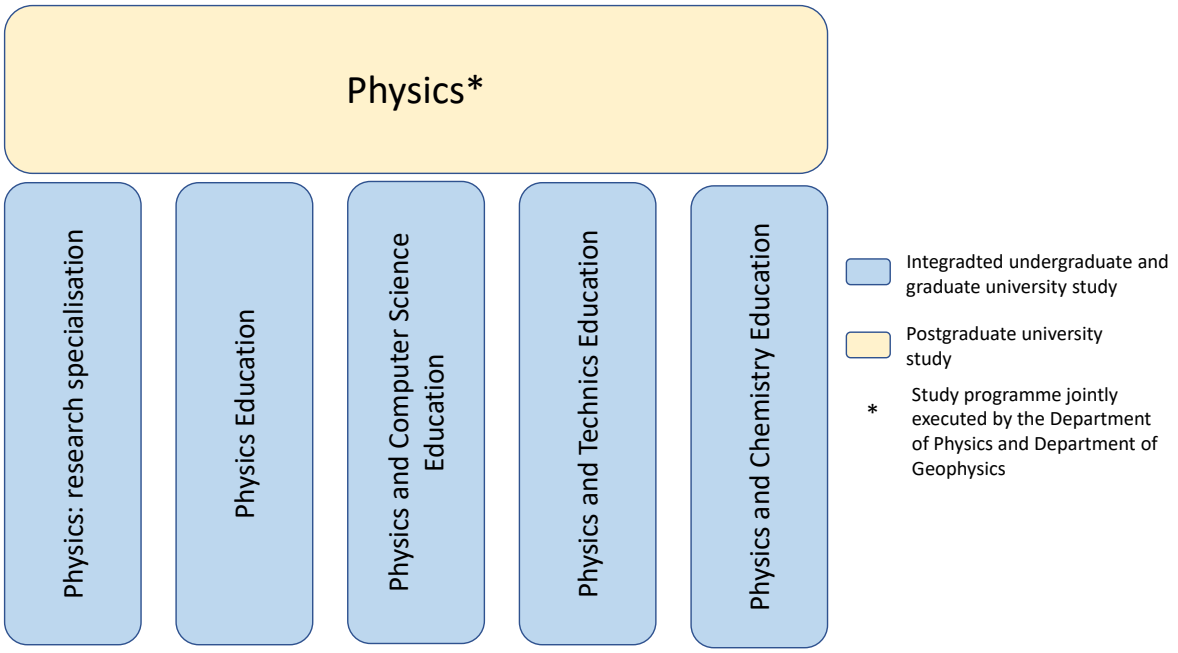

FIGURE 4. STUDY PROGRAMMES OF THE DEPARTMENT OF PHYSICS

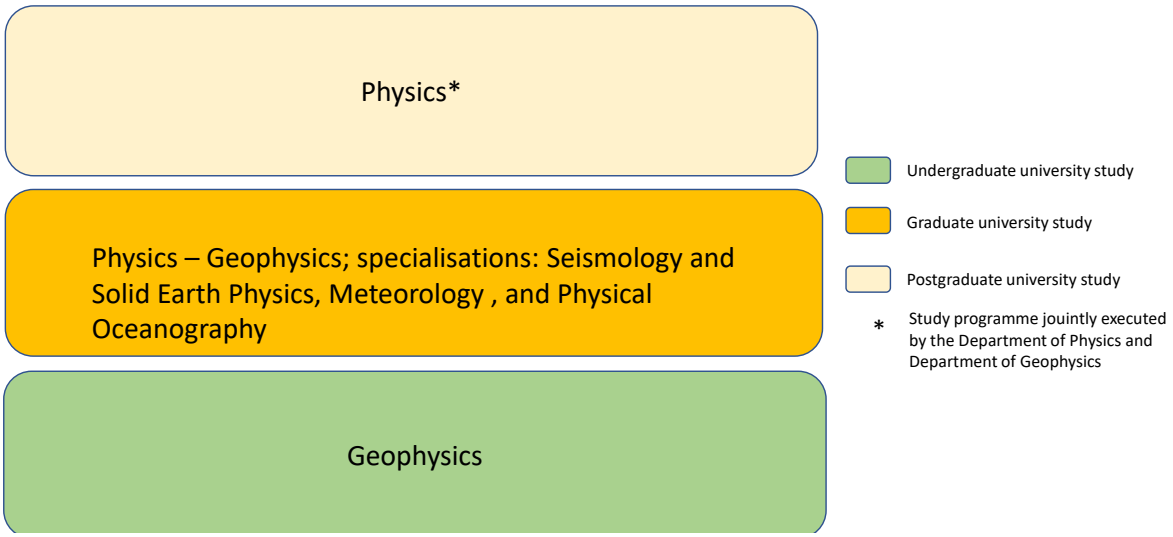

FIGURE 5. STUDY PROGRAMMES OF THE DEPARTMENT OF GEOPHYSICS

It is important to note that the PMF Department of Geophysics is the only institution in Croatia to offer university education in all three levels in the fundamental disciplines of geophysics: meteorology, oceanography, seismology, geomagnetism and aeronomy.

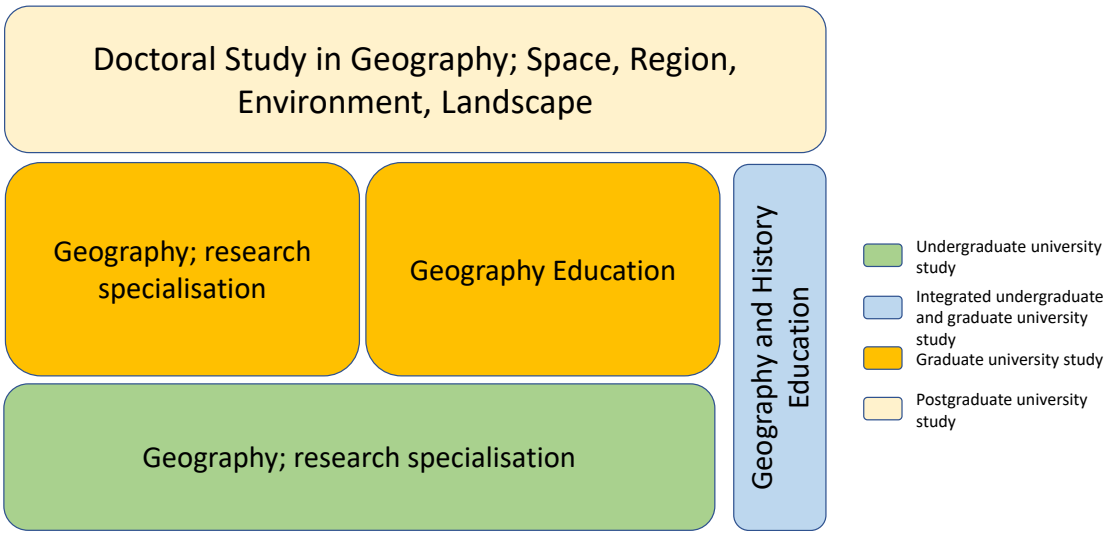

FIGURE 6. STUDY PROGRAMMES OF THE DEPARTMENT OF GEOGRAPHY

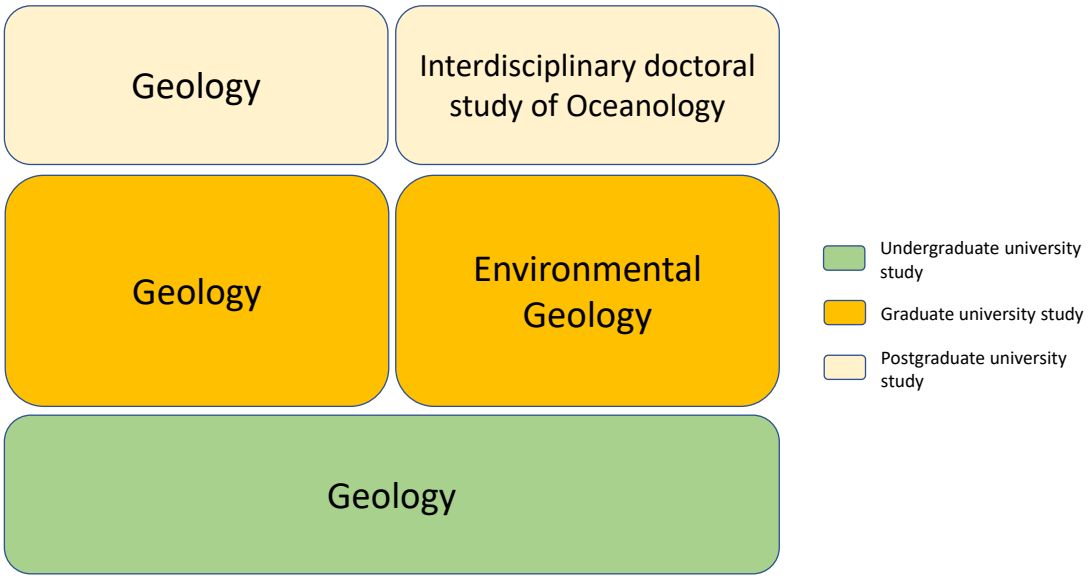

FIGURE 7. STUDY PROGRAMMES OF THE DEPARTMENT OF GEOLOGY

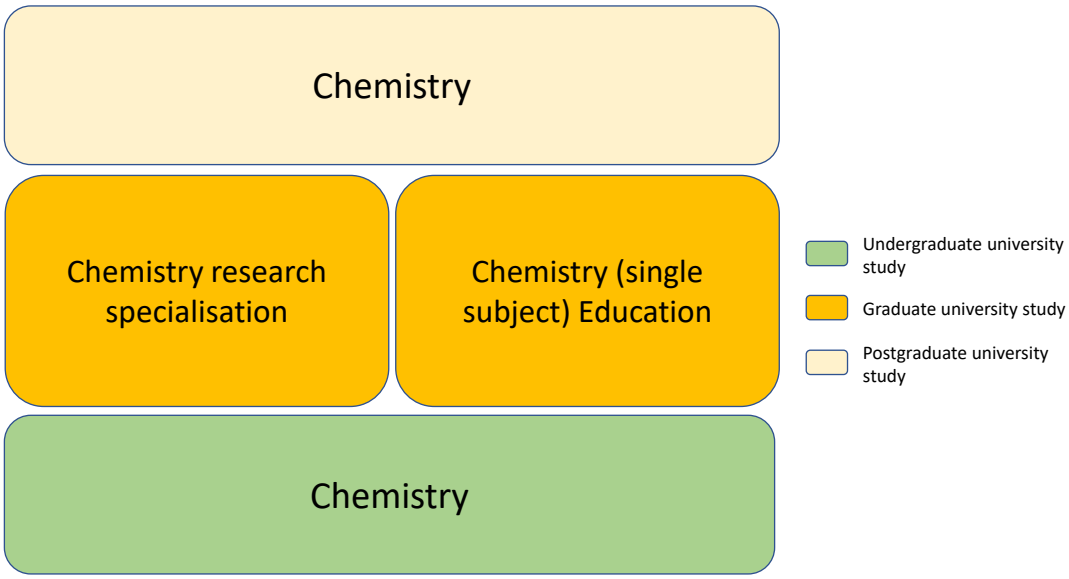

FIGURE 8. STUDY PROGRAMMES OF THE DEPARTMENT OF CHEMISTRY

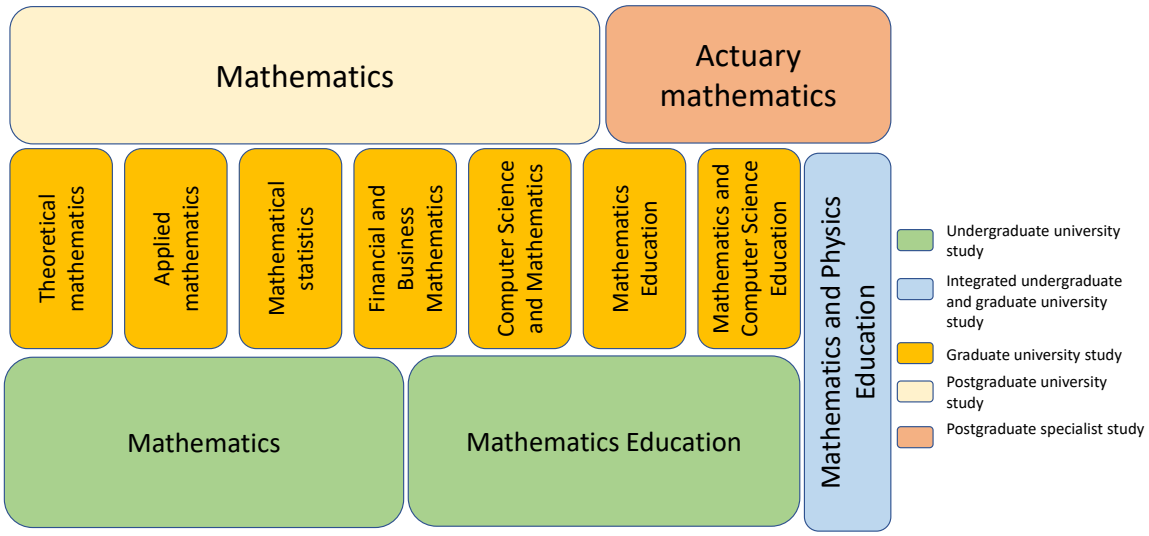

FIGURE 9. STUDY PROGRAMMES OF THE DEPARTMENT OF MATHEMATICS

4. OUTCOMES OF PREVIOUS EVALUATIONS AND OVERVIEW OF RESULTS AFTER IMPLEMENTED PROCEDURE

The previous reaccreditation cycle of the Faculty was carried out from 13 to 15 April 2015. The Report of the expert committee was delivered in July 2015, and was divided into seven sections: Managing the higher education institution and quality assurance, Study programmes, Students, Teachers, Scientific and expert activities, Mobility and international cooperation, and Resources: expert services, facilities, equipment and financing.

1. MANAGING THE HIGHER EDUCATION INSTITUTION AND QUALITY ASSURANCE

Recommendation 1a

Strategic goals: In order to develop new directions for future strategy, and to achieve the strategic goals, comprehensive consultations are necessary. In the development of future scientific strategy, the Dean's Collegium should carry out extensive consultations with departments, scientific institutions and industry. Through internal consultation processes, the departments should determine their goals for the five-year period: for scientific research strategy, interdisciplinary and international cooperation, expert roles, and involvement in industry and scientific production. Following this, the departments need to monitor their achievement. Forums for discussions between departments should be valuated and further developed, to create opportunities for interdisciplinary cooperation. In order to ensure continuity of working to implement such a strategy, the Faculty should consider a different term of the mandates for the dean and vice-deans, instead of the current 2 + 2 years, to introduce, for example, terms of 3 + 2 or 4 + 2 years. Extending the mandate term would certainly be beneficial in developing and implementing strategy.

1a.1

Conduct consultations for adopting strategic documents of the Faculty.

The drafting of the Faculty Development Strategy for the following five-year period began in 2020, with an analysis of operations in the preceding period (see standard 1.1.4, ev. 0_0_0_3 and ev. 0_0_0_4). The analysis was conducted on the basis of data and feedback from a range of stakeholders, and the results collected were used to detect challenges and to determine the guidelines for further development and improvement of quality in all Faculty activities. Members of the Committee for drafting the draft Strategy will conduct further consultations with Faculty employees, relevant external stakeholders, and student body representatives. Adoption of the new Faculty Development Strategy is expected during the second half of 2021.

The *Strategic programme of scientific research at the Faculty of Science for the period 2018–2023* (hereinafter: *SciStrat*), with its

specific goals, defined activities and success indicators was adopted in 2018, and is publicly available on the Faculty website (URL_0_1_1 and ev. 0_0_0_5). The expert committee for drafting the *SciStrat* strategy (ev. 0_0_0_6), conducted extensive consultations with the scientific and teaching staff, and following public presentation of the draft strategic programme *SciStrat* at all departments, consultation was also held with the interested public. The activities encompassed in this strategic document were analysed and outlined in the annual reports, as described in Standard 1.6. In order to ensure continuity of work on strategy implementation, the drafting of a new draft Faculty Statute began in 2020. In accordance with the recommendations, the mandate term of the dean and the Dean's Collegium was extended from two to three years. Consultations were held with Faculty staff, followed by public consultations, and the draft Strategy was adopted at the session of the Faculty Council in December of last year, and forwarded for adoption to the Senate of the University of Zagreb (ev. 0_0_0_7 and ev. 0_0_0_8).

1a.2

Strengthening scientific research cooperation.

In accordance with the strategic goals, the Faculty is continuously promoting the strengthening of scientific research cooperation between departments and divisions, with the aim of establishing larger projects and increasing scientific productivity. The *Centre for Climate Research* has been established for interdisciplinary and multidisciplinary research on climate and climate change, and their effects. In addition to the development and implementation of contemporary research, the Centre brings together the top scientists at the Faculty in the field of climatology, which facilitates their preparations for future project applications (URL 0_1_2). An example of this cooperation is seen through the current interdisciplinary project *Croatia's climate vulnerability and possibilities of urban and natural environments* (Klima-4HR) that is the result of cooperation between researchers of the Departments of Biology and Geophysics at PMF, and scientists of the Ruđer Bošković Institute.

The Scientific Centre of Excellence for Quantum and Complex Systems and Representation of Lie Algebras (QuantiXLie) brings together scientists from several faculties at the University of Zagreb (PMF, Faculty of Electrical Engineering and Computer Science, Faculty of Civil Engineering, Faculty of Metallurgy, and Faculty of Textile Science and Technology), with researchers at the Institute for Physics, Ruđer Bošković Institute, Department of Mathematics at the University of Rijeka

and the Faculty of Science at the University of Split. The *QuantixLie* Scientific Centre is housed at PMF, University of Zagreb. The synergy between research groups enables better quality project applications for further financing from international sources, and a better education of young researchers.

As part of the *Centre of Excellence in Chemistry* (CIuK), new research laboratories have been established, and their activities engage scientists from different divisions at the Department of Chemistry, with the aim of strengthening interdivisional cooperation and raising the level of interdisciplinary studies. In a similar way, the *Centre for Advanced Research of Complex Systems* (CeNiKs) has strengthened the interdivisional cooperation at the Department of Physics. For example, the Division of Experimental Physics and the Theoretical Physics Division of Condensed Matter are working together on the project entitled *Collective effects, tunnelling and topological transport in new nanocompounds* (C3TiNN). Furthermore, the *Laboratory for Geospatial Analysis and Visualisation* (GeoAnVil) has contributed to cooperation between divisions at the Department of Geography, by stimulating activities to develop and apply geospatial technology for the collection, processing, analysis, visualisation and exchange of geoinformation.

Recommendation 1b

Quality of courses: Every department should establish a Course committee, that would include representatives of the student body, that would actively analyse feedback on courses, to allow for their evaluation and improvement. Best teaching and learning practices should be encouraged by publishing feedback on the best assessed lecturers, for example, among all lecturers and among assistants. New lecturers should be assigned an experienced mentor who is tasked with giving timely and constructive criticism, for example, in discussion after attending a class, or while watching a video of a lecture.

1b.1

Develop and improve course quality.

The PMF Committee for quality assurance, and the PMF Committee for coursework continually monitor the execution of study programmes and activities needed for quality assurance of coursework at the Faculty. Student body representatives are included in the work of these committees (ev. 0_0_0_9 and ev. 0_0_0_10). At virtually all departments, there are department committees for coursework, or bodies with a similar name, that are active in this area. At the Department of Geography, this body was established on the basis of the recommendations from the previous reaccreditation procedure, and has been operational since the 2017/18 academic year (ev. 0_0_0_11).

The Committee for coursework conducts analyses of study programmes with a special emphasis on student success during studies, and on the need for aligning and adapting course content and/or learning outcomes, and course implementation plans. The Committee for quality assurance monitors the amendments to the study programmes and analysis the results of student surveys, as described in detail in Standard 1.1.6. On the basis of the collected data, teaching methods and means of verifying the mastery of the learning outcomes are adapted. As needed, Department heads hold discussions with poorly rated lecturers, with the aim of improving course quality. The survey results are publicly available on the Faculty website (URL 0_1_3).

The Student Council, as the representative of the student body, conducts its own surveys, and examples of good practices are presented at the sessions of the Department councils. On PMF Day, the best lecturers, based on student assessments, are awarded the *Brdo* award (URL 0_1_4).

With the aim of ensuring the continuity of course quality, the work of young lecturers and associates is assessed by giving classes under the supervision of the lead lecturer (ev. 0_0_0_12). Improving teaching competencies is a long-lasting process, and the course leader is required to give younger associates the needed advice and proposals on planning and executing courses,

in the application of the strategy of active learning and teaching, and on the evaluation of student accomplishments. New lecturers are introduced to supervisory work with students as co-mentors or indirect supervisors of graduate theses (ev. 0_0_0_13), and they give constructive recommendations on how to improve their mentorship competencies. The work of young lecturers is overseen and their teaching materials reviewed (ev. 0_0_0_14). The Committee for the evaluation of teaching materials appoints reviewers, and based on positive reviews received, write their final opinion and proposed grade. These opinions are forwarded for adoption to the Department Council and/or Faculty Council. Young associates who are appointed to a scientific-teaching grade (rank) for the first time, under the conditions prescribed by the Rector's Council, must have a positively assessed exemplary lecture by the appointed Committee, in accordance with the Decision on the form and manner of executing the exemplary lecture for appointment to the scientific-teaching grade (rank), artistic-teaching or teaching rank (ev. 0_0_0_15). The public is notified of the exemplary lecture before lecturers and students via the website.

Recommendation 1c

Geoscience Departments: Departments for geoscience possess an abundance of expertise in the fields of urban and spatial planning. In order to more effectively use these capacities, PMF needs to lobby for amendments to the national legislation to make the participation of geoscientists mandatory on issues concerning physical planning and land use. It is particularly important to enable geographers trained in spatial analysis and geoscientists to sign official documents pertaining to urban and spatial planning.

1c.1

Strengthen the role of geosciences in the field of urban and spatial planning.

In addition to the far wider-reaching impact of the Faculty of Architecture, the geosciences at PMF have succeeded in strengthening their position in national bodies for the development of physical planning documentation. The staff of the Department of Geography regularly participate in scientific and expert activities of the Ministry of Spatial Planning, Construction and State Assets (until recently the Croatian Institute for Spatial Development, which has since been integrated into the Ministry), on topics associated with physical planning and development. A particularly important contribution has been participation in the drafting of the scientific study *Regional development, development of systems of settlements, urban and rural development, and transformation of space* included in the *Croatian Spatial Development Strategy (2017)*.

Other important activities include participation at the conference "Urban-rural connections" of the Croatian Institute for Spatial Development (2017) and two projects in ESPON (European Spatial Development Network), coordinated in Croatia by the Ministry of Physical Planning, Construction and State Assets. Thanks to these activities, stronger institutional integration has been achieved, with the constant presence of geographers in the urban and physical planning system. Though there is no database on the employment of alumni, the available data for the past five years indicate that graduates of geography have successfully become employed in public institutions in the physical planning system, particularly in county planning departments.

The scientists of the Department of Geology are actively involved in research that serves as a foundation for the protection of geoheritage and for obtaining or reaccreditation of status of a protected area (Plitvice Lakes National Park, Vransko Lake and Papuk Nature Parks). The staff of the department have made important contributions to monitoring the state of the environment (e.g., monitoring marine sediments in coastal areas and marinas, at beaches). These collected data are used in planning sustainable development and the management of natural resources. Department staff have also been included in writing the draft Act on geological activities, which should emphasize the importance of geology and understanding the geological structure of the Republic of Croatia as a fundamental requirement for sustainable management and use of natural geological resources, as this greatly contributes to general economic development. Systematic and continuous geological research lays the foundation for sound physical planning, investments, and lowers costs in construction (particularly for large infrastructure projects), exploitation of mineral resources, water management, disaster protection, environmental protection and nature conservation.

The scientists of the Department of Geophysics are actively involved in promoting and transposing geophysics expertise in the scientific (at the national and international levels) and expert sense to a broad circle of users. This particularly concerns the inclusion of seismologists in the process of transposing and including European norms for earthquake-resistance construction (Eurocodes) into Croatia's normative and legal system (standard: HRN EN 1998-1:2011). Seismic hazard maps have been developed and were accepted by the Croatian Standards Institute, and included in the National Addendum to the Eurocode-8 (standard: HRN EN 1998-1:2011/NA). This information is also useful to the

general public, particularly following the Zagreb earthquake in 2020. Further, the Seismology Survey (URL 0_1_5) operates as a part of the Department of Geophysics, and thereby also PMF, and is a member of the main working group *Croatian Platform for reducing disaster risks* coordinated by the *National Protection and Rescue Directorate* that functions within the *Government of the Republic of Croatia*. This platform brings together political, operational and scientific levels, enabling the transfer and alignment of knowledge, proposal of solutions, adoption of documents and stimulates their implementation, with the aim of reducing disaster risks. Seismologists have also participated in a series of expert projects, such as the project *Monitoring seismic activity* in 2019, 2020 and 2021, for the needs of the local community and domestic economic entities (e.g. City of Zagreb, Rijeka LNG terminal Rijeka, Dubrovnik General Hospital, etc.).

Recommendation 1d

Partner institutions: Within the Faculty, it is necessary to draw up framework agreements that would enable competent persons employed outside the University, i.e., at institutes, to teach and be mentors for students, and for their work to be recognised. These agreements should also regulate the use of equipment countrywide in a manner that would most benefit students.

1d.1

Concluding agreements with partner institutions and including experts from the economy and institutes in courses.

An agreement between the Faculty with scientific institutions, such as the Ruđer Bošković Institute and other universities around the country, such as the University of Rijeka and the Zagreb Technical College, has enabled active inclusion of scientists and teachers of other institutions into the teaching process (ev. 0_0_0_16, ev. 0_0_0_17 and ev. 0_0_0_18). The postgraduate (doctoral) university study programme *Mathematics* is executed in conjunction with the University of Rijeka, University of Split, and University of Osijek. Scientists holding the appropriate grade (rank) and who are employed in the private sector, are also able to serve as mentors for graduate theses. Students who develop their graduate thesis in other institutions are also able to use the available scientific equipment.

In order to strengthen cooperation with the private sector, and prepare students for the labour market, the course *Internship* has been introduced into nearly all study programmes, beginning from the 2020/21 academic year. Within the project *ProSPer*, the process has begun to conclude a cooperation agreement (ev. 0_0_0_19) with interested companies, which has enabled private sector experts to become involved in teaching.

2. STUDY PROGRAMMES

Recommendation 2a

Courses: The Faculty of Committees for coursework of each department should explore the possibilities of coursework rationalisation. In particularly, they should examine whether there are overlaps in courses, and reconsider whether the structure 3 + 2 would contribute to better mobility and internationalisation than the structure 5 + 0 (where present). Lecturers in undergraduate and graduate courses should be regularly exchanged so as to avoid stagnation in content and materials, and to reduce course loads. Keeping the same lecturer in the same course for longer than five years should be considered a derogation from the standard, and should only be permitted in the most exceptional cases. With regard to geography classes, the proposals of geography students should urgently be implemented, i.e., allowing their active participation in the implementation and in evaluating the success of implementation.

2a.1

Planning the teaching, scientific and administrative work of teaching staff.

The work standards for employees of the Faculty in scientific-teaching, teaching and associate work posts is stipulated at the national level by the Collective Agreement for science and higher education (hereinafter: CASHE), which for the first time, quantified (weighted) individual elements of the work process with the number of necessary work hours. Accordingly, since 2019, planning the teaching, scientific and administrative work of Faculty teaching staff is conducted at the beginning of the academic year, and the schedule, called the Work Composition (ev. 0_0_0_20) is approved by the Faculty Council.

When greater workloads of teachers are observed, a more flexible division of work hours is permitted or, in accordance with the possibilities, a second course leader is appointed. Regular changes of course leaders is not fully applicable, since such changes would result in an additional increase in the already substantial teaching obligations. Exchanging associates in courses (in seminars, laboratory exercises, etc.) is carried out continually, wherever possible.

In certain study programmes, in accordance with the recommendations of the committee for teaching, enrolment quotas are reduced to raise the quality of work between teachers and students, or to reduce teaching obligations (ev. 0_0_21). The changes in enrolment quotas are outlined in Section 3.

2a.2

Rationalisation and consolidation of courses and improving study programmes.

Though certain courses have few students (particularly higher year elective courses), courses are regularly held in most cases, as this is the only possible access to the sustainability of specific professions and national requirements (e.g., seismologists, agro-meteorologists, education specialisations). Where it is possible to rationalise coursework by merging courses, redundant (elective) courses have been terminated, as was the case with the undergraduate university study *Geography, research specialisation*; the graduate university study *Geography, research specialisation*; and the integrated undergraduate and graduate university study *Geography and History Education: teaching specialisation* (ev. 0_0_0_22). Rationalisation of courses has also been conducted by aligning the implementation plan for the integrated undergraduate and graduate study programmes *Biology and Chemistry Education, teaching specialisation*, and *Physics and Chemistry Education*, teaching specialisation. The amendments of these two study programmes have been in effect since the 2017/18 academic year (ev. 0_0_0_23).

Student proposals were considered in making significant changes to the study programmes at the Department of Geography (undergraduate university study *Geography, research specialisation*; integrated undergraduate and graduate university study *Geography and History Education, teaching specialisation*; graduate university study *Geography Education, teaching specialisation*; and graduate university study programme *Geography, research specialisation*) (ev. 0_0_0_24) which have been implemented since the 2016/17 academic year. Ongoing monitoring is performed of these programmes to determine improvements to classes and the improvement of student competencies, and in 2019/20, some minor amendments were proposed, and these were implemented int he 2021/21 academic year. Students were involved in the proposal and adoption procedures (ev. 0_0_0_24) via the Committee for coursework and the Council of the Department of Geography.

2a.3

Changes to integrated study programmes.

The Recommendation of the Committee for AZVO concerning the changes to the integrated study programmes (5 + 0) and introduction of separate undergraduate and graduate study programmes (3 + 2) have not yet been implemented. However, preparations of documentation are underway for multiple study programme expected to undergo accreditation in the forthcoming period. A proposal of the study programme in Physics Education based on the 3 + 2 model at the Department of Physics is currently under consideration (ev. 0_0_0_26).

Recommendation 2b

Mobility: In order to encourage student participation in mobility programmes, it is necessary to improve the practice of recognising ECTS credits achieved abroad, e.g., within the Erasmus programme. Field courses and study trips should be financed, so that no students find themselves in a position that they cannot afford to participate.

2b.1 *Recognise competencies gained through mobility.*	Students participating in mobility programmes sign the Learning Agreement (ev. 0_0_0_27) before their departure, which ensures that the competencies and ECTS credits acquired in the programmes attended by students in exchange programmes will be recognised. This is conducted regularly at the start of the semester, and is the responsibility of the ECTS coordinator and Office for international cooperation and monitoring projects. The recognition of internships or traineeships is achieved through the *Learning Agreement for Student Practice or Traineeships* (ev. 0_0_0_28) which clearly lists the traineeship programme. If the traineeship is not an integral part of the study programme, the home institution will enter the information about the performed traineeship into the additional study document. At the host institution, Study practice and traineeships are secured through the Erasmus programme (ev. 0_0_0_29). Students are able to transfer between related study programmes, with the recognition of a certain number of passed courses by the second programme. The criteria for transfer from a related study programme to a corresponding study programme at PMF are defined by the individual departments, and published before the start of the academic year. In line with the Ordinance on undergraduate and graduate studies at the Faculty of Science, University of Zagreb (hereinafter: Ordinance on studies), see Art. 16, 17 and 18, the department committees or working bodies determine the differential subjects that must be taken upon transfer. The transfer from related study programmes is described in detail in Standard 3.1.
2b.2 *Financing field courses.*	Within certain study programme and individual courses, field courses are planned. At the session of the Faculty Council, the Decision on the maximum participation of students of the Departments of Biology, Geography, Geology and Geophysics in the costs of field courses (ev. 0_0_0_30) is adopted. The decision on addition support for students via the departments is adopted by the department collegium or council (ev. 0_0_0_31).

Recommendation 2c

Examinations: In line with the Faculty ordinances, the departments may rationalise the number of examinations in order to reduce the work load for students, lecturers or examiners. For example, consideration should be given to less frequent examinations in each individual course, with sufficient space between exam periods, once the student has had enough time to properly master the knowledge. The faculty should establish, publish and conduct clear and consistent ordinances on examinations at the undergraduate and graduate levels, that would be valid for all departments. The department committees for teaching must ensure regular assessments of the quality, reliability and difficulty of all examinations, and repeated questions, which would be the task of experienced lecturers who at that time are not teaching in that specific course.

2c.1

Rationalise examinations and regulate the execution of exams.

In accordance with the Act on Scientific Activities and Higher Education (see. Art. 79) (OG 123/03 to 131/17) (hereinafter Science Act) and the Ordinance on studies (see Art. 23), at the start of the year, lecturers familiarise students with the implementation plan, midterm and/or examination schedule, and manner of executing midterms and examinations. Lecturers give students information about the learning outcomes by which they will be graded.

The Ordinance (Art. 27) regulates the procedures for conducting examinations of all courses in undergraduate, graduate, and integrated undergraduate and graduate study programmes. Compliance with the provisions of the Ordinance is supervised by the Vice-dean for teaching, and the department committees for teaching. Students have the right to view their test results, and if necessary, to consult with the lecturer on other issues concerning their advancement of studies, as regulated in the Science Act (OG 123/03 to 113/17), see Art. 82. Ordinance on graduate work and graduate exams, and baccalaureate and graduate work and the final/graduate examination are adopted by the departments (URL 0_2_2).

In executing examinations, it is important to ensure that evaluations are conducted consistently and justly for all students, in accordance with the relevant regulations. The Committee for teaching does not conduct quantitative and qualitative analysis of the content of all executed examinations, as the number and structure of those sitting the exam changes significantly with each exam period. However, the difficulty of examinations is examined comprehensively if a study lodges an appeal against their grade. Every fourth and eighth sitting of an examination is taken before a committee that assesses all parts of the examination, thereby ensuring objectivity and in part assessing difficulty. The reliability of the examination is visible in the competencies for the further

continuation of studies. Considering the importance of specific outcomes for acquiring the fundamental competencies, the questions that examine those outcomes are considered anchors and are repeated.

In line with the recommendations, the Committee AZVO conducts testing in certain subjects in a manner that the exam and/or midterm periods do not overlap between departments, thereby enabling students to have unhindered access to examinations. However, students are still enabled a greater selection of exam periods, and they independently select the period in which they wish to sit the exam. For subjects in which knowledge and skills are assessed continuously, students have the further option of being exempted from a part of the exam, or in its entirety, which is regulated by the implementation plan of the course in question (URL_0_2_3).

3. STUDENTS

Recommendation 3a

Doctoral studies: Reduce the deadline for the completion of studies from six years to four years, which should be adopted as soon as possible, and all interested persons notified. It is recommended that one person who is not from the department be present at every doctoral dissertation defence, and should have the right to vote and submit a short, written report to the dean. In order to reduce the burden of students, teachers and departments, it is necessary to develop a culture in which the standard is to compile a cumulative doctoral dissertation (consisting of several published papers) in English, instead of a monograph in Croatia. Where such dissertations are impractical, then it is necessary to remove barriers for the adoption of this model.

3a.1

Reduce the duration of studies and obligations of doctoral candidates.

The duration of the doctoral studies is regulated by the Ordinance on doctoral studies at the Faculty of Science, University of Zagreb (hereinafter: Doctoral ordinance) (URL 0_3_1) see Art. 9, and the Ordinance on doctoral studies at the University of Zagreb, see Art. 8 (URL 0_3_2). The minimum conditions for the organisation and execution of doctoral studies at all constituents of the University of Zagreb are laid down by university ordinances, and a specific unit offering the study programme may issue an act prescribing stricter conditions (Art. 1, para. 2 of the said Ordinance). Accordingly, postgraduate doctoral university studies last for a minimum of three years, and upon fulfilling all the prescribed conditions and public defence of the doctoral dissertation, the academic title of doctor of science (DSc or PhD) is attained. The duration of doctoral studies is also regulated in the competition pursuant to which the candidates enrol in the programme, such

as the CSF competitions for doctoral candidates as part of the "Project for career development of young researchers – education of new doctors of science", in which the time period for completion of the doctoral studies is listed as four years.

In order to reduce the workload of students in doctoral studies and for teachers of the faculty, the new Doctoral ordinance (Art. 16) has enabled the Scandinavian model of the doctoral dissertation, which applies the proposed conditions (Art. 14, para 2 of the Ordinance on doctoral studies at the University of Zagreb). More precisely, it is prescribed that the Scandinavian model of a doctoral dissertation must contain at least three published papers indexed in the Web of Science, Scopus or ERIH. For example, at the Department of Biology, about 10 cumulative doctoral dissertations in either English or Croatian have already been defended. The defence of the dissertation is performed before a committee in accordance with the above listed legal acts. The committee consists of three or five members, in which at least one member may not be an employee of the Faculty. The supervisor may not be a member of the committee, except in exceptional situations, with the consent of the Council for doctoral studies.

Recommendation 3b

Presentation of research results: It is necessary to establish a mechanism that would ensure that every doctoral candidate has the opportunity to present the results of their work to the international public, if possible abroad, at least once during their studies. Furthermore, it is necessary to introduce an annual "student event" at every department. This can be a one-day conference in which each doctoral candidate at the department outlines the progress achieved in their doctoral research and preparation of their dissertation.

3b.1

Support for the presentation of research results of doctoral candidates.

Presenting the results of the doctoral candidate's research at an international conference is still mostly achieved through approved funds of national and international projects. Due to a lack of funds from the domestic budget, doctoral candidates are encouraged to present their work through participation at international conferences organised by the Faculty, like the Solid-State Science & Research (SCIRES), Computational Chemistry Day, Extreme Value Analysis, 7th European Phycological Congress (EPC7). At departments, a special decision is passed to award monetary support for doctoral candidates and postgraduate students to attend scientific conferences. The possibilities are determined based on the available funds from the previous academic year, and the expected revenues and expenditures in the current year (ev. 0_0_0_32).

In line with the recommendations of the Committee for AZVO concerning holding the annual student event, the first scientific conference of doctoral candidates in doctoral studies at the Faculty was held during the 2015/16 academic year. The doctoral candidate symposium has since been established as a regular practice, and is held once a year (URL 0_3_3). The symposium is organised by the heads of doctoral studies, enabling the exchange of experiences among candidates. Participation at the symposium can also be awarded with ECTS credits, pursuant to the decision of the competent councils of doctoral studies. Within the doctoral candidates' symposium, lectures are also held, outlined examples of good practice of achieving a career in industry, and in start-up companies (Genos, Rimac automobili, etc.).

Recommendation 3c

Alumni: Departments should further improve cooperation with scientific organisations in Croatia and abroad, the academic community and industry, by creating an electronic database of former students that would be kept at the Faculty level.

3c.1

Establish alumni organisations.

With the application of the project *Implementation and improvement of traineeships at PMF* (*ProSPer* PMF), activities started to establish contacts with former students. For that purpose, the Alumni Office was recently established (ev. 0_0_0_33) with the aim of connecting former students and forming a network, and to create lasting ties of alumni with the Faculty, teachers, current students and entrepreneurs in Croatia and abroad. Alumni are additionally included in certain departments (see Standards 1.1.2 and 1.6.2). Contact with former students is performed via professional organisations, whose activities unfold within the Faculty. Informal communications take place via social media. The Facebook profile was created in March 2014, Twitter in May 2019, and the Faculty is also active on Instagram and LinkedIn, and has a YouTube channel.

Recommendation 3d

Website: The effectiveness of the Faculty website should be considered and user experiences analysed. Multiple members of the expert committee warned of difficulties in finding information, or expressed the impression that the website does not give a realistic or attractive image of the Faculty.

3d.1

Develop the Faculty website and ensured ongoing visibility.

Work to redesign and develop the Faculty website started in the 2018/19 academic year, with the aim of modernising the site and improving the information it provides and its attractiveness. The new website is markedly improved in comparison to the former site, and is more user-friendly. The new dynamic design has made it possible to completely synchronise the website with the ISVU. The Faculty has hired a journalist as a senior public relations officer, and she was also included in the process to conceive and develop content for the website. The content on the Faculty and department website is continually updated, and this is a permanent task, with administrators appointed for each department.

The Faculty is also active on social media, where it achieves:

- Faster communications and interactions with students
- Exchange of information
- Connections with alumni
- Access to content needed for independent learning
- Connections with other universities, organisations and partners.

4. LECTURERS

Recommendation 4a

Recruitment: In order to mitigate the consequences of a lack of work posts for younger employees, the existing retirement policy must be consistently and rigorously implemented once criteria are fulfilled. The Faculty needs to ensure transparent recruitment and advancements by including at least one external (from another department) member of each committee who is not in a conflict of interest, in the role of an observer. This member would be entrusted with preparing a written report to the dean on the conducted procedure, and ensuring the abidance of ethical standards regarding, for example, conflicts of interest and discrimination. Further, the membership of department committees for recruitment and advancements should be regularly alternated. An appropriate policy, for example, is that no employee may be a committee member for more than two of five consecutive employments or advancements. Guielines should be drawn up to determine the minimum acceptable international experience in the recruitment of professors.

4a.1

Transparently conduct recruitment and promotions to higher ranks.

In most cases, employees enter into retirement at 65 years of age, except in cases where there is a need for holding lectures or in the case of completion of scientific projects for which they are responsible (ev. 0_0_0_34). All procedures and decisions are executed in accordance with Art. 68 of the Act on Scientific Activity and Higher Education (OG 123/03 to 113/17).

Assessment of the quality of scientific research work is conducted in accordance with the Decision on the necessary conditions for assessing teaching and expert activities in the appointment procedure for scientific-teaching ranks (hereinafter: Decision of the Rector's Council) (OG 106/06, 122/17), Ordinance on the conditions and procedure for appointments to ranks at the Faculty of Science, University of Zagreb (hereinafter: Ordinance on conditions and procedure for appointment to ranks) URL 0_3_4. Certain departments have also adopted department ordinances that regular additional requirements for appointments to ranks (ev. 0_0_0_35). The minimum international experience is defined by the Decision of the Rector's Council. However, even though this is not a binding condition, "adequate international experience" is sought at the Faculty, in accordance with the Ordinance on conditions and procedure for appointments to ranks. In the appointment procedure for scientific-teaching ranks and the corresponding work post, the members of the Expert Committee must have the same or higher scientific-teaching rank, in relation to the rank under appointment. Committee members are regularly alternated, depending on the procedure for appointment into the appropriate rank and work post. The Committee may have, at most, two-thirds employees of the Faculty,

in accordance with Art. 83 of the Faculty Statute, and one member must be an external member.

The Expert committee assesses whether the applicants meeting the conditions for appointment to the rank and work post, taking into consideration all relevant aspects of the applicant's activity, and compiles a report and proposal confirming which applicant(s) are proposed for appointment to the rank according to the competition. The Decision on appointment to the rank and work post of the competition is passed by the Faculty Council in a secret ballot. Every scientific-teaching rank is further confirmed by the Council of the field or Senate of the University of Zagreb, within which is the Committee for establishment of criteria and confirmation of appointments to ranks.

Every year, the Human Resources management plan is aligned with the financial plan for the current year (ev. 0_0_0_36). The plan assesses the need for new work posts that would reduce deficient personnel capacities, employments into the appropriate scientific-teaching, associate and administrative and technical work posts.

Recommendation 4b

Course load: The coarse loads of assistants (junior researchers and researchers) must enable flexibility to not jeopardise their research work. This is important in all phases of the doctoral study, and key during the time of writing the dissertation. The Committee for teaching must enable all professors to have greater flexibility in taking a sabbatical year – for example that they can use one semester in seven years, instead of the whole year. The Faculty must also ensure that all teachers can count on reductions to their course load in periods of greater scientific or administrative workloads.

4b.1

Enable greater flexibility in the course load of teaching staff.

Information on the obligations of teaching staff is regularly collected with the aim of aligning their workloads with the standards prescribed in the Ordinance on the basis of financing higher education at public higher education institutions (OG 25/96). With the entry into effect of the new collective agreement from the 2019/20 academic year, a more flexible work standard was formally made possible for employees, see Art. 70 of the Collective Agreement. The Faculty particularly considers the workload of junior researchers so as to not jeopardize their research work (ev. 0_0_0_37).

In line with the Ordinance of the Faculty of Science, University of Zagreb on the use of a free study year (sabbatical) (hereinafter: Ordinance on sabbatical), the employee attains the right to a paid free study year on the basis of the labour contract,

once every seven years. According to the interpretation of the Collective Agreement, the sabbatical year is approved for the duration of one year, and the employee may choose to use a shorter period than one year in the approved free study year.

Recommendation 4c

Career: All employees should regularly write a self-assessment, and have the opportunity (e.g., once in two years) to discuss their career goals with their superiors.

4c.1

Career development and information about available professional training.

All employees may discuss their career goals with their direct superiors. For scientific-teaching staff, the goals are tied to their scientific and expert projects, within which the goals are defined in the application, and the project leader or chief investigator submits a report on the achieved activities on an annual basis. During that process, there is the opportunity to give feedback on achieved progress. Further, the goals defined in the strategic document of the Faculty, in accordance with the chain of responsibility, and feedback on these goals is also received. A positive assessment of the scientific activity plan is one of the additional criteria when applying for an appointment to a scientific-teaching rank, which is regulated by a special ordinance at specific departments.

Since 2009, the Office for international cooperation and project monitoring has been in place at the Faculty, and this office continually improves the quality of the Faculty's international relations, and provides administrative support to teachers in the organisation of mobility. Via the office and department assistant heads or coordinators for international cooperation, teachers are regularly informed about the possibilities for mobility. All notifications are clearly listed on the Faculty website, with detailed information on mobility in this period described in Standard 1.6.2a.

5. SCIENTIFIC AND EXPERT ACTIVITIES

In the context of deficient state financing, the Faculty and its departments have to think carefully about their internal organisation, and the organisation of external associates, in order to implement the highest possible number of international studies with the funds available. In terms of future plans, it is necessary to secure initial function and share knowledge of how to increase the use of non-traditional sources of financing, including European competitions. With Recommendation 1a, the Expert committee proposes:

Recommendation 5a

External financing: A special working group should develop an innovative and ambitious strategy for the development of a broad spectrum of non-traditional sources of financing, such as alumni, industry, sponsorships, donations, private companies and foreign private foundations. Furthermore, the Faculty should encourage postgraduate researchers to apply for scientific projects, and to enable them to do so.

5a.1 *Systematic support for scientific work.*	In order to provide support for scientific work and achieve the goals and activities of the strategic programme for scientific research *SciStrat* (see Standard 1.2.1a), activities have been launched to optimise the work of the expert services. Education of expert services has begun, with an emphasis on education in the application of new legislation, improving competencies concerning the administration of complex scientific and development projects, and competencies in the application of new computer tools for office operations and network communications. The Office for international cooperation and project monitoring has been reorganised, and a competition opened for a new expert associate due to the needs of more active work on project applications and monitoring. A team to assist in managing expert projects has also been formed (see further in Section V and the analytical appendix of Table 5.3).
5a.2 *Financing.*	In accordance with the financial opportunities, there is an individual approach to requests for initial support in project applications and implementation, which is decided at the department level. The departments also participate in financing all indirect costs incurred due to project implementation (ev. 0_0_0_38). The Faculty secures a portion of the funds on the basis of non-traditional financing sources obtained from business entities from a range of sectors. Each year, some 15 to 20 cooperation agreements are concluded on the basis of sponsorship contracts and donations, as outlined on the Faculty website. Large companies, as well as small and medium enterprises, are involved, and the structure of activities of sponsors and donors is connected to those professions the Faculty sends to the labour market, or whose

products or services are tied to the scientific and expert activities of the Faculty. The obtained funds are then invested in the organisation of scientific and expert conferences, and for the procurement of content used by students. The Botanical Garden is financed in part from the budget of the City of Zagreb, and recently the project to construct the *Shaded Tunnel* in the Botanical Garden was completed.

Further, the Faculty encourages postdoctoral researchers to apply for international or bilateral scientific projects, though there are few such projects (ev. 0_0_0_39). At the national level, there are no opportunities for postdoctoral fellows to apply for projects.

6. INTERNATIONAL COOPERATION AND MOBILITY

The general issues of Faculty internationalisation overlap with the historical fact of Croatia's recent accession to the European Union, and all the consequences it brings, both expected and unexpected. An additional element that affects a massive portion of the scientific work at the Faculty, is that publication is almost exclusively in a "foreign" language – English. This is true the world over. The general impression is that this is a strong academic community, with dedicated members who react to the new reality of international scientific-teaching work. If the teachers and scientists of the Faculty will be able to quickly and agilely react to these challenges, they will turn them into opportunities. In referring to these unavoidable truths, the Expert committee recommends:

Recommendation 6a

European Union funds: There is an entire series of European Union programmes that deserve to take a more prominent place in the Faculty's plans. The faculty should encourage applications to competitions in all sectors of the Horizon 2020 programme, including the European Research Council. Overhead funds from existing Horizon 2020 projects may be invested in improving the position of the Faculty in future competitions. PMF needs to take steps within the University, and at the national level, to ensure that a substantial portion of the European Union Structural funds are invested into science and innovation within the Faculty, particularly for large projects, such as constructing infrastructure. It is possible to proactively improve the participation of the Faculty in European Union mobility programmes, such as Marie Sklodowska-Curie and Erasmus. Further encouragement is needed for visits to foreign higher education institutions, for one or two semesters, as a usual part of regular study. Further steps could include the application of Faculty employees as experts on the Horizon 2020 programme expert sites. The participation of all Faculty scientists in evaluations of the European Union should be monitored. Scientists who work as evaluators should be put on the list of speakers at events organised by PMF for the purpose of sharing their experiences with their colleagues. It is necessary to verify whether PMF professors are applying as reviewers in European Union competitions and the competitions of other international organisations, since this will assist them in the further understanding of the process and procedure of approving grants and projects.

6a.1

Encourage applications for international projects.

In line with the *SciStrat* strategy, applications to international project competitions and EU funds are encouraged, in order to build a contemporary and advanced scientific infrastructure, and to ensure greater, long-term international competitiveness and recognisability. In this period, the implementation of two large projects has been contracted: *CeNIKS* and *CiUK* (see Standard 1.2.1), financed from the European Fund for Regional Development, and one project ***QuantiXLie*** financed from the European structural and investment funds.

The scientific and development activities predominantly financed through international funds pertain to the project ***HORIZON 2020***, with two prestigious projects of the *European Research Council* (ERC), and via the ERASMUS+ projects, the project *Tenure Track Pilot Programme* and projects financed by the *Swiss National Science Foundation*, one project by the *International Centre for Genetic Engineering and Biotechnology* (ICGEB), and one project by the *International Atomic Energy Agency* (IAEA). Details on these projects are available on the Faculty website, and they are described in Section V.

The Centre for the development, application and transfer of biological research – ***BIOCRIPT***, was applied for in 2019 to the Call for the submission of project applications "Preparation of IRI infrastructure projects" within the Operational programme Competitiveness and Cohesion for the period 2014–2020. A positive decision on its financing was obtained in 2021 (ev. 0_0_0_40). Within the same Call, the Faculty, in cooperation with other institutes and faculties of the University of Zagreb, participated in the preparation of documentation for establishment of the *Centre for advanced materials and nanotechnology* - ***C2AMN***, and the financing contracting is currently in procedure (ev. 0_0_0_41).

With the aim of encouraging scientists to apply for prestigious projects of the European Research Council (ERC), a Decision of the Department of Mathematics was adopted in October 2019, which lays down the requirements for obtaining financial support for those applying for ERC projects (ev. 0_0_0_42).

The scientists of nearly all Faculty departments participate in the evaluations of international projects, though this information is not systematically collected (ev. 0_0_0_43)

6a.2

Faculty participation in European Union mobility programmes.

The participation of Faculty scientists in European Union mobility programmes, such as Marie Sklodowska-Curie (ev. 0_0_0_44) and Erasmus is described in detail in Sections IV and V. Within the Erasmus+ programme (with 70 currently active contracts), the constant growth of international mobility has been made possible. In the preceding five-year period, this accounts for a total increase of 38%. On average, teaching and non-teaching staff achieve about 1000 mobilities each year, usually of shorter duration.

Recommendation 6b

Science Office: The Faculty should provide administrative support for in-house scientific work. It should be aimed at providing assistance to Faculty scientists to effectively prepare and administer research grants. Such an office must possess expertise in both financial and legal matters. Office employees should actively look for application opportunities, local success stories and best practices and inform all Faculty staff about them. The establishment of an information and liaison office for European Union research programmes, which would also have a permanent representation in Brussels, would assist in benefiting from the opportunities provided by Horizon 2020.

6b.1

Continuous administrative support for scientific work.

Over the past period, the Faculty Management Board and the Dean's Office have supported various activities related to the application, implementation, reporting and external evaluation of scientific projects through the Office for International Relations and Project Monitoring and Projects Office of the Physics Department. Efforts are also made to establish adequately resourced offices for supporting project managers at other departments as well. The Faculty regularly informs all interested parties about the opportunities for project applications and best practices, and calls for project proposals related to EU funding are published on the Faculty website.

The practice of holding a kick-off meeting (ev. 0_0_0_45) at the beginning of each major project, in particular EU-funded projects, was introduced. On that occasion, the project manager and administrative staff are briefed on the possibilities and procedures for recruiting project associates, simple public procurement procedures, protocols for communication between department services and the Dean's Office regarding project documentation, and specific procedures, tasks and responsibilities for that project are established.

The Argosy programme was procured at the end of 2017 and it was fully implemented in March 2018. It computerised the Procurement Office and enabled up-to-date monitoring of procurement at the level of the entire Faculty and hence better

planning of future needs, especially in light of the implementation of the new Public Procurement Act (OG 120/16). Besides the implementation of the Argosy information system, experts from the LAUS company held a series of workshops for Faculty and department professional services (ev. 0_0_0_46).

In order to encourage scientists to apply for prestigious projects of the European Research Council (ERC), in October 2019 the Department of Mathematics adopted the Decision laying down the conditions for granting financial support to applicants for ERC projects (ev. 0_0_0_42).

Recommendation 6c

Language: Further adopt the recruitment process to the international context by alleviating the requirement of the knowledge of Croatian, so that the ability to teach and perform administrative tasks in Croatian is expected after several years of work, instead of being a prerequisite for applying to a competition. The University should be encouraged to improve the offer of foreign language content and create a welcoming atmosphere and culture for immigrant scientists at the Faculty. At the time of graduation, students should be required to have a higher level of English language proficiency. Each department should develop and promote at least one whole course that is conducted entirely in a foreign language, mostly in English. The Faculty should step up the efforts for informal recruitment of international scientists living outside of Croatia with potential of becoming future science leaders at the Faculty, and inform them of vacancies, which should generally be more widely promoted.

6c.1

Knowledge of Croatian for employment.

Job vacancies are published on the European portal EURAXESS, which informs the international academic community about advertised jobs. Knowledge of the **Croatian language** is a prerequisite in all announced competitions for selection to scientific-teaching grades (ranks), since all study programs have so far been accredited for teaching in Croatian. Knowledge of Croatian is not a compulsory requirement for employing associates on international projects (ev. 0_0_0_47).

In the context of increasing internationalization of studies and business, continuous efforts are made to improve the level of language and communication competencies of non-teaching staff in English, in particular for employees who come into direct contact with foreign students or documents in a foreign language. A positive practice of organizing English language courses for non-teaching staff has been initiated (ev. 0_0_0_48).

6c.2

Improving the offer of foreign language content.

In order to improve the quality of information available on the Faculty's website, a decision was made to adapt the website content to the international context and increase the amount of informative content in English, in particular on study programmes and scientific and professional work at the Faculty. The competition for enrolment to postgraduate doctoral studies is also published in English in order to encourage the internationalization of these studies.

6c.3

Teaching in English.

Internationalisation of studies at the Faculty was initiated under the two-year project *Development of International Graduate University Biomedical Mathematics Study - BioMedMath*, with the development of the graduate biomedical mathematics study programme in English. Besides the Faculty scientific-teaching staff, the Young Gifted Mathematicians "Marin Getaldić" Association and a number of scientists from the Ruđer Bošković Institute and Medical Faculty of the University of Zagreb (ev. 0_0_0_49) were also involved in the project. In September 2020, a promotional film was made. The study programme is currently being evaluated in accordance with the Ordinance of the University of Zagreb.

Faculty students can also enrol in the two-year graduate study programme Bioindustrial Techniques within the mobility programme "Bioindustrial Techniques" which is jointly delivered by the University of Orleans, France, and the University of Zagreb (ev. 0_0_0_50). Classes are held in both English and Croatian, and after completing studies in Orleans students receive a diploma and the academic title of Master of Biochemistry, Molecular Biology and Biotechnology, and upon completion of studies in Zagreb a diploma and the academic title of Master of molecular biology. The first generation of students within the mobility programme was enrolled in 2015/16 academic year. Over the previous period, all the necessary preliminary work was done for the introduction of the undergraduate university study programme Molecular Biology in English.

Designating one subject in each study programme to be conducted exclusively in a foreign language is not possible according to legal acts as all Faculty study programmes are accredited to be carried out in Croatian. Teaching in English is regulated for certain subjects (ev. 0_0_0_51), but classes for these subjects, according to legal acts, must also be provided in Croatian, which then further increases teacher workload. For those subjects, students can choose the language of instruction.

The literature for almost all study programme courses is partly in

	English and in this way, students are required to possess a sufficiently high level of proficiency in English. This is in particular related to higher levels of study programmes where students also use original scientific articles in English. An appropriate language level is also stipulated in the rules of the Erasmus + student mobility competition for student practice and traineeships. In this case, there is also a possibility to write a graduate thesis or doctoral dissertation in English.
6c.4 *Increasing scientific visibility by hiring top scientists with successful international careers.*	The Faculty is aware of the need to develop human scientific potentials in order to be able to keep up with global development of science in the long run. Therefore, the recommendation to integrate eminent international scientists living abroad was addressed and the Faculty requested more work posts for such returning scientists (ev. 0_0_0_52). The implementation of this recommendation partially depends on the Ministry of Science and Education and their possibility to create jobs, and in part on the Faculty, which should create appropriate preconditions for their integration.

Recommendation 6d

ERA: To organize applications for ERA Chairs competitions under Horizon 2020 in order to achieve excellence by attracting foreign scientists

6d.1 *Support for applying to ERA Chairs competitions.*	In September 2017, the Faculty submitted an application for the highly competitive ERA Chairs competition (ev. 0_0_0_53) with the aim of improving both human and technical capacities of the Faculty in the field of computer science and numerical mathematics, with special emphasis on machine learning. Evaluation of the application ended in February 2018, and the project proposal was not selected for funding. Further work on the development of this project proposal has been temporarily suspended.

7. EXPERT SERVICES, FACILITIES, EQUIPMENT AND FINANCES

A new Biology, Geology and Geography building on the North Campus, currently in the design phase, is essential for further activities of the Faculty. Raising funds for its construction presents an undeniable challenge. However, this challenge also presents an opportunity to enhance the Faculty's engagement with alumni, decision makers, media and industry partners, and other institutions. In order to push for its construction, the expert committee considers it necessary to launch a new, promotional initiative aimed at engaging a wide range of external stakeholders. The Faculty is able to tell an impressive story about the inadequacy of the existing buildings and all opportunities that the construction of a new one would create.

Recommendation 7a

New Building: Academic staff at all levels, and especially those in positions, must make the utmost efforts to convey the desperate and urgent need for an adequate complex for the Departments of Biology, Geology, and Geography in the North Campus area. The urgency of this request should be elaborated and communicated as part of a separate, persistent communication campaign involving the Faculty and all its departments, University, scientific associations, alumni, industry, as well as city and state authorities. The new building also underlines the need to provide accommodation facilities next to the North Campus for new students, and for visiting teachers and scholars. Public-private partnership models can also be explored to drum up financial support.

7a.1

The effort to obtain all the prerequisites for the construction of the BGG complex.

The construction of new buildings on the North Campus was planned many years ago and is a part of the strategic plan for spatial and functional development of the Faculty. Deans, Vice-deans for investments and construction, and department heads of the Biology, Geography and Geology have continuously strived to ensure all the necessary pre-conditions are in place for the construction of what will be called the BGG complex. Most issues were related to resolving property and legal relations and obtaining a location permit (ev. 0_0_0_54), which was finally achieved after development of the conceptual design. A spatial analysis was also conducted, including conceptual architectural design solutions, on the basis of which special conditions for the reconstruction and extension of the building of the Department of Geophysics were established. In this way, the preconditions for spatial development and consolidating all capacities at the Faculty on the campus in Horvatovac were created.

Dialogue was also initiated with the Ministry of Science and Education to obtain financial support for the construction of the complex after the devastating earthquake in March 2020, and a memorandum was sent for the construction of the building of the Biology, Geography and Geology Departments of the Faculty. The earthquake that struck Zagreb and the surrounding areas in 2020

has damaged all the buildings in which the Faculty operates. The damage, estimated at approximately HRK 20 million, directly affects the scientific, teaching and professional activities of the Faculty. In order to enable timely and safe work in the academic year 2020/2021, the Faculty staff decided to launch a charity action to raise funds for the repair of earthquake damage. The Faculty has published a promotional video "For our PMF" which invites all alumni, companies and friends of the Faculty to donate.

Recommendation 7b

Maintenance: The Faculty should provide sufficient appropriations for the maintenance of scientific equipment, for example, by allowing the recovery part of the funds for equipment repairs.

7b.1

Providing funds for the maintenance of scientific equipment.

The existing resources, laboratories and other premises intended for the performance of teaching and scientific activities are continuously maintained and upgraded in line with financial means and on the basis of public procurement tenders. Funds for the maintenance of scientific equipment are partly provided from department funds, but they are still mostly provided from existing scientific projects.

The departments also apply to the public invitation of the Ministry of Science and Education for financing repairs, maintenance and upgrades of scientific research equipment which is registered in the Šestar database, and upon adopting a decision, certain funds are allocated for this purpose. For further information on equipment see Topic IV, standard 4.4., Table 4.9.

I. INTERNAL QUALITY ASSURANCE AND THE SOCIAL ROLE OF THE HIGHER EDUCATION INSTITUTION (ESG1.1., ESG1.7., ESG1.8)

1.1. THE HIGHER EDUCATION INSTITUTION HAS ESTABLISHED A FUNCTIONAL INTERNAL QUALITY ASSURANCE SYSTEM

1.1.1.

Internal quality assurance system includes and evaluates all activities of the higher education institution (study programmes, teaching process, student support, support to students from under-represented and vulnerable groups, learning resources, scientific/artistic activity, professional activity, etc.) and provides underlying documentation.

The Faculty of Science, University of Zagreb (hereinafter: the Faculty) has established a functional quality assurance system that includes and evaluates the entire operation and all activities of the Faculty. Quality assurance and improvement procedures are aligned with the basic national legal acts, the *Act on Scientific Activities and Higher Education* (OG 123/03 to 113/17) and Act on Quality Assurance in Science and Higher Education (OG 45/09), regulations aligned with the *Quality Assurance Standards and Guidelines in the European Higher Education Area 2015* (hereinafter: ESG Guidelines), general acts of the University of Zagreb, as well as European, national and university strategies. *The Quality assurance policy of the Faculty of Science, University of Zagreb* (hereinafter: Quality Policy) lays down the principles for establishing the system, methods and organisation of the quality assurance system (ev. 1_1_1_1).

Fostering excellence in all activity fields of the Faculty is in line with the mission and vision and the *Development Strategy of the Faculty of Science of the University of Zagreb for the period 2015–2020* (hereinafter: PMF Strategy), which defines the basic strategic goals: 1. Improving the quality of teaching and promoting the importance of the educational process, 2. Improving the quality of scientific research, 3. Improving the quality of academic work, transfer of knowledge and technology, 4. Improving infrastructure, organisation and management and the self-control systems, and 5. Increasing the influence on the development of society as a whole, and accepting social responsibility (ev. 1_1_1_2).

Other legal acts and documents of the Faculty relevant for the quality insurance system are:

- Statute of the Faculty of Science, University of Zagreb
- Ordinance on quality assurance at the Faculty of Science, University of Zagreb
- Rules of procedures for the Faculty Council
- Strategic programme for scientific research from 2018 to 2023

- Ordinance on undergraduate and graduate studies at the Faculty of Science, University of Zagreb
- Ordinance on doctoral studies at the Faculty of Science, University of Zagreb
- other Faculty documents and regulations
- other general acts of the Faculty

The new *Ordinance on quality assurance at the Faculty of Science, University of Zagreb* (hereinafter: Ordinance on quality) lays down the fields of quality assurance and is aligned with the Ordinance on the Quality Assurance System at the University of Zagreb and the 2015 ESG standards. These standards relate to quality assurance policy, preparation and approval of study programmes, student-oriented learning, enrolment and advancement of students, recognition and certification, teaching staff, learning resources and student support, information management, public information, continuous monitoring and periodic review of study programmes, periodic external quality assurance, scientific research and expert activity and mobility, international cooperation, and internationalisation (ev. 1_1_1_3).

1.1.2.

Internal quality assurance system seeks to involve all stakeholders of the higher education institution (students and external stakeholders, employers, alumni, representatives of professional organisations, civil society organisations and internal stakeholders).

Internal quality assurance system actively involves all stakeholders with the aim of achieving progress in all areas of Faculty activity, as well as improve activities that contribute to economic and social development in line with the strategic development goals of both the Faculty and University. The establishment and operation of quality assurance systems is supported by the management, departments and other organisational units, and all staff and students in assuming quality assurance responsibilities, preventing socially unacceptable forms of intolerance and preserving academic integrity and freedom.

Quality improvement and assurance tasks are conducted at the leadership and decision-making, advisory, supervisory and operative levels. Bodies responsible for quality assurance at the leadership and decision-making level are the Dean, Faculty Collegium and Council, at the advisory level the Faculty committees and boards, and at the operative level department heads, department councils and heads of Faculty and department administrative and professional services.

The composition, operating procedures and other issues relevant for the work of the Quality Management Committee are further specified by the Ordinance on quality. In addition to employee representatives from each Faculty department chosen from among the ranks of employees appointed to

scientific-teaching grades (ranks), a student representative, representative of the administrative and technical staff and an external stakeholder also participate in the work of the Committee (see Article 12 of the *Ordinance*). Student representatives are also involved in work and decision-making at the level of the Faculty Council (ev. 1_1_2_1), department councils and other committees (ev. 1_1_2_2).

External stakeholders and other representatives of professional associations are involved in the quality assurance system by participating in public debates and consultation prior to the adoption of important internal legal acts and strategic documents, public discussions with employees, debates and roundtables as well as via Career Centre, within which the *Alumni Collaboration Service* has recently been established. Employers and alumni are involved in reviewing the exit competences acquired through study programmes, both in case of minor, major and substantial modifications, and in the implementation of the Croatian Qualifications Framework. The involvement of alumni which operates within certain departments, such as Department of Mathematics (alumni_math) or Department of Biology (alumni_biol), also contributes to the development of the Faculty.

1.1.3.

The higher education institution adopted a quality assurance policy, which is a part of its strategic management and is achieved through the implementation of the strategy, including the strategic research agenda, involving a period of at least five years.

Upon a proposal of the Quality Management Committee, the Faculty Council adopted the Quality Assurance Policy at the Faculty of Science of the University of Zagreb, which is a part of strategic management of the Faculty and is achieved through the implementation of the *Development Strategy of The Faculty of Science of the University of Zagreb for the period 2015–2020*, as well as *Strategic programme for scientific research from 2018 to 2023*.

In addition to these documents, the Dean's *work programmes* are also an important starting point for improving the quality assurance system (ev. 1_1_3_1). The programmes are aimed at continuous improvement of science and education in the STEM field, including geography, as well as initiating and actively participating in all positive social processes related to science and education, and consistently promoting high academic and universal human values.

1.1.4.

The implementation of the strategy includes SWOT or similar analysis, strategic goals, programme contract goals (where applicable),

The Development Strategy of the Faculty defines areas of strategic work and activities and highlights all elements of *SWOT analysis* that could affect their performance. The activities covered by the strategic documents are continuously monitored and presented in the *annual reports on teaching, scientific and professional work and other activities at the Faculty of Science* (hereinafter: annual reports of the Faculty) which represent quality indicators for the entire Faculty (URL 1_1_4_1).

operational plan, defined responsibilities for implementation, monitoring mechanisms and the report on its implementation. The stakeholders recognize the strategy as an effective tool for improvement.

Effective management and adequate measures are aimed at overcoming weaknesses, mitigating threats and using opportunities to further develop and fulfil the mission and vision of the Faculty as a leading institution for scientific and educational work and expertise in the fields of natural sciences and mathematics that will be able to respond to the forthcoming challenges and needs of society.

Business analysis of the Faculty of Science, University of Zagreb with recommendations (hereinafter: Business Analysis) was conducted within the project "CeNIKS - *Centre for Advanced Research of Complex Systems*" in 2020. The analysis presents the conclusions of the Expert Committee made within the framework of reaccreditation of the Faculty in 2015 and highlights the main challenges and guidelines for future progress as a basis for proposing further activities and measures. The analysis was made on the basis of data and feedback collected from various stakeholders and lays down activities for achieving the basic strategic goals of the Faculty (URL 1_1_4_2):

- improve the quality of teaching, strengthen internationalisation of teaching and promoting the importance of the educational process
- improve the quality of scientific research and the transfer of knowledge and technology
- strengthen scientific research cooperation with the private sector and improve the transfer of knowledge and technology
- improve infrastructure, organisation and management of the Faculty, strengthen human resources and improve the self-control system
- increase the impact on the development of society as a whole, improve the promotion of social responsibility and improve visibility and international recognition.

1.1.5.

The higher education institution systematically collects and analyses data on its processes, resources and results, and uses them to effectively manage and improve its activities, as well as for further development.

Data on teaching, scientific and professional activities, international cooperation, publishing activities, scientific conferences, science popularization and other activities and work of the management are systematically collected and analysed in *annual reports* of the Faculty available on its website (2015/16; 2016/17; 2017/18; 2018/19) and annual department reports (ev. 1_1_5_1). The achieved results are also presented in annual reports of the Dean (ev. 1_1_5_2) and department heads (ev. 1_1_5_3).

Every academic year, the Faculty submits to the Quality Management Committee of the University of Zagreb the Annual Report on Quality Assurance at the level of the constituent

regarding activities implemented during the previous academic year, and the Action Plan for Quality Assurance of the university constituent for the next year by fields of internal quality assurance establishing ESG standards (URL 1_1_5_1). In 2016, a publicly available link Quality Assurance (URL 1_1_5_2) was added to the Faculty's website and it is regularly updated. All collected data and analysis are used as quantitative and qualitative indicators of Faculty's achievements, and their analysis allows the definition of strategic directions aimed at improving and raising the quality of work.

1.1.6.

The higher education institution uses various methods for collecting data on quality (student satisfaction surveys, peer review, feedback from employers and/or associates, graduates etc.).

Various types of surveys, and other formal and informal methods for collecting data, are used for systematic improvement of the teaching process. Student satisfaction surveys for the evaluation of teaching and teachers must be conducted every three years in accordance with the recommendations of the University Office for cyclical conducting of the Survey for teacher performance evaluation at the level of constituents. Teacher evaluation is also conducted more often, and, as a general rule, prior to the initiation of the procedure for appointment to a higher rank. In order to improve the teaching process, the obtained survey results are regularly presented to the surveyed teachers. The *Quality Management Committee* analyses data on student satisfaction with study programmes, and the overall results of surveys are publicly available on the Faculty website in accordance with the Recommendations for handling the results of student satisfaction surveys. Upon request, the student representative has the right to access individual survey results URL 1_1_6_1. In addition to the University survey, the Faculty also uses internal Faculty surveys (ev. 1_1_6_1).

Surveying students who have completed undergraduate, graduate and integrated undergraduate and graduate studies provides valuable feedback on satisfaction with the Faculty as a whole. In addition to information on the work of teaching and non-teaching staff, these student satisfaction surveys (URL 1_1_6_2) also provide feedback on external associates, and the work of the management, secretariat and library.

Opinions of external stakeholders on the quality of education of graduates are also collected through informal contacts (*Faculty Days*, teachers' personal contacts, or during round tables) or at events such as Meet the Mathematicians (ev. 1_1_6_2), and also through reports on traineeships and methodological training (see standard 2.3). A survey aimed at getting feedback from employers on the achievement and expediency of learning outcomes is

planned for the forthcoming period.

Feedback from all Faculty stakeholders collected using both formal and informal methods is used to regularly amend study programmes for the purpose of their improvement. A formal evaluation procedure of study programmes is carried out (URL 1_1_6_3) within the Faculty. Based on the opinion of the *PMF Quality Management Committee*, the Faculty Council adopts a decision on establishing proposals for amendments to existing study programmes and proposals for new university study programmes, after which the necessary documentation is forwarded to the University of Zagreb for further action.

For the purpose of introducing new study programmes, labour market analysis is conducted regularly; for example, this was the case with undergraduate and graduate university study programme Ecology and graduate university study programme Computer Science and Mathematics by applying the CQF within the framework of the *EkoRaMa* project (ev. 1_1_6_3) and graduate university study *Biomedical Mathematics* within the *BioMedMath* project (ev. 1_1_6_4).

In addition to the above, the collection and analysis of information is carried out systematically through information systems, such as data on enrolled students available via the *National Information System of Application to Higher Education Institutions (NISPVU)* and data obtained via the *Higher Education Institutions Information System (ISVU)*.

1.1.7.

The higher education institution is committed to the development and implementation of human resource management policies (managerial, scientific-teaching, artistic-teaching, administrative, professional and support resources), in accordance with professional principles and standards.

The Faculty is committed to the development and implementation of human resources management policies in line with professional principles and standards. The Ordinance on the organisation of work posts at the Faculty of Science of University of Zagreb (hereinafter: Ordinance on organisation) lays down the internal organization of the Faculty, work posts and professional and other requirements for employment at these posts, job description for each post, and the number of employees by organizational units and work posts.

The human resources available to the Faculty have been limited by a decree of the Government of the Republic of Croatia in terms of available coefficients, which prevents significant recruitment of new employees, and slows the advancement to higher ranks. All this also affects the implementation of development-oriented human resources policy. Therefore, in order to effectively develop and manage human resources, it is crucial to recognize the abilities of individuals and to encourage and develop their potentials through lifelong professional development.

In accordance with the development strategy of the institution, special attention is paid to the excellence of junior associates. Their development goals related to scientific research and the acquisition of generic skills are defined by mentors or institutional mentors who monitor their progress and submit annual reports for adoption to the competent department (ev. 1_1_7_1). The Faculty encourages and acknowledges the quality of teachers also by a system of rewards based on transparent criteria, which are defined by appropriate acts (Srećko Jelenić Award - ordinance, Stipe Vidak Award - ordinance, *Department of Chemistry Medal* - ordinance, awards of certain societies, for example Ordinance on the annual award of the Croatian Geographic Society). Every year, recognitions of excellence are also awarded to the best young scientist of each department on the occasion of the Faculty of Science Day (ev. 1_1_7_2).

Scientific and professional development of all employees is also achieved through visits to eminent foreign universities or scientific institutes (for more details see the Analytical appendix, Tables 4.5 and 4.6), attending scientific and professional conferences, participating in webinars, organized workshops and courses. Periodic courses are also organised for additional training of non-teaching staff. For further information see standard 1.6.

1.2. THE HIGHER EDUCATION INSTITUTION IMPLEMENTS RECOMMENDATIONS FOR QUALITY IMPROVEMENT FROM PREVIOUS EVALUATIONS

1.2.1.

The higher education institution analysed the recommendations for improvement and undertakes activities on the basis of previous internal and external evaluations.

In 2015, the Agency for Science and Higher Education conducted the procedure of reaccreditation of the Faculty in line with the first cycle plan. The content of the Report of the Expert Committee was carefully analysed and discussed at the sessions of the Faculty and department collegia and was made available to all employees and students of the Faculty of Science (ev. 1_2_1_1). Subsequently, the Faculty also submitted an observation to the Expert Committee Report (ev. 1_2_1_2). Upon receiving a positive accreditation recommendation (on 23 November 2015, ev. 1_2_1_3), adopted on the basis of the previous opinion of the Accreditation Council of the Agency, on 14 December 2015 the Minister of Science, Education and Sports issued a Certificate of fulfilment of requirements for the performance of high education and scientific activities to the Faculty of Science, University of Zagreb (ev. 1_2_1_4). In accordance with the accreditation recommendation, the Faculty has undertaken a number of measures and activities to improve quality, and the results are detailed in Section I. *Outcomes of previous evaluations* along with

accompanying documents.

In accordance with the mission of the Faculty, all activities and measures outlined in that chapter are permanent and aimed at improving and developing the quality assurance system and therefore should continue to be implemented continuously.

In 2016, the Quality Management Committee of the University of Zagreb carried out an internal revision of the quality assurance system of all constituents, aimed at determining whether the activities that constitute the University's quality assurance system and their results are effective and comply with both national and ESG standards. For that purpose, the Faculty completed a self-evaluation form of the level of quality assurance system maturity, and this was followed by a discussion between the University Expert Committee and representatives of the Faculty. Based on the self-evaluation , with regard to individual standards, the level of maturity was generally assessed as partial (grade of 4 out of 5) (ev. 1_2_1_5). The report of the Committee on internal revision of quality assurance system compliance with ESG and University's internal processes and procedures was adopted at the session of the University Senate held on 13 December 2016.

1.2.2.

The higher education institution analyses improvements and plans further development accordingly.

The Faculty systematically collects and analyses data on its scientific, professional and teaching activities, human and material resources as well as achieved results and uses them for the purpose of effective management, improvement of activities and further development in all fields of activity (for further details, see standards 1.1.4 and 1.1.5).

1.3. THE HIGHER EDUCATION INSTITUTION SUPPORTS ACADEMIC INTEGRITY AND FREEDOM, PREVENTS ALL TYPES OF UNETHICAL BEHAVIOUR, INTOLERANCE AND DISCRIMINATION

1.3.1.

The higher education institution supports academic integrity and freedom, upholds the ethical standards and preserves academic integrity and freedom.

The Faculty supports academic freedom and respect for ethical research principles, as well as general principles which define the roles, responsibilities and tasks of teachers, associates, students, administrative, technical and other non-teaching staff, in accordance with the *Act on Scientific Activities and Higher Education* (OG 123/03 to 113/17), *Code of Ethics of the University of Zagreb, Statute of the University of Zagreb, Statute of the Faculty of Science of the University of Zagreb, Personal Data Protection Act* (OG. 103/03 to 106/12) and *Regulation (EU) 2016/679 of the European Parliament and of the Council on the protection of natural persons with regard to the processing of personal data, Ordinance on the system for internal reporting of*

irregularities at the Faculty of Science, University of Zagreb (hereinafter: Ordinance on Irregularities, ev. 1_3_1_1), *Ordinance on disciplinary responsibility of PMF students* (ev. 1_3_1_2) and other decisions, such as the *Ministry's Decision and the opinion of the Ethics Committee on the use of animals for experimental purposes* (ev. 1_3_1_3). By fostering academic integrity, the Faculty encourages every stakeholder to give a positive example by acting ethically, in order to preserve the reputation of the Faculty and the university community as a whole.

1.3.2.

The higher education institution effectively uses mechanisms for preventing unethical behaviour, intolerance and discrimination.

The Faculty advocates and promotes the highest standards in scientific research, professional and teaching activities. Furthermore, unethical behaviour, or any form of discrimination, is not tolerated. The Ordinance on Irregularities regulates the procedure for reporting irregularities, which includes the rights of persons reporting irregularities, the employer's obligations in relation to reported irregularities, the appointment of a confidential person responsible for receiving reports (ev. 1_3_2_1) and his deputy (ev. 1_3_2_2), procedure management, and other issues relevant for reporting irregularities and protecting the persons reporting them.

The Ethics Committee, which consists of representatives of all Faculty departments, acts in accordance with the powers laid down in the *University Code of Ethics* (ev. 1_3_2_3). The Committee addresses ethical issues related to maintaining the academic level of interpersonal relations, and in research, and issues certificates and recommendations on compliance with principles of ethical research, project implementation and the like. It promptly responds to all complaints related to unethical behaviour of employees.

Students are also expected to comply with high standards of ethical principles. The Disciplinary Committee, which consists of representatives of both Faculty teachers and students, (ev. 1_3_2_4) decides on disciplinary responsibility of students. In its work, the Disciplinary Committee operates in accordance with the Ordinance on the disciplinary responsibility of PMF students, the Ordinance on studies and subordinate acts listed under standard 1.3.1.

The Dean of the Faculty and heads of departments and divisions act in accordance with their powers laid down in the Statute of the Faculty.

1.3.3.

The higher education institution carries out activities related to the sanctioning of unethical behaviour, intolerance and discrimination.

Breaches of the rules of conduct established by the University Code of Ethics, laws and other acts (see standard 1.3.1), and tarnishing the reputation of the University, Faculty and its departments and employees, are subject to sanctions as regulated by Articles 33 to 35 of the Code. During the previous period, the Committee received two cases, in which proceedings were initiated and opinions were issued, and one proceeding was referred to a higher instance. The procedures undertaken for detecting and sanctioning unethical behaviour are considered confidential and cannot be further presented in this analysis. The *Ethics Committee* submits annual reports in accordance with the provisions on data confidentiality (ev. 1_3_3_1).

Appropriate measures laid down in the Ordinance on disciplinary responsibility are imposed against students who commit a serious disciplinary offense. The Student Ombudsman also participates in disciplinary proceedings in order to ensure the protection of student rights (ev. 1_3_3_2). In the previous period, five disciplinary proceedings were instigated.

1.3.4.

The system for managing conflicts and resolving irregularities is functional at all levels of the higher education institution.

The Faculty guarantees all rights, respect for integrity and ensures academic freedom and the conditions for achieving equality and justice for all its employees. In particular, the Faculty strives to foster good relations among all its employees and among students. Minor conflicts are resolved through mediation conducted by division heads, department heads, Vice-Deans or the Dean. Student assistance is provided by study programme leaders, department teaching assistants, the Vice-Dean for Teaching, student associations and the Student Ombudsman.

1.3.5.

The work of employees of the higher education institution, its students and external stakeholders, is based on ethical standards in higher education.

All Faculty activities are conducted in line with the principles of academic ethics. In order to further verify the observance of ethical principles when drafting graded papers, the Faculty deploys the *Turnitin* software (URL 1_3_5_1) to detect plagiarism and establish the authenticity of papers. At the same time, the use of authentication software has a positive effect on raising awareness among students and doctoral students, who consequently pay more attention to the correct citation of sources in their work. Students sign a declaration of authenticity for their thesis confirming that the thesis / dissertation (final / graduate / doctoral) is written completely independently and that all other authors and documents cited within are clearly indicated (URL 1_3_5_2).

Applicants to competition for the appointment election to scientific-teaching ranks are required to enclose a Declaration of

Authenticity of their Published Papers (URL 1_3_5_3), confirming that all their papers and achievements are original and the result of their own work and contain no sources other than those cited within.

1.4. THE HIGHER EDUCATION INSTITUTION ENSURES THE AVAILABILITY OF INFORMATION ON IMPORTANT ASPECTS OF ITS ACTIVITIES (TEACHING, SCIENTIFIC/ARTISTIC AND SOCIAL)

1.4.1.

Information on study programmes and other activities of the higher education institution is publicly available in Croatian and at least one world language.

The area of public information and the right of access to information is regulated by the Right to Access Information Act (OG 25/13, 85/15). On its website (URL 1_4_1_1), the Faculty publishes the following information: 1. information on the internal organization of the Faculty, 2. information on activities and operations of the Faculty and its organizational units, 3. acts and other regulations applicable to its field of activity, 4. general acts and decisions, 5. annual plans, programmes, strategies, instructions, activity reports and other documents, 6. information from available databases, 7. financial reports, 8. information on donations, 9. information on public procurement procedures, 10. public consultations, 11. notices of competitions, 12. announcements on the manner and right of access to information exercised by submitting a request to the Information Commissioner of the Faculty of Science and other important announcements.

Information on study programmes can be found on the websites of the Faculty and individual departments (Biology, Geography, Geology, Geophysics, Physics, Chemistry, Mathematics) (URL 1_4_1_1, URL 1_4_1_2, URL 1_4_1_3, URL 1_4_1_4, URL 1_4_1_5, URL 1_4_1_6, URL 1_4_1_7). Prospective students and other interested public are also informed about study programmes through more direct forms of communication, such as the University of Zagreb Fair (URL 1_4_1_8), and other events at which study programmes, and education and employment opportunities are presented. One of the events that needs to be especially highlighted is *PMF Day and Night* (URL 1_4_1_9). *Career Day* (URL 1_4_1_10_Work in' Science – WISe) is another important event organized by the Career Centre, which is focused on students, associations and the labour market. The event promotes practical knowledge, cooperation and interaction of students, entrepreneurs and alumni, with the aim of motivating, educating and informing students about professional and academic opportunities both in the country and abroad. A similar event is organized at the individual departments.

Information on study programmes and other activities of the

Faculty are also available by means of information leaflets or brochures (ev. 1_4_1_1), Faculty and department social media pages, promotional videos (URL 1_4_1_11) and participation in television programmes (ev. 1_4_1_2).

1.4.2.

The higher education institution informs stakeholders on the admission criteria, enrolment quotas, study programmes, learning outcomes and qualifications, forms of support available to students.

Each academic year, the Senate of the University of Zagreb adopts a *Decision on the procedure and criteria for accepting enrolment quotas for undergraduate and integrated undergraduate and graduate studies at the University of Zagreb*, and consequently a *Decision on enrolment quotas* for enrolling students in the first year of the said studies. Also, following the decisions of the Senate, the University announces combined competitions for enrolment in the first year of *graduate studies*. Competitions are published on the University and Faculty websites, thus informing the public on the enrolment criteria and quotas for particular study programmes. Information on study programmes is also available on the website of the National Information System of Application to Higher Education Institutions (NISPVU) and the Register of Study Programmes (URL 1_4_2_1).

Information on learning outcomes and qualifications, various forms of support available to undergraduate, graduate, or integrated undergraduate and graduate students and information on academic degrees and titles are also available on the Faculty website. Postgraduate studies have a special menu on department websites featuring all relevant information for students and levels of study, as well as for future doctoral candidates.

Important information about study programs is available in the Lecture Schedule (URL 1_4_2_2). Syllabuses for particular study programmes can be found on department websites. The syllabus informs students and the interested public about teachers and associates who will teach in a study programme, the time and place of lectures, number of hours per subject, teaching forms and methods, manner of taking exams, exam deadlines, bibliography and possibilities for teaching in a foreign language.

Information on student support provided in the form of demonstrations, mentoring, consultations, and heads of study years is available on the websites dedicated to specific study programmes. Administrative support is provided by the Student Office (URL 1_4_2_3) of each department. Information related to mobility, as well as overall support for this activity (counselling, contracting, mentor appointment, accommodation, recognition of ECTS credits, etc.), is available to students through the Office for International Relations and Project Monitoring. In the context

of providing specific forms of student support, the Career Centre plays a special role offering students career and psychological counselling with the aim of increasing their academic performance, fulfilling their potential and achieving a successful future career.

1.4.3.

Information on the social role of the higher education institution is made available to stakeholders.

Education and science should be the foundation for the development of every society, and therefore their continuous improvement, along with active engagement in all processes related to education and science, is the greatest social responsibility of the Faculty. Accordingly, many Faculty teachers participate in the work of numerous national and university bodies and committees (see standard 1.5.3), and information on those activities are available on the websites of those councils, foundations or agencies.

One of key social roles of the Faculty is related to supporting and improving the educational system at all levels. This role is achieved by providing continuous support to teachers and school principals (see standard 1.6), through active participation in national competition committees (ev. 1_4_3_1), expert committees and working groups for conducting state matura (exit) exams (ev. 1_4_3_2), as well as through authorship, peer review and approval of school textbooks and other literature (ev. 1_4_3_3), delivering public lectures, etc. Faculty teachers actively participated in working groups for curricular reform of the education system.

The social role of the Faculty (see standard 1.5) is manifested through participation in scientific and expert conferences (see standard 5.4) and public popular science events, such as the event Magic in Chemistry (URL 1_4_3_1), Science Festival (URL 1_4_3_2), Scientific Picnic, and the Summer School, aimed at popularizing science and mathematics in the public domain. It is important to highlight the presence of the Faculty in public media, its indispensable role in addressing current social challenges (for example during the recent earthquake, COVID-19 pandemic, etc.) and in preparing and undertaking a number of consultations as detailed in standard 1.5.

Information on the activities of student associations and the Student Union (URL 1_4_3_3) is publicly available through the website and presentation of students' scientific and professional projects: SISB – Students Symposium in Biology and Life Sciences, SISK - Chemistry Students Symposium, International Interdisciplinary Congress of Geography Students, Space through the prism of sustainability, and the Congress on Renewable Energy

Sources. All these events are open to the public.

1.4.4.

The higher education institution informs stakeholders about other indicators (e.g., pass rate analyses, graduate employment, drop-out rates, outcomes of previous evaluations, etc.).

Every academic year, the Faculty also shares the information on pass rate analysis, study success, number of graduates and awarded students. The collected data are used as quantitative and qualitative indicators for possible amendments to study programmes.

Monitoring the rate of graduate employment is one of the activities of the Faculty of Science, and related data is published on the website of the Croatian Employment Service. The available data indicate high employability of PMF students (see MOZVAG analytical appendix, Table 3.7.) and serve as grounds for defining enrolment quotas for all PMF study programmes each academic year, as well as for revising existing and proposing new study programmes.

The results of previous evaluations are published on the website of the Agency for Science and Higher Education and the Faculty website, where a subsequent business analysis was published with special reference to previous reaccreditation.

1.5. THE HIGHER EDUCATION INSTITUTION UNDERSTANDS AND ENCOURAGES THE DEVELOPMENT OF ITS SOCIAL ROLE

1.5.1.

The higher education institution contributes to the development of economy (economic and technological mission of the university).

The Faculty provides high quality and effective university education in the fields of science and mathematics at all three levels of university studies. Study programmes are based on research and the latest scientific knowledge. Top quality and highly motivated students, who will be the bearers of economic and societal development with their knowledge and skills, are among the greatest values of the Faculty of Science. In recent years, additional courses combining professional internships with scientific and professional competencies, have been deployed to help students develop generic skills, which is extremely important for their fastest possible integration into the labour market. The Career Centre systematically informs students on employment and career development opportunities available in Croatia and abroad, and facilitates the connection between employers and interested students.

In addition to its educational role, the Faculty, in accordance with its mission, contributes to the development of the economy and society as a whole through applied and development-oriented scientific research, carried out in cooperation with the economic sector. Cooperation with the economic sector, as well as cooperation with spin-off companies (URL 1_5_1_1) ensuing

from research conducted at the Department of Physics, in most cases, is regulated by contracts on expert projects. The Faculty cooperates with the economy on multiple levels, ranging from strategic projects implemented with certain companies, through medium-term projects addressing specific professional or scientific challenges, to service activities in the course of which measurements and analysis are performed using scientific and professional expertise and existing equipment (such as the NMR Laboratory (URL 1_5_1_2) at the Chemistry Department). The cooperation takes place in many economic sectors, some of the most prominent examples being within the pharmaceutical industry segment, in which the Faculty cooperates with companies such as PLIVA, Xellia, Belupo, or in the technology sector with enterprises such as Rimac cars, Uprise, Mireo and Aduro. Through the transfer of knowledge and technology, the result of these activities is incorporated into the development of new products and services.

1.5.2.

The higher education institution contributes to the development of the local community

The Faculty achieves fruitful cooperation with state administration and local self-government bodies, as well as with the public and private sector with the aim of developing and preserving local values, developing local community capacities, encouraging change and discovering untapped potential within the local area (e.g., Croatian Waters, national parks, nature parks and other public institutions for nature protection), as well as the development of expert projects. Examples of contracts can be found in ev. 1_5_2_1.

Effective cooperation with the local community has been established through the active engagement of the Faculty in the daily life of citizens. The Botanical Garden of the Faculty of Science is a good example of such cooperation, offering various events, educational and popularization content and publications intended for additional, life-long education of all visitors (URL 1_5_2_1). The Seismological Survey collects and analyses macroseismic and microseismic data. Earthquake records are a valuable source of information for the citizens and various services, as well as for providing professional expertise to construction enterprises, insurance companies, etc. Mareographic stations continuously record changes in the sea level at selected locations and provide information to citizens. In cooperation with the Croatian Actuarial Association and the Croatian Insurance Bureau, the Faculty participated in the preparation of the first Croatian annuity mortality tables. The geological walk through the City of Zagreb is an example of the geotourism offer of the city realized in

cooperation with the Faculty.

Other Faculty activities of social importance are detailed in standards 1.6. and 1.2.1d.

1.5.3.

The higher education institution contributes to the foundations of the academic profession and the accountability of teachers for the development of the university and the local community.

The Faculty contributes to the foundations of the academic profession and accountability of University teachers through membership in various national bodies such as the National Council for Science and Higher Education (regional councils, Scientific field committees), Croatian Science Foundation, Croatian Academy of Sciences and Arts, Ministry of Science and Education, Agency for Vocational Education and Training and Adult Education, Education Agency, Agency for Science and Higher Education and National Centre for External Evaluation of Education. Within each, Faculty teachers actively participate in discussions on topics of interest for the development of science, higher education and technology in the Republic of Croatia.

The Faculty contributes to the development of the University by participating in the work of the Senate of the University of Zagreb (5 members and 5 alternates), the University Council (1 member), Council for Natural Sciences (14 members and 14 alternates in science-teaching ranks, 1 member and their alternate in associate ranks, Chairperson and Vice-chairperson, 4 undergraduate and graduate students, and 1 doctoral student and their alternates), as well as by its engagement in University boards (1 representative in each) and various University committees.

Faculty employees participate in the work of international, national and local professional and scientific boards, commissions, committees, working groups and other organizational structures. Every year, teachers and associates deliver a large number of public lectures, participate in round tables and similar events that contribute to strengthening the role of science and its popularization in Croatia and abroad, which is described in more detail and supported by documents in standard 5.2.

The Faculty also supports student associations such as the Student Union of the Faculty of Science, Science and Mathematics Students Association - PRIMUS, Biology Students Association - BIUS, Young Gifted Mathematicians Marin Getaldić, e-Student, Geography Students Club, and the student sections of the Croatian Mathematical Society, Croatian Physical Society and Croatian Chemical Society. Associations are oriented towards scientific and professional work, popularization of science and other aspects of student life. Information on student associations' activities can be found on the Faculty website and social networks.

1.5.4.

The development of its social role is a part of higher education institution's mission (e.g., development of civil society, democracy, etc.).

The contribution to the development of the economy and society as a whole is part of the mission of the Faculty and is realized through applied and development-oriented scientific research. Promoting and popularizing science and mathematics in all segments of society, especially among younger generations, should encourage greater interest in the STEM field (which is described in more detail and supported by evidence in standards 3.1, 3.4 and 5.2) as well as a better understanding of the role of science in addressing social issues both locally and globally. In order to achieve this mission, employees, individual departments and the Faculty as a whole are engaged in intensive and comprehensive cooperation with public institutions and civil society organisations.

The engagement of Faculty's human resources in fulfilling its social role is demonstrated by their engagement in various consulting activities (URL 1_5_4_1) in science and in the implementation of Goal 2 of the Strategy of Education, Science and Technology, civil society organizations as well as volunteering and charity actions after the March 2020 earthquake in Zagreb (and the December 2020 earthquake in the Banovina region).

1.6. LIFELONG LEARNING PROGRAMMES DELIVERED BY THE HIGHER EDUCATION INSTITUTION ARE ALIGNED WITH THE STRATEGIC GOALS AND THE MISSION OF THE HIGHER EDUCATION INSTITUTION, AND SOCIAL NEEDS

1.6.1.

There is evidence that general goals of the lifelong learning programmes are in line with the mission and strategic goals of the higher education institution.

The Faculty has accepted the concept of lifelong learning as the foundation of its own mission and is continuously promoting it. Lifelong learning has been recognised by the Faculty employees as an imperative of success, which they put into practice by taking part in various courses, seminars and workshops with the aim of their further professional development in various areas of methodological and professional activities and acquiring other competencies essential for personal growth and development. Lifelong learning is traditionally achieved by attending lectures by renowned foreign and domestic experts, as well as department and institute colloquies. In addition, Faculty staff participate in workshops on using various information systems in teaching and communication with students, workshops to improve mentor competencies and other forms of training thematically related to learning outcomes, alignment of teaching methods with evaluation methods and improving the quality of high education institutions (see standard 1.1.7). Furthermore, potential future assistant professors are given an opportunity to teach a portion of classes under the mentorship of the course leader, in order

to acquire the necessary didactic and methodological skills. Activities carried out within lifelong learning programmes contribute to improving the quality of teaching and promoting the importance of educational process, which is one of the strategic objectives of the Faculty.

Most of the programmes aimed at educating, informing, advising and guiding higher education, secondary and primary school and preschool school teachers, students and other education stakeholders in the fields of mathematics, science and technology at the Faculty are carried out within the *Centre for improving education in the fields of natural sciences, mathematics and technical sciences* (PriMaTeh) (URL 1_6_1_1), as an organizational unit of the Faculty of Science. The Centre was established in 2014 to ensure the active participation of the Faculty in the process of lifelong professional development of all stakeholders in the field of education.

In accordance with the conclusions and recommendations of the European Commission, the Department of Biology initiated activities related to deployment of technological innovations in higher education aimed at developing and realising social and economic potential that it can achieve as one of the umbrella institutions in the field of biological sciences in the Republic of Croatia. In cooperation with several other faculties and institutions, a *LabAnim* (URL 1_6_1_2) training course was organised for persons working with experimental animals and animals used in the production of biological preparations.

1.6.2.

There is evidence that general goals of the lifelong learning programmes are in line with social needs.

The general objectives of the lifelong learning programme are aligned with social needs, which is corroborated by the feedback received from participants of those programmes. New social needs that highlight the importance of expanding and adapting lifelong learning programmes to the current moment have been identified. Shortage of experts from certain curriculum areas (mathematics, science and technical and information science) in primary and secondary schools, as well as the interest expressed, in particular, by of our alumni, underlines the need to obtain a permit to provide additional training in this methodological group of subjects. Until this permit is obtained, the Faculty will implement additional training from this methodological group of subjects under the agreement with the Teacher Education Centre of the Faculty of Philosophy, University of Zagreb (ev. 1_6_2_1).

1.6.3.

Revision and development of lifelong learning programmes is carried out systematically and on a regular basis.

The needs of primary and secondary school teachers are regularly monitored, and shorter lifelong learning programmes are developed and implemented accordingly. Most programmes have been focused on the development of teacher competencies for the implementation of Objective 2 of the Strategy for Education, Science and Technology, as in the period between 2015/16 and 2019/20, subject curricula and the curricula of cross-subject topics were in the final stage of preparation, and subsequently in the process of experimental implementation. From the 2019/20 school year, subject and cross-subject topic curricula were introduced frontally in primary schools and gymnasiums. Teachers and associates of the Faculty have significantly contributed to the creation and final design of these curricula, as well as to teacher training for their integrated introduction into teaching practice.

In order to meet the identified needs of teachers of biology, physics, geography, information science, chemistry, mathematics, nature and technology classes, professional conferences are organized at the national, inter-county and county levels, as a contribution to lifelong learning of education system stakeholders. Teachers and associates of the Faculty participate in these conferences and meetings as lecturers and workshop leaders, and several departments and the Faculty are co-organisers.

The journals such as *Educatio Biologiae, Geografski horizont, Matematičko fizički list, Poučak: časopis za metodiku i nastavu matematike, Matka* and *math.e* also contribute to the regular implementation of lifelong learning programmes.

II. STUDY PROGRAMMES (ESG1.2., ESG1.9.)

2.1. THE GENERAL OBJECTIVES OF ALL STUDY PROGRAMMES ARE IN LINE WITH THE MISSION AND STRATEGIC GOALS OF THE HIGHER EDUCATION INSTITUTION AND THE NEEDS OF THE SOCIETY.

2.1.1.

The general goals of all study programmes are in line with the mission and strategic goals of the higher education institution.

The general goals of study programmes executed by the Faculty are aligned with the mission and strategic goals of the Faculty, as outlined in the Development Strategy. In line with this strategy, the Faculty systematically advances, modernises and introduces new study programmes, to meet the needs of society and the labour market. Simultaneously, the content of courses and study programmes as a whole reflect recent scientific findings and the results of educational research, and are the general goals are aligned with the document *SciStrat*.

2.1.2.

The justification for delivering study programmes, with regard to social and economic needs, is provided and includes an analysis of resources of the higher education institution required for delivering study programmes.

The contribution to society and economic needs can be viewed through direct contributions of the goals of higher education from the Strategy for Education, Science and Technology. The contribution to goal 1.1. of the Strategy is seen through amendments to the existing study programmes to improve their quality, and the introduction of new programmes, such as the proposed graduate study programme in Biomedical Mathematics in English (project *BioMedMath* (URL 2_1_2_1), and proposing new standards of professions and standards of qualifications in line with the CroQF (projects *EkoRaMa* and FizKO) URL 2_1_2_2 and URL 2_1_2_3. Practice exercises are regularly improved, and the opportunities to conduct traineeships increased, with great emphasis placed on student creativity and innovativeness, inclusion in scientific projects, thereby contributing to goal 1.2. The contribution to goal 2.3 is seen through the ongoing alignment of enrolment quotas with the needs of the labour market (ev. 2_1_2_1 and ev. 2_1_2_2). Faculty staff, with their expertise, enable the organisation of classes in line with goal 2.4 of the Strategy, and where needed, external experts with specific competencies are engaged. The recent establishment of the Career Centre has achieved stronger links between the labour market and the Faculty, which has substantially contributed to goal 2.7. Through investments of Faculty resources, and the assistance of European structural funds, e.g. through the projects CIuK and CeNiKs, the Faculty has enabled significant upgrades to research equipment, which is available to scientific-teaching staff and students, and which is a direct contribution to goal 5.1. Finally, the contribution to goal 7, with regard to

the internationalisation of higher education is seen through the practice of incoming and outgoing mobility of students and teaching staff (programmes ERASMUS and CEEPUS), and through the increasing number of employments of young researchers, doctoral candidates and postdoctoral fellows from abroad. Also, in cooperation with the Faculty of Food Science and Biotechnology, University of Zagreb, and the University of Orleans, France, the diploma study programme Bioindustry Techniques URL 2_1_2_4 has been implemented, and is attended by both Croatian and French students. Upon completion of the programme, students receive two diplomas. The personnel and spatial resources and equipment are described in detail in the Annual reports.

2.1.3.

If the higher education institution delivers study programmes leading to degrees in regulated professions, it accepts the recommendations of professional organisations that govern their licencing.

The Faculty delivers study programmes leading to degrees in the following regulated professions: primary and secondary school teachers of biology, physics, geography, information science, chemistry, mathematics and technical science; biologist in health care; medical physicist; and meteorologist in air traffic control. In developing and implementing study programmes for teacher training, particular care is taken of the Framework of the National Qualification Standards for teachers in primary and secondary schools, in which the learning outcomes at the level of the study programmes are in line with the given recommendations, and the results of educational research are built into the education process. The Faculty also provides support to professional organisations, such as the Croatian Society of Biologists in Health Care, and the Croatian Society of Medical Physicists. The latter society has its seat at the Department of Physics, PMF, and its leaders also work closely in the development of the qualification standards and profession standards (project FizKo).

2.1.4.

The higher education institution produces competitive professionals for national and international labour markets.

The labour market demands for persons completing their studies at the Faculty are high, as seen in the high employment rates of PMF graduates (for more detail see Analytical appendix, Table 3.7). The demand for PMF graduates is also confirmed by the Recommendations of the Croatian Employment Bureau for education and enrolment policy 2020, which stresses the need to increase enrolment quotas in all study programmes provided at the Faculty. Interest for research specialisations is high, and the number of interested candidates is regularly higher than the quota, while the demand is somewhat lower for the education specialisations.

The importance of the need to develop the sciences became particularly evident during 2020, when the world was struck by the pandemic caused by the novel virus COVID-19, and also by the devastating earthquakes that struck Croatia.

Biologists in health care and chemists and key professions in studying the SARS-CoV-2 virus, and in developing tests for COVID-19. Other Faculty experts, particularly geophysicists and geographers, have been actively involved in collecting data on the earthquakes that have affected Croatia, and in developing geoinformation systems for recording their consequences. In addition to the high demand on the domestic labour market, Faculty alumni are also recognised at scientific institutions abroad, and in the economy.

2.2. THE INTENDED LEARNING OUTCOMES AT THE LEVEL OF STUDY PROGRAMMES DELIVERED BY THE HIGHER EDUCATION INSTITUTION ARE ALIGNED WITH THE LEVEL AND PROFILE OF QUALIFICATIONS GAINED.

2.2.1.

The higher education institution has clearly defined the learning outcomes of the study programmes, and they are aligned with the mission and goals of the higher education institution.

The learning outcomes of all study programmes are aligned with the mission and strategic goals of the Faculty as listed in the Development Strategy. The Faculty study programmes are systematically improved and modernised in line with scientific developments, the needs of students, the labour market and society as a whole. Furthermore, the Ordinance on undergraduate and graduate studies at PMF, University of Zagreb ensures the possibility for horizontal mobility of students for the needs of achieving the learning outcomes at the level of the study programmes.

2.2.2.

The higher education institution checks and ensures that the learning outcomes at the level of courses are aligned with the learning outcomes at the programme level.

At the Faculty, the learning outcomes at the level of the study programme and courses are regularly examined and aligned by external working groups engaged in study issues or working groups formed as needed. Changes and alignment of outcomes at the programme level are implemented through the procedure of amending the existing study programmes. An important source of information on the need to align the learning outcomes are student surveys that asses the study programme as a whole, and also assess the course teacher. Learning outcomes at the programme level are shown in detail in Table 2.1 of the Analytical appendix.

2.2.3.

Learning outcomes achieved in the study programme are aligned with the CroQF and EQF level descriptors.

Over the past five years, the Faculty has participated in several projects aimed at developing the qualification standards and profession standards in accordance with the CroQF. From 2015 to 2016, the project *Development of the study of ecology, computer science and mathematics with the application of the Croatian Qualifications Framework – EcoRaMa* was implemented at the Faculty. Standards were developed for the following professions: ecologist, data engineer, and software engineer, and qualification standards were developed for the following:

university bachelor of ecology, master of ecology, master of computer science and mathematics. The curricula were developed for the undergraduate university study of *Ecology*, graduate university study of *Ecology*, and graduate university study of *Computer Science and Mathematics*. The procedure for inclusion of these profession standards and qualification standards into the CroQF Register is underway.

From 2019 to 2022, the Faculty has been a partner in the implementation of the project *Development of the study of physics with the application of the CroQF – FizKO*. The project aims are: (1) to develop four standard professions in cooperation with employers (physics engineer, graduate computer science physics engineer, graduate environmental physics engineer, medical physicist) and three qualifications standards (bachelor of physics, master of physics, master of physics research), (2) to submit an application for entry of these standards into the CroQF Register, and to align the existing study programmes with the develop qualification standards, and equip the staff of the lead partner and other partners on the project to continually align the study programmes with the demands of the labour market. The project leader is the University of Rijeka.

From 2019 to 2021, the Faculty has been a partner in the project *Competency standards of lecturers, pedagogues and mentors*, led by the University of Zadar. The aim of the project is to develop profession standards and qualification standards for teachers in general subjects, subject teachers, and teachers – flight instructors and pedagogues.

2.2.4.

In defining learning outcomes, the higher education institution acts in line with professional requirements and internationally recognized professional standards, ensuring that the programme is up to date.

During work on the development and improvement of study programmes, the Faculty departments rely on the guidelines of the relevant international professional organisations and bodies, and on their competency profiles, standards and curriculum models for individual professions and levels of study, and on the results of significant international studies dedicated to higher education. For example, the graduate university study programme *Computer Science and Mathematics* has been aligned with the joint curriculum model of the international organisations Institute of Electrical and Electronics Engineers Computer Society (IEEE Computer Society) and the Association for Computing Machinery (ACM). In creating this study programme, the following competency profiles and standards were applied: European ICT Professional Profiles (European Committee for Standardization - CEN, CWA 16458:2012), European e-Competence Framework 3.0, and the National Occupational Standards,

UK (URL 2_2_4_1). The recommendations of international professional organisations also follow the programmes of other professions. For example, programmes delivered at the Department of Physics are aligned with the educational guidelines of the European Physical Society (EPS) (URL 2_2_4_2), and the programmes at the Department of Chemistry with the recommendations of the European Association for Chemical and Molecular Sciences (EuCheMS) (URL 2_2_4_3).

2.2.5.

The intended learning outcomes clearly reflect the competencies required for employment, continuing education or other individual/society needs.

The deficit of experts in the natural sciences, particularly mathematicians and physicists, was highlighted in the study entitled *Network of higher education institutions and study programmes in the Republic of Croatia*, published by the National Council for Higher Education in late 2011. The same results were also seen in the regular annual analysis and forecasts of the labour market demands for individual professions in the coming year, published by the Croatian Employment Service (CES) at the end of each year in their publication *Recommendations for educational enrolment policies and scholarship policies*. According to the CES recommendations for 2013–2020, the study in all fields at the Faculty, particularly education specialisations, are listed as education programmes that in most Croatian regions need to increase the number of enrolled students and students with scholarships, and none are on the list of education programmes in which the number of enrolments and scholarships should be decreased. Also, the very low unemployment among Faculty graduates can also be seen in the CES table on the number of registered unemployed Faculty graduates for the period 2007 – 2020, which is examined and shown in Table 3.7 of the Analytical appendix.

The successful attainment of the competencies necessary for inclusion onto the labour market, continuation of education, or other needs of individuals and society, has also been recognised by the Faculty graduates. The results of anonymous student surveys at the completion of study are given in the documents (ev. 2_2_5_1). These are the last available results of such surveys that are regularly conducted by the University of Zagreb. The opinion of alumni on the competencies acquired in studies at the Faculty and training for the labour market have also been published in the Brochure of the Faculty of Science (ev. 2_2_5_2) intended to inform secondary school students, as prospective future students, about the Faculty, study programmes, studying and career options after graduation.

2.3. THE HIGHER EDUCATION INSTITUTION PROVIDES EVIDENCE OF THE ACHIEVEMENT OF INTENDED LEARNING OUTCOMES OF THE STUDY PROGRAMMES IT DELIVERS.

2.3.1.

The higher education institution ensures the achievement of intended learning outcomes of the study programmes it delivers.

To ensure the intended learning outcomes in the study programmes delivered at the Faculty are achieved, the appropriate teaching capacities (more detail in standard 4.1), space, equipment, infrastructure and library (more detail in standards 4.4 and 4.5) have been secured, in addition to class organisation, student-oriented learning, support for students, evaluation of student accomplishments and monitoring course quality and the level of achievement of outcomes (more detail in standards 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.8 and 3.10). This is also seen in the feedback collected from the graduate students, employers, current students, external stakeholders, and especially data on the rapid employability of graduate students upon the completion of studies.

The learning outcomes are aligned with the demands of the labour market, with social needs and with student interests. The opinions of employers are collected at events such as Career Day, *WorkIn' Science (WISe)* or at organised round tables such as the Geography employment round table (URL 2_3_1_1).

2.3.2.

The higher education institution continually revises and improves the teaching process on the basis of evidence on the achievement of the intended learning outcomes (for example, tests, seminar papers, presentations, etc.).

The achievement of the intended learning outcomes at the subject level is verified through a range of methods for measurement and evaluation, such as mid-term exams, written exams, oral exams, seminar papers, projects, laboratory exercises, auditory exercises, trainee logbooks, methodical practice logbooks, supervisor reports, and field class logbooks (ev. 2_3_2_1). Upon the completion of undergraduate studies, at certain departments, the generic competencies are evaluated in the final / baccalaureate thesis (URL 2_3_2_1, URL 2_3_2_2), while at all departments upon completion of graduate studies and the integrated undergraduate and graduate studies with the graduate thesis (URL 2_3_2_3) and graduate exams.

An analysis of the achievements of intended learning outcomes is performed at multiple levels. At the course level, each course leader conducts an annual analysis of the achievement of planned learning outcomes, and where needed, proposes minor amendments to the learning outcomes, teaching methods, course content, evaluation methods and learning environment, with the aim of improving the course. Special attention is given to ensuring the use of contemporary equipment and software packages as part of the learning environment, with the aim of improving the conditions for achieving the planned outcomes. In accordance with the valid regulations, some of these changes are also reported to the

Quality Board of the University of Zagreb, and some are verified by the department councils and Faculty council as part of the Implementation plan. Monitoring the achievement of outcomes of every study programme is performed annually, and after the implementation cycle. The results of these analysis, and the feedback from students and external stakeholders, are the starting point for initiating the procedures for minor, major or significant amendments to study programmes.

2.4. FEEDBACK FROM STUDENTS, EMPLOYERS, PROFESSIONAL ORGANISATIONS AND ALUMNI IS USED IN THE PROCEDURES OF PLANNING, PROPOSING AND APPROVING NEW PROGRAMMES, AND REVISING OR CLOSING THE EXISTING PROGRAMMES.

2.4.1.

Development activities related to study programmes are carried out systematically and regularly, involving various stakeholders.

The Faculty systematically carries out activities and planning, proposing and accepting new, and revising existing study programmes, with the inclusion of various stakeholders. Permanent department bodies analysis the exit competencies of graduating students, passing levels, level of achieving of learning outcomes, forms of work and teaching methods, criteria, methods and procedures for evaluating student accomplishments, allocation of ECTS credits, labour market demands for new competences and the transfer of new scientific findings into course content. Feedback is collected from employers, Croatian Employment Service, professional organisations, alumni and students, and included in the proposal of new, and revision of existing study programmes. Also, prior to the amendment of study programmes, feedback collected through study valuations from students is also carefully examined. In analysing surveys, special attention is given to the group of questions pertaining to the study programme (e.g. content and quality of compulsory and elective courses, offer of elective courses, adaptation of requirements and course difficulty according to student knowledge, level to which courses in the first year facilitate student adaptations to studying, connections and flow of content in various courses and years of study), and also on the group of questions pertaining to the general assessment of the outcomes of study programmes, and the proposals and comments at the end of the study given by surveyed students.

With the survey on evaluation of the study programme as a whole, the results of surveys to evaluate courses are also regularly analysed. In the past give academic years, student evaluation of courses was conducted in 2016/17 for all courses and all teachers in all undergraduate, graduate and integrated study programmes at the Faculty, in both the summer and winter semesters, and again in 2019/20 in the winter semester. The results of this evaluation, and

the evaluation for only certain lecturers/courses and student evaluation of remote learning in 2019/20 are available on the Faculty website (URL 2_4_1_1). The survey results indicate continuous high marks, above the average for the University of Zagreb.

2.4.2.

Planning and proposing new study programmes includes an analysis of justification for delivering a study programme, resources and alignment with the strategic goals at the local and regional level, and other needs of society.

A feasibility analysis, capacity analysis and alignment with the strategic goals at the local and national level and with social needs was conducted to determine significant amendments and to introduce a new study programme. From the first reaccreditation 2014/15 to the 2019/20 academic year, significant changes to the study programme were implemented for three programmes (undergraduate university study of *Geography, research specialisation*; graduate university study of *Geography, research specialisation*; and graduate university study of *Geography Education, teaching specialisation*). The proposals of students from prior reaccreditations were also included in these amendments. Additionally, a new graduate study programme *Biomedical Mathematics* in English is currently in the approval process (ev. 2_4_2_1).

2.4.3.

The higher education institution provides evidence on the justification for delivering same or similar study programmes within the same university.

There are no same or similar study programmes at the University of Zagreb to those that are delivered at the Faculty. Though there are multiple study programmes at the University of Zagreb that include courses in the fields of biology, physics, mathematics and other natural sciences, with technical science and information science, our Faculty is the only constituent of the University of Zagreb to deliver study programmes in the field of the natural sciences and interdisciplinary science, field Geography. A comparison of the learning outcomes and structure of the study programmes delivered at the Faculty with those study programmes with similar names at other constituents of the University shows clear and evident differences.

2.4.4.

The higher education institution publishes up-to-date versions of study programmes.

The current versions of the study programmes are published every academic year in the Lecture schedule (URL 2_4_4_1) and Implementation plan for courses, which are available to students via the ISVU system (URL 2_4_4_2), and also on the websites of individual departments of PMF.

2.4.5.

The higher education system records changes to study programmes and analysis their fitness for purpose.

Proposed changes to study programmes, the implementation of new study programmes, and analysis of their fitness for purpose are prepared by department bodies responsible for monitoring course quality, and these are verified by the department councils, the PMF Committee for quality assurance (ev. 2_4_5_1) and the Faculty Council. Pursuant to the established needs, the proposed changes to study programmes include introducing a smaller

number of new compulsory courses that improve the exit competencies of graduating students, and the termination of a smaller number of compulsory courses, termination or merger of certain elective courses, for the purpose of eliminating redundancy. In a large number of study programmes, revisions include changes to the semester or year in which the course is offered, to allow for the better attainment of prerequisite knowledge and entrance competencies needed for the course. The largest number of changes pertains to the introduction of a larger number of elective courses, so as to increase the range of elective courses in the study programme. There are fewer revisions aimed at aligning ECTS credits with actual student workloads, and the contribution of individual courses to the learning outcomes of the study programmes, and this should be systematically addressed in the future.

2.5. THE HIGHER EDUCATION INSTITUTION ENSURES THAT ECTS ALLOCATION IS ADEQUATE.

2.5.1.

The higher education institution allocates ECTS credits in accordance with the actual student workload, based on the analyses of feedback from stakeholders in the teaching process, or other procedures.

Feedback on the alignment of the actual student workload and ECTS credits allocated to each course is collected as part of analyses at the end of the academic year, and are used in determining the need for amendments to study programmes. Information is systematically collected from students in surveys and in evaluation of study programmes as a whole. These procedures are an integral part of the quality assurance system at the departments, and at the Faculty level. At the departments, this is managed by persons and bodies responsible for teaching, students and study programmes, while at the Faculty level, this is the responsibility of the Committee for quality assurance. Nearly all minor, major and significant amendments to study programmes have also included a change in ECTS credits, with the aim of better alignment with the actual student workload. In addition to raising or lowering the ECTS credits allocated to a certain course, significant attention has been given to redistributing student activities within courses in order to increase the share of independent work in integrated and graduate study programmes, and with that to give a more realistic assessment of the actual workload for students as expressed by the ECTS credits.

The most recent available data on the evaluation of undergraduate and graduate studies by students, who completed their studies in the 2018/19 academic year, indicated the need for continuous attention to the topic of aligning ECTS credits with the real student workload.

2.5.2.

Students are provided with feedback on the results of the analysis of gathered information and the implemented changes.

Student representatives included in department and faculty bodies responsible for quality assurance participate in the analysis of the collected data and decision on revising the allocation of ECTS credits. After the amendments to study programmes are approved by the Committee for quality assurance of the University of Zagreb, or the AZVO or MZO, new versions of the study programme are published on the department website, so the implementation changes are visible to students.

2.6. STUDENT PRACTICE IS AN INTEGRAL PART OF STUDY PROGRAMMES (WHERE APPLICABLE).

2.6.1.

The higher education institution allows for learning and obtaining new skills through student practice, where applicable.

Student practice at the Faculty is represented in the form of the compulsory course *Work practice* (Department of Geography), and methodological practice (teacher education specialisations). In the study programmes at the Departments of Biology, Geophysics, Geography and Geology, the *Field Course* is compulsory, while students at the Department of Biology can also enrol in the elective course *Laboratory expert practice*. As part of most study programmes, until 2020 there was no course dedicated solely to student practice. However, since 2020, as part of the project *Implementation and improvement of student practice at PMF – ProSPer PMF*, student practice in the form of traineeships for acquiring work experience was implemented and improved, in cooperation with institutions outside the higher education system.

The PMF Career Centre (URL 2_6_1_1) was established on 1 July 2020, and in the 2021/21 academic year, the elective course *Expert practice* was introduced in four undergraduate and 12 graduate study programmes in five departments, while the courses *Work practice* and *Laboratory practice* were improved. The Career Centre is the centre for communication among students, teachers and employers, and it provides administrative support for processes in setting up and carrying out expert practice.

Since the introduction of study programmes based on the Bologna system, the courses called *Work practice* is compulsory in the undergraduate research and graduate research study at the Department of Geography. Through the project *ProSPer PMF,* these courses were improved and the learning outcomes redefined, with a newly defined evaluation system. The system of evaluating learning outcomes will be carried out by the end of the 2020/21 academic year, while the amended learning outcomes will be applied in the next academic year, as possible.

Methodology practice for students in teacher education specialisations is carried out in accredited primary and secondary schools, and is organised and evaluated by the head of the methodological practice at the Faculty (ev. 2_6_1_1). This practice is executed by mentors, as experienced course teachers/ professors in primary and secondary schools, that hold the rank of teacher/professor mentor or advisor. During a semester, students are able to observe and analyse the work of mentors in a real classroom environment, and under the supervision of the mentor, they prepare and deliver up to 14 class hours with pupils. The number and structure of hours of methodological practice is defined by the study programmes. Monitoring and evaluating students during practice is defined and is dominantly of a formative nature.

The course entitled *Laboratory expert practice* is an elective course at the Department of Biology, in which students attain experience in practical work in the laboratories of the Faculty, and in scientific institutions with which the Faculty cooperates. The course entitled *Expert practice* was introduced in the undergraduate and graduate studies at the Departments of Biology, Geophysics, Geology and Chemistry, and in the graduate students at the Department of Mathematics, with the aim of deepening and expanding the knowledge and skills of students that are acquired through theoretical and practical education in the classic form of teaching, familiarisation with work processes in real work environments, and networking with potential future employers. Due to the specificity and diversity in the organisation of study programmes, the introduced courses are elective in the study core, or elective outside the study core (facultative), with a range of workloads (ECTS credits).

The expert and scientific-research work of the students of the Faculty is carried out in the laboratories and/or theory groups of partner institutions, during the drafting of seminar papers, or final or graduate theses, and as part of student projects. Most often, these are public scientific institutions situated near the Faculty, and with which the University of Zagreb has concluded cooperation contracts, as well as with other University constituents, other public scientific institutes, hospitals, departments and individual companies.

2.6.2.

Student practice is carried out in a

The selection of employers is systematic, taking into account the study programme from which the student is going to the student practice. Before the start of the student practice, a cooperation agreement is concluded with the employer, which ensures that

systematic and responsible manner, ensuring the achievement of intended learning outcome regarding student practice.

the student practice will unfold in a safe and previously agreed manner, and will achieve the previously set learning outcomes. During student practice, all students are insured against occupational hazards. During their practice, students are required to keep the Student practice logbook. Upon completion of the practice, they submit to course leaders the Confirmation of performed student practice and the Report on the performed activities, and filled out Questionnaire for mentor evaluation. Mentors fill out the Questionnaire for evaluation of the student in student practice. Upon successful completion of the student practice, the student receives the Confirmation of completion of practices with the achieved learning outcomes of their department (URL 2_6_2_1.

III. TEACHING PROCESS AND STUDENT SUPPORT (ESG 1.3., ESG 1.4., ESG 1.6.)

3.1. ADMISSION CRITERIA OR CRITERIA FOR THE CONTINUATION OF STUDIES ARE IN LINE WITH THE REQUIREMENTS OF THE STUDY PROGRAMME, CLEARLY DEFINED, PUBLISHED AND CONSISTENTLY APPLIED.

3.1.1.

The criteria for admission or continuation of studies are published.

The admission criteria for the first year of undergraduate, integrated undergraduate and graduate, as well as graduate study programmes at the Faculty of Science are established by the Faculty Council in October and November of the current year for the next academic year at the proposal of department councils (ev. 3_1_1_1). The criteria are presented at the University of Zagreb Fair and they are available on departmental web pages and in the calls and competitions of the University of Zagreb (ev. 3_1_1_2), For undergraduate and integrated study programmes, they are also available in the National System of Applications to Higher Education Institutions (NISpVU). Every year the presentation of criteria is also organised at the PMF Day and Night event, and at interested schools (URL 3_1_1_1).

The criteria for the continuation of studies and for the transfer from other study programmes are regulated by the Ordinance on studies, and the procedures are published on individual department websites. These criteria are regularly updated (ev. 3_1_1_3).

3.1.2.

The criteria for admission

The councils for the admission procedure at each department of the Faculty of Science consistently apply the criteria for admission or continuation of studies. The admission criteria include

or continuation of studies are consistently applied.

candidates' prior achievements and are given in the NISpVU and in the call for enrolment to the first year of candidates' prior achievements and are given in the NISpVU and in the call for enrolment to the first year of undergraduate and integrated study programmes, or in the text of the call and on ranking lists for admission to the first year of graduate studies, which are published on the individual department websites as defined by the Regulation on personal data protection.

Pre-Bologna students were given the possibility to continue their studies until the end of the 2018/19 academic year, and at the beginning of the 2019/20 academic year, they could transfer to Bologna study programmes (ev. 3_1_2_1).

The criteria for the continuation of studies at Bologna study programmes are consistently applied in line with the Ordinance on studies, subject to decision by competent department bodies and employees (ev. 3_1_2_2).

The competencies acquired in study programmes are the main factor that attracts potential candidates to apply for and enrol in study programmes at the Faculty of Science. The published admission criteria and their consistent application also contribute to a considerable interest in and to the attractiveness of the majority of study programmes.

Due to increased interest in enrolling certain undergraduate, integrated and graduate study programmes, admission quotas have been increased, in accordance with the personnel and spatial resources in place (ev. 3_1_2_3). Over the last five years, interest in enrolling certain teaching specialisation study programmes has decreased considerably.

3.1.3.

The criteria for admission or continuation of studies ensure the selection of candidates with appropriate prior knowledge, which is aligned with the requirements of the study programme.

The criteria for admission are aligned with the requirements of study programmes and ensure the selection of candidates whose prior knowledge is a good predictor of their future achievements. The criteria clearly indicate the conditions for the evaluation of success achieved in all subjects during high school education, the exam level of compulsory subjects at the state matura (exit) exam, the necessity to take exams in additional subjects and the manner of their evaluation, and the evaluation of additional achievements, principally results achieved at state and international competitions. For all undergraduate and integrated undergraduate and graduate study programmes, the candidates should pass the higher-level mathematics matura exam, while for six study programmes they should also pass the higher-level Croatian and foreign language matura exam. For nine study programmes,

in addition to the higher-level mathematics matura exam, the candidates should pass the basic level of Croatian and a foreign-language matura exam. For one study programme, the candidates should pass the higher-level mathematics and foreign language matura exam and the basic level Croatian matura exam. For 13 study programmes, the candidates should pass at least one additional subject. No additional checks of knowledge and skills are required for admission.

To enrol in graduate studies, criteria for candidates who have graduated from related undergraduate studies have been elaborated in detail in order to select the candidates with the appropriate prior knowledge. Furthermore, the aim of the obligation to take exams in differential subjects is to maximally standardise the entrance competencies (ev. 3_1_3_1).

The analysis of structure of candidates enrolled in all types and levels of study programmes is the starting point for any correction to admission criteria. Admission criteria and those for the continuation of studies are re-examined and as necessary corrected each year at the department level and verified by the Decision of the Faculty Council. The introduction of the threshold at state matura exam for the compulsory optional subject (e.g., grade “good” in physics for study programmes at the Department of Physics and grade “good” for study programmes at the Department of Geography), as well as a higher ratio of credits for state competition results (e.g. for study programmes at the Department of Geography) has proved to be a good practice in improving the pass rates during studies.

In the 2019/20 academic year, all study programmes of the Faculty of Science accepted 4095 students (see Analytical Appendix, Table 3.1). A decrease in the overall number of students of the final year of high school over the observed period impacted the interest in study programmes of the Faculty, so the total number of candidates applying for the first level study programmes dropped by 15 %. The decline of the students applying for teaching study programmes was greatest, while the interest in the undergraduate university study programme *Chemistry and Molecular Biology* (see Analytical Appendix, Table 3.2) has increased. The majority of graduate study programmes have been recorded a decrease in the number of applications. Admission quota for three study programmes have been reduced in the analysed period. A half of the graduate study programmes continue to be very attractive and completely full in the analysed period. The least attractive have been graduate teaching study programmes (see Analytical

Appendix, Table 3.3).

3.1.4.

The higher education institution has effective mechanisms for recognising prior learning.

Effective mechanisms have been put in place to recognise prior learning for students transferring from other study programmes or continuing their studies. The recognition of prior learning for students transferring from other study programmes has been regulated by Art. 16–18 of the Ordinance on studies. The decision on the conditions of transfer and the recognition of previously passed exams for each individual candidate is passed by responsible people and bodies in individual departments (ECTS coordinator, assistant head for teaching, department head, head of studies, Board for Teaching, Committee for Teaching). The list of recognised previously passed exams, earned ECTS credits and other fulfilled obligations and the list of differential obligations for each transferring student is entered into the decision on transfer or in the decision on the recognition of previous learning based on which these data are recorded in ISVU. The examples of decisions are available in (ev. 3_1_4_1).

The procedure for the recognition of fulfilled obligations and earned ECTS credits in horizontal mobility is regulated by the Ordinance on studies, and the procedure for the recognition of fulfilled obligations and earned ECTS credits in international mobility is regulated by the Ordinance on international mobility of the University of Zagreb, whose provisions are consistently and effectively applied.

3.2. THE HIGHER EDUCATION INSTITUTION GATHERS AND ANALYSES INFORMATION ON STUDENT PROGRESS AND USES IT TO ENSURE THE CONTINUITY AND COMPLETION OF STUDY.

3.2.1.

Procedures for monitoring student progress are clearly defined and available.

The procedures for monitoring student progress and the conditions for advancing to higher years of studies are defined by the Ordinance on studies; they are clear and available on the websites of the Faculty and individual departments. The lecture schedule (syllabus for all study programmes of the Faculty) specifies which subjects are the prerequisites for progress. The procedures for monitoring student progress in each subject are outlined in the course descriptions in the study programme overview.

During introductory lectures for first year students of undergraduate and integrated studies (freshmen), general study progress conditions are presented. At the subject level, each teacher meets their students and as appropriate discusses the ways for monitoring progress in that course. The procedures for

monitoring progress are updated before the beginning of each academic year and they are published in the Implementation plan on individual department websites (ev. 3_2_1_1).

3.2.2.

The information on student progress in the study prgramme is regularly collected and analysed.

The competent bodies of individual departments regularly analyse student progress during studies, especially from the first to the second year of studies. The results of progress analysis by study programme of the Faculty and the dynamics of graduation are available in Annual Report tables. The analysis of student progress by subject is carried out by the respective teachers and associates for each semester or each academic year. So far, there is no standardised form for the collection and archiving of such analyses.

3.2.3.

The higher education institution ensures adequate mechanisms for nalysing student performance and pass rates, and initiates necessary actions accordingly.

The analysis of performance and pass rates is discussed by competent departmental bodies and persons, and they propose the appropriate activities. One of the activities carried out to increase pass rates is the inclusion of the very best students in teaching as student demonstrators for exercises, practical work and seminars.

As necessary, students who have difficulties in mastering certain topics and who progress more slowly during their studies are offered support (see standards 3.4 and 3.5). Once lower pass rates from the first to the second year are established, bridging and differential subjects are organised to improve entrance competencies and, as stated above, the threshold pass rate for compulsory optional subjects in the state matura exam has been changed to ensure a better selection of candidates who will enrol the first year of studies. Detailed data on pass rates and graduation are available in the Analytical Appendix, Tables 3.4 and 3.5.

3.3. THE HIGHER EDUCATION INSTITUTION ENSURES STUDENT-CENTRED LEARNING.

3.3.1.

The higher education institution encourages various modes of programme delivery, in accordance with the intended learning outcomes.

In line with the anticipated learning outcomes and changes in teaching and learning paradigms, an increasingly stronger emphasis has been placed on the development of student generic competencies. Classes with students as active participants hold a major share in teaching processes, which are student-centred and foster the use of active learning methods. Work in small groups and pairs and individual mentor-guided work are encouraged, which results in inquiry-based learning and the communication of results (professional papers, scientific papers, dissertations and theses, papers for Rector's Award).

3.3.2.

Various teaching methods are used that encourage interactive and research-based learning, problem solving and creative and critical thinking (for example, individual and group projects, cooperative learning, problem-based learning, field work and other interactive methods).

Teaching methods that encourage interactive and inquiry-based learning, which is both the goal and the means in the development of scientific literacy, are planned in the analyses of study programmes. Methods are continuously upgraded and enriched with new approaches, new technologies and software. Learning through inquiry, discovery, problem solving and interactions with others encourages critical thinking, logical conclusions, creativity in concept development, interdisciplinarity in synthesising knowledge, communicating new ideas and assuming responsibility for results and progress as one of the components of self-regulated learning. Individual or group projects are student tasks in certain subjects in a number of study programmes. In addition to field courses, which are obligatory in study programmes in four departments, field work is an interactive teaching method in a number of courses. The upgrading of teaching methods is included in the amendments to study programmes. For example, the new subject *Inquiry and problem-solving based learning* was introduced to the undergraduate university study of Mathematics in the 2018/19 academic year.

3.3.3.

The HEI continually evaluates and adapts teaching methods and different modes of programme delivery.

The manner of delivering classes and teaching methods is continuously evaluated. At the end of each semester, they are evaluated not only by teachers and associates, but also by students (in discussions or surveys at individual departments). In order to obtain feedback on satisfaction with online classes in the summer semester of the 2019/20 academic year, the Student Council conducted a survey (URL 3_3_3_1). Systematic evaluation of classes and teaching methods is conducted in cycles by the University of Zagreb. The surveys cover all subjects in one academic year, or more often if necessary, for certain teachers and associates.

In addition to teachers, the evaluation results are made available

to the department head, assistant for teaching, or board for teaching, and these persons have all signed confidentiality agreements. If the survey analysis shows systematically low grades for certain survey elements, interviews are held with teachers and associates and possibilities for upgrading teaching methods are suggested. This is subject to follow-up.

3.3.4.

Teaching methods are adapted to a diverse student population (non-traditional student population, part-time students, senior students, underrepresented and vulnerable groups** etc.).*

Teaching methods are regulated by the Ordinance on studies and other University documents. In coordination with the services of the University of Zagreb and of the Faculty, all students, and particularly special student groups, can receive the assistance of student supervisors, head of studies, teaching assistants, deputy department heads, vice-dean for teaching. At the Faculty level, activities are coordinated by the coordinator for students with disabilities, who is also the contact person for students who want to exercise their rights to tailored classes and exams (URL 3_3_4_1).

3.3.5.

The higher education institution ensures the use of state-of-the-art technologies to modernise teaching.

In order to modernise teaching and provide the conditions requisite to achieve the planned learning outcomes, the use of state-of-the-art technologies and tools and e-learning systems has been enabled (ev. 3_3_5_1). Each department has computer rooms and laboratories with equipment available to both students and teachers (see Analytical Appendix, Table 4.8). Every year investments are made in upgrading computer programmes and software packages and in their maintenance. The list of software packages is given in ev. 3_3_5_2. The available equipment, together with other forms of support, has allowed for the classes and exams to be adapted to the consequences of the pandemic and earthquake that affected Zagreb in 2020. Additionally, in order to enable greater use of different equipment for teaching and research, an agreement has been concluded with the Zagreb University of Applied Sciences, which made its equipment available to students and teachers of the Faculty of Science. The course *Student practice* enables access to cutting-edge technologies through work placements and traineeships in different departments and in partner institutions (see standard 2.6).

Special attention is given to the education of teachers in the use of new technologies, organisation of classes under new conditions and improvements in the implementation of e-learning.

3.3.6.

Available and committed

In addition to regularly encouraging student activity during classes to increase their engagement and achieve the planned levels of competencies, students have access to consultations at least

teachers contribute to the motivation of students and their engagement.

once a week. Under regular, and especially under extraordinary studying conditions during the pandemic, students have access to different channels for communication with their teachers that enable continuous two-way communications with teachers and other associates in the education process. In addition to teachers and associates for every subject, peer support is provided by student-mentors, in coordination with student supervisors, teaching assistants and the vice-dean for teaching. Students also receive support from student assistants, selected each academic year at each department. Successful and highly motivated students are selected as student demonstrators.

3.3.7.

The higher education institution encourages autonomy and responsibility of students.

Autonomy and responsibility of students are encouraged by giving them independent assignments, seminars, projects, etc., and the feedback on the achievement of goals and planned outcomes is a form of the assessment for learning and an additional extrinsic motivation factor. Several examples, which are clearly visible from the very name of the subject, can be mentioned. One of these examples is the subject *Independent seminar on research in physics*, where students produce an independent research paper under mentorship, present it to their colleagues at mini conferences and participate in the evaluation of the presented paper in a discussion. Another example of encouraging student autonomy and responsibility is the subject *Independent field work* at the Department of Geology.

Students and mentors apply with their selected works for the Rector's Award, departmental awards and awards presented by professional associations. Over the last five years, 79 works of students of the Faculty have received the Rector's Award (URL 3_3_7_1). Some works are published in scientific and professional journals. In order to encourage and promote scientific and research professional development of students during studies at the Department of Chemistry, awards are presented to students for scientific research work arising from independent extracurricular scientific research. Autonomy, initiative and responsibility of students are also reflected in the activities of student associations, such as the Association of Biology Students, Student Section of the Croatian Physics Society, Club of Geography Students, Student Section of the Croatian Chemistry Society, the Association of the Faculty of Science Students, PRIMUS, etc. The activities of professional and student associations are financially supported by the Faculty and individual departments, while the staff offer their professional support (see standard 1.5.).

3.4. THE HIGHER EDUCATION INSTITUTION ENSURES ADEQUATE STUDENT SUPPORT.

3.4.1.

The higher education institution provides guidance on studying and career opportunities to students (for example, tutors, supervisors and other advisers as a support in student learning and progress).

Organized guidance on career opportunities is provided to students and future students via the Career Centre. At the department level, the appropriate support to students is provided by student supervisors, teaching assistants, deputy heads and Student Offices, while at the Faculty level, it is provided by the Vice-Dean for teaching.

Guidance and information on career opportunities are also provided at organised events such as a Career Day (WISe). In addition to instructions related to each course given at the beginning of classes, students can receive guidance on learning methods and progress during individual consultations, whose hours are published on each department website or the office doors of each employee, or by appointment with individual students.

3.4.2.

The higher education institution has established functional procedures for student career guidance, psychological and legal counselling, support to students with disabilities, support in outgoing and incoming mobility, and library and student administration services, at university or faculty level and students are informed about them.

Since the very first day of their student life, students are acquainted with the procedures and informed about the possibilities of career guidance, psychological and legal counselling and other forms of support, especially support for students with disabilities (introductory classes for freshmen). During introductory classes, students are acquainted with the work of student libraries, the Student Office and responsible persons at the department level that they can turn to for help and support. Psychological counselling during studies is provided to students via the Career Centre. In joining outgoing and incoming mobility programmes, students are supported by the International Office at the Faculty level, ECTS coordinators and other responsible persons at departmental levels and student offices, in cooperation with university offices.

Surveys on the evaluation of undergraduate studies by students who have graduated, and especially *Section B. Work of services and general conditions of studying at a higher education institution*, are a source of information about student satisfaction with the mentioned forms of support. Student surveys show high satisfaction (>4 on the scale from 1 to 5) with individual elements. Detailed survey results are available in ev. 3_4_2_1.

3.4.3.

Student support is tailored to a diverse student population (part-time students, mature

Student support is tailored to a diverse student population. Information is available in the Lecture Schedule, the information package, on the department websites, and during individual consultations. The report of the Faculty coordinator for students with disabilities shows the ways of support for special groups of

students, students from abroad, students from underrepresented and vulnerable groups, students with learning difficulties and disabilities, etc.).	students and the number of decisions underpinning such support (ev. 3_4_3_1).
3.4.4. *The higher education institution employs an adequate number of qualified and committed professional, administrative and technical staff.*	The Faculty employs 43 professional, 109 administrative and 64 technical staff. Restrictive employment measures and procedures for recruiting staff on fixed-term contracts make it difficult in certain situations to achieve an appropriate and necessary number of administrative employees for work with students. Detailed employee data are analysed in Section IV.

3.5. THE HIGHER EDUCATION INSTITUTION ENSURES SUPPORT TO STUDENTS FROM VULNERABLE AND UNDERREPRESENTED GROUPS.

3.5.1. *The higher education institution monitors various needs of students from vulnerable and under-represented groups.*	The information about enrolment conditions and procedures is available to students from vulnerable and underrepresented groups in the text of the call for enrolment and on department websites. From the time of enrolment of these groups, they receive support from the responsible persons and services at the Faculty level. In addition to the above stated forms of support, they are informed on how to exercise their rights, scholarships (P category) and other possibilities of support. Students from vulnerable and underrepresented groups are contacted individually to ensure the consistent implementation of the Personal Data Protection Act. The conditions for holding classes and other activities at the Faculty drastically changed from March 2020 to the end of the academic year. Consequently, a number of students were permitted a special approach to fulfilling their obligations and received appropriate support by responsible people and professional services.
3.5.2. *Teaching process is adjusted to the individual needs of students from vulnerable and under-represented groups.*	Following the collection of information on individual needs of students from vulnerable and underrepresented groups, teaching, other obligations and the manner of taking exams are adjusted in line with the decision of the Faculty coordinator. The process is in line with the University Regulation (ev. 3_5_2_1).

3.5.3.

The higher education institution invests resources in the support to students from vulnerable and under-represented groups.

The Faculty invests resources in the support to students from vulnerable and underrepresented groups by passing decisions on their exemption from the obligation to pay the costs of studies, field courses and other costs, depending on individual student needs (ev. 3_5_3_1).

The Faculty buildings at Bijenička ulica and some buildings on Horvatovac were adapted during their construction to meet the needs of students with disabilities. Investments in the removal of physical and other barriers at locations in the Lower Town are limited by the architecture of these buildings and their protection status. A long-term goal of the Faculty is to ensure funds for construction and other interventions to ensure maximum accessibility for students with disabilities.

3.6. THE HIGHER EDUCATION INSTITUTION ALLOWS STUDENTS TO GAIN INTERNATIONAL EXPERIENCE.

3.6.1.

Students are informed about the opportunities for completing part of their study abroad.

Students have the opportunity to gain international experience as part of the Erasmus+ (2014-2020) and CEEPUS III programmes, through bilateral agreements on the exchange of students between the Faculty of Science and partner institutions abroad, by joining various projects, by acquiring scholarships and by participating in student international and professional meetings. Outgoing mobility is regulated by the Ordinance on international mobility, Erasmus+ student charter, CEEPUS III agreement, bilateral exchange agreements, projects and scholarships from the Igor Štagljar fund (URL 3_6_1_1).

Students are informed about international mobility programmes via the website of the Office for International Relations and Project Monitoring of the Faculty of Science, department websites, personal contacts with the Office for International Relations, and with project managers. The competitions for study visits and internships, as well as the information about the possibility of drafting master's thesis at the Department of Biochemistry and Medical Genomics, University of Toronto for graduate students of the Department of Biology are publicly available. Over the last five academic years (from 2015/16 to 2019/20), 83 students participated in outgoing mobility programmes up to three months, and 421 students participated in outgoing mobility programmes of longer than three months (see Analytical Appendix, MOZVAG Table 3.6). In the same period, the Faculty received 21 students for incoming mobility programmes of up to three months, and 157 students for incoming mobility programmes of more than three months. A considerable part of shorter mobility programmes is

carried out within the CEEPUS III network.

3.6.2.

The higher education institution provides support to students in applying for and carrying out exchange programmes.

The Office for International Relations and Project Monitoring provides support to students in applying for international mobility programmes, and it provides administrative and organisational support to domestic and foreign students in carrying out exchange programmes. It also organises workshops and responds to individual student needs. The website of the Office contains the list or people who can be contacted by students from various departments for support. In addition to Vice Deans and the Office Head, students are supported by departmental ECTS coordinators, departmental coordinators for international cooperation, assistants or deputy department heads, student offices and teachers contacted by students.

Departmental coordinators help students in drafting Learning Agreements for Studies in order to enable them to smoothly acquire the planned knowledge and competencies during mobility programmes, and to carry out the procedure for the recognition of acquired ECTS credits and continue their studies at the Faculty upon return. The process of drafting of the Learning Agreement for Studies, realisation and recognition of taken subjects and passed exams is in line with the Ordinance on international mobility. Examples of Learning Agreements for Studies are given in ev. 3_6_2_1.

All activities that include counselling, administrative and organisational support in international mobility programmes are coordinated with the Office for International Cooperation of the University of Zagreb.

3.6.3.

The higher education institution ensures the recognition of ECTS credits gained at another higher education institution.

In line with the Ordinance on international mobility and following the completion of mobility programmes related to ERASMUS+, CEEPUS and other forms of international experience, students file a request with the Student Office. In accordance with the Ordinance, ECTS coordinators carry out the procedure of recognition of ECTS credits gained by passing exams at a foreign higher education institution defined in the Learning Agreement for Studies, by carrying out research activities related to the parent programme of studies or through student practice. Students are issued decisions on the recognition of fulfilled obligations and these decisions are forwarded to the Student Offices. In cooperation with the PMF Office for International Relations and Project Monitoring and the University Office for International Cooperation, Student Offices issue the necessary certificates and record ECTS credits and other obligations in the ISVU in line with the issued decisions and documents.

3.6.4.

The higher education institution collects information on student satisfaction with the quality of HEI's support regarding practical matters of student mobility.

Information on student satisfaction with the quality of support before, during and after mobility programmes is collected through informal interviews and continuous contacts with students. Students who studied at the Department of Biochemistry and Medical Genomics of the University of Toronto present their impressions on the website of the Department of Biology (URL 3_6_4_1). Students also share their impressions and experiences during faculty events and those of professional associations.

3.6.5.

Students gain competencies required for the employment in an international environment.

By participating in international mobility programmes, projects and scientific and professional meetings of students, they acquire knowledge and competencies required for employment in the international environment. Through study visits abroad, student practice, use of research equipment and cooperation with other students and teachers at host institutions, the Faculty of Science students improve their professional, linguistic and communication competencies, become acquainted with different educational environments, and establish contacts for future cooperation. This creates educational and cultural benefits both to host and parent institutions. International experience bolsters their competitiveness on the labour market both in Croatia and abroad.

Students also gain competencies required for work in an international environment during study visits of foreign students at individual departments of the Faculty, lectures and workshops given by guest lecturers and incoming mobility programmes of the teaching staff. For the majority of courses on all study levels, especially at the graduate level, students must use literature in foreign languages. They are therefore continuously in contact with both international experiences and practices and with foreign terminology, which facilitates their participation in mobility programmes. Additionally, students at all study levels can attend classes that are fully delivered in a foreign language. The list of subjects is available in the lecture schedule. Evidence of acquired competencies are exams passed within international mobility programmes which are not recognised as a substitute for exams to be passed as part of the Faculty study programmes, but they are entered in the Diploma Supplement (ev. 3_6_5_1).

Some students involved in international projects participate at international scientific conferences both in Croatia and abroad. A number of students is involved in organisational committees of conferences organised by the Faculty. The acquisition of

competencies for work in an international environment is also supported by co-authoring works with teacher mentors from the Faculty, or by giving independent presentations at international symposia. The acquisition of competencies for work in an international environment is also supported by field courses (as obligatory subjects) which take place at higher education institutions abroad (e.g., in Ljubljana and Vienna). Example in ev. 3_6_5_2.

3.7. THE HIGHER EDUCATION INSTITUTION ENSURES ADEQUATE STUDY CONDITIONS FOR FOREIGN STUDENTS.

3.7.1.

Information on the opportunities for enrolment and study is available to foreign students in a foreign language.

The information on the opportunities for enrolment and study is available in a foreign language on each department website. Interested students may obtain additional information in a foreign language in Student Offices and from the responsible persons (assistant head for teaching), both in oral and written form.

Studying within bilateral and multilateral agreements or projects is represented to a lesser extent. Foreign students regulate the courses they enrol in from undergraduate or graduate or from integrated undergraduate or graduate studies in their Learning Agreements for Studies, whereby they can combine courses from different study levels, from multiple Faculty departments or multiple constituents of the University of Zagreb. As this represents a considerable organisational challenge, the responsible persons and services from each department and University constituents where courses are taken are included in the process, and this is coordinated by the PMF Office for International Relations and Project Monitoring. The opportunities for enrolment in undergraduate or graduate or integrated undergraduate and graduate studies of the Faculty are regulated by enrolment quota for foreign students. As part of these quota, five students enrolled in undergraduate and two students enrolled in graduate studies over the last five years.

The number of students having used the opportunity to study in a foreign language was 21 in incoming mobility programmes up to three months, and 157 students in incoming mobility programmes of more than three months (see Analytical appendix, MOZVAG Table 3.6).

3.7.2.

The higher education institution collects

In order to encourage and improve outgoing and incoming mobility programmes, the Faculty established the PMF Office for International Relations and Project Monitoring in 2009. Additionally, foreign students are provided support during application and

feedback on satisfaction and needs of foreign students.

their studies by the Vice-Dean for international cooperation, Faculty ECTS coordinator, departmental ECTS coordinators, departmental coordinators for international cooperation, Student Offices at each department and other responsible people and services. Like outgoing mobility programmes, incoming mobility programmes are carried out in cooperation with the Office for International Cooperation of the University of Zagreb.

Faculty staff and departments provide support to foreign students during their studies in Croatia or during other organized visits.

3.7.3.

The higher education institution collects feedback on satisfaction and needs of foreign students.

Feedback on satisfaction and needs of foreign students is collected via informal interviews and continuous contacts with students during their stay in Croatia. Feedback on satisfaction of foreign students is partly obtained from the next generation of students who chose to study at the Faculty on the basis of recommendations of their predecessors.

3.7.4.

Foreign students have the opportunity to attend classes delivered in a foreign anguage (English).

Classes in English throughout the study programme will be delivered only in the graduate university study programme *Biomedical Mathematics*, and as necessary will be delivered at each of doctoral study programmes. It is possible to attend all classes in English for courses listed for each academic year at the end of the Lecture Schedule. For other courses given in the Learning Agreements for Studies, and for students enrolled within the foreign student quota, classes will be delivered in English if five or more students are enrolled. For a smaller number of students, classes will be delivered for foreign students only. If only one foreign student is enrolled, regular consultations are held weekly thus ensuring a strong individual approach.

3.7.5.

Croatian language courses are delivered for foreign students at the level of the university or university constituent.

Foreign students are invited, as part of their mobility programme, to take a Croatian language and culture course at Croaticum – Centre for Croatian as a Foreign Language at the Faculty of Humanities and Social Sciences of the University of Zagreb. Student associations also provide support to foreign students in learning Croatian and becoming acquainted with cultural and other specificities.

3.8. THE HIGHER EDUCATION INSTITUTION ENSURES AN OBJECTIVE AND CONSISTENT EVALUATION AND ASSESSMENT OF STUDENT ACHIEVEMENTS.

3.8.1.

The criteria and methods for evaluation and grading are clear and published before the beginning of a course.

The criteria and methods for evaluation and grading are clear and published in the syllabus on department website pages before the beginning of each academic year, and in the ISVU and during the introductory classes of each course. Evaluation procedures and techniques are adjusted to the status of individual departments following the decision on delivering online classes and the earthquake in Zagreb in March 2020.

3.8.2.

The criteria and methods for evaluation and grading are aligned with the teaching methods used.

The criteria and methods for evaluation and grading are to a great extent aligned with the teaching methods used, which is confirmed by students in general study evaluation surveys. Uniform criteria in certain courses and the number of exam periods in individual departments are areas where improvements are possible and necessary.

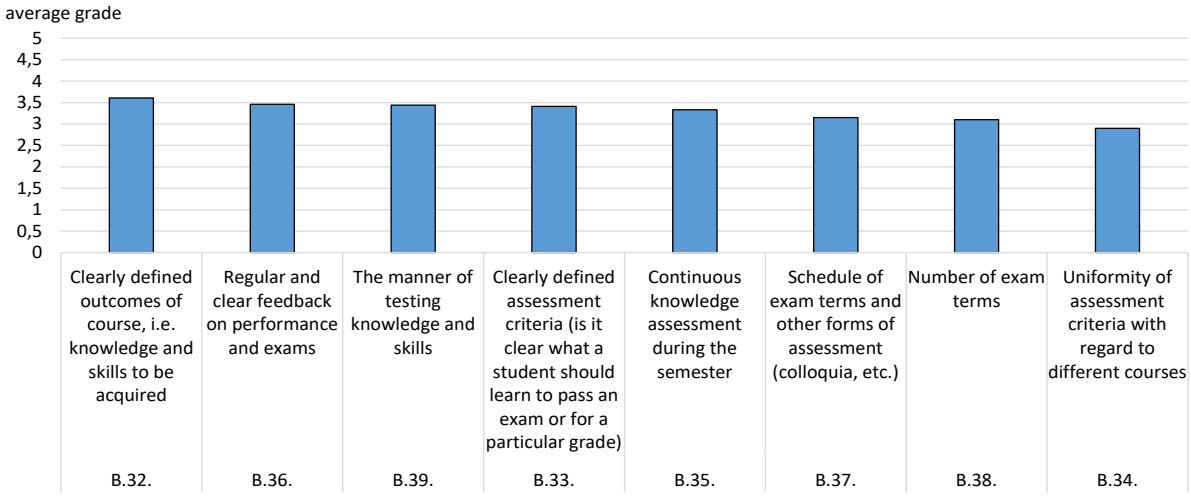

FIGURE 10. EVALUATION OF UNDERGRADUATE STUDIES BY STUDENTS WHO COMPLETED THEIR STUDIES IN THE 2019/20 ACADEMIC YEAR

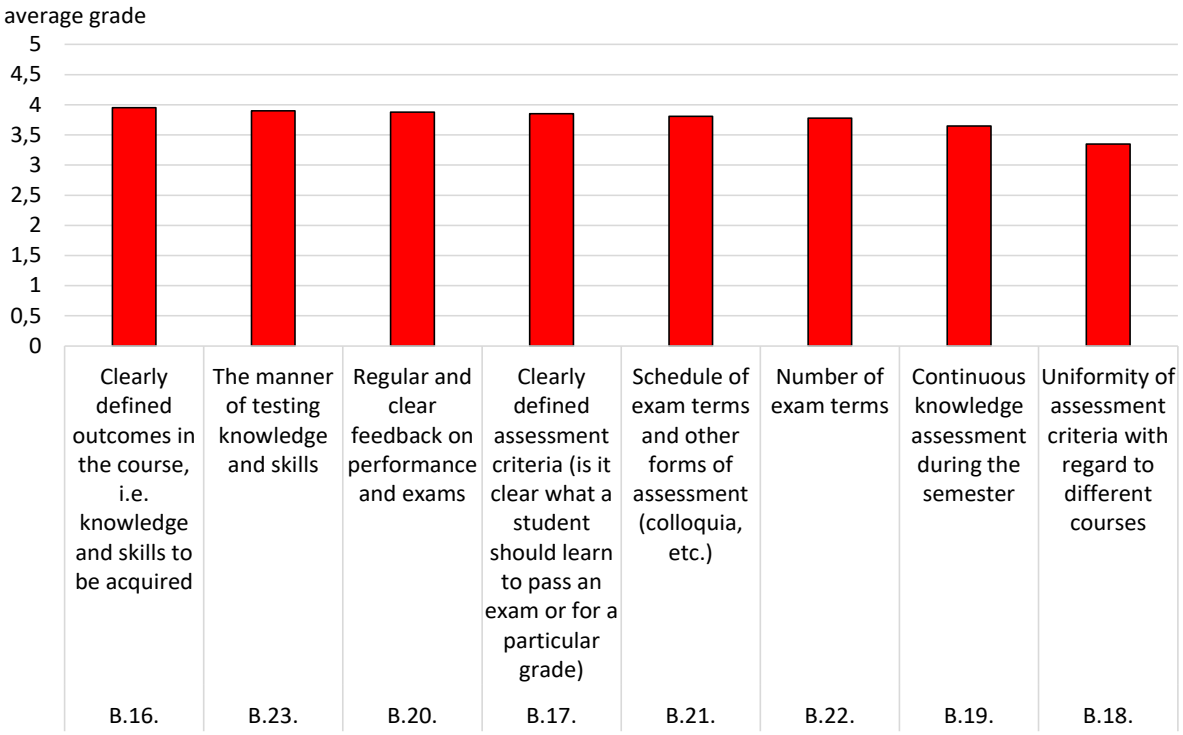

FIGURE 11. EVALUATION OF GRADUATE STUDIES BY STUDENTS WHO COMPLETED THEIR STUDIES IN THE 2018/19 ACADEMIC YEAR

3.8.3.

The higher education institution provides support to the assessors in the development of skills related to the testing and assessment methods.

The Faculty provides support in the development of skills related to the testing and assessment methods. To this end, workshops are organised occasionally, and the assessors are encouraged to join other forms of education according to their choice. The evaluation of studies by students indicates that continuously organised activities by the Faculty are a must, especially in order to standardize evaluation criteria.

3.8.4.

The higher education institution ensures objectivity and reliability of grading.

Student feedback on the objectivity and consistency in grading is collected and analysed not only on the basis of the overall study evaluation surveys, but it is also collected and discussed at the meetings of student supervisors with students.

In order to ensure maximum objectivity and reliability of grading, the Ordinance on studies has anticipated the student complaint procedure. If students take their exams for the fourth and the eighth time, they do this before a committee that carries out additional checks on and grading of all parts of the exam. Committee members for individual courses are appointed at Department Council meetings at the beginning of the academic year (committee exams).

3.8.5.

If possible, the higher education institution carries out the evaluation of grading.

So far, the Faculty has not carried out a standardised evaluation of grading.

3.8.6.

The evaluation procedures take into account special circumstances of certain groups of students (modifying examination procedures to suit e.g. students with disabilities), while at the same time ensuring the achievement of intended learning outcomes.

The evaluation procedures take into account special circumstances of certain groups of students, which is visible from the report by the coordinator of students with disabilities and the person that students can contact to exercise their rights related to modifying classes and examination procedures and other issues related to the rights of students with disabilities (see standard 3.5). The evaluation procedure is carried out at the University and delivered to the Faculty.

3.8.7.

The students receive feedback on the evaluation results, and if necessary, guidelines for the learning process based on these evaluations.

Students receive feedback for each continuous evaluation procedure and for each written and oral exam. As necessary, they receive advice related to the learning process during individual consultations. Since the 2019/20 academic year the possibility of counselling has been institutionalized and students can contact the Career Centre. The evaluation of study programmes by graduates (Figures 1 and 2) shows that students are very satisfied with the feedback.

3.9. THE HIGHER EDUCATION INSTITUTION ISSUES DIPLOMAS AND DIPLOMA SUPPLEMENTS IN ACCORDANCE WITH THE RELEVANT REGULATIONS.

3.9.1.

Upon the completion of their studies, students are issued appropriate documents (diploma and Diploma Supplement).

Upon completion of undergraduate, graduate and integrated studies, students are issued diplomas and diploma supplements in both Croatian and English. Immediately upon completion, students receive the certificate of completion, and the diploma is awarded at a formal public ceremony.

3.9.2.

Diplomas and Diploma Supplements are issued in accordance with relevant regulations.

Diplomas and diploma supplements are issued in accordance with the Ordinance on the content of diplomas and diploma supplements (Consolidated Text, Official Gazette 77/08 and 149/11) and in accordance with the Ordinance on studies.

3.9.3.

The higher education institution issues the Diploma Supplement in Croatian and English, free of charge.

Upon completion of studies, the diploma supplement is issued together with the diploma. The printing of the diploma (together with diploma supplement in Croatian and English) is charged as regulated under the Fees for costs of services from the scope of Faculty activities (URL 3_9_3_1).

3.10. THE HIGHER EDUCATION INSTITUTION IS COMMITTED TO THE EMPLOYABILITY OF GRADUATES.

3.10.1.

The higher education institution analyses the employability of its graduates.

The Faculty continuously analyses the employability of its graduates and records the status in the substantiated proposal of quota for graduate studies for the next academic year. One of the sources it uses in the analysis are the data of the Croatian Employment Service on monthly changes in employment, unemployment, unemployment rates and employment rates in Sector *XV. Mathematics, physics, geography, geophysics, chemistry, biology*, as well as in Sectors *III. Mining, geology and chemical technology (subsector Mining, geology)*, *VII. Electrical engineering and computing (subsector Computing)* and *XVI. Basic technical sciences of the Croatian Qualifications Framework*, which are presented on www.kvalifikacije.hr.

The status at the annual level is determined on the basis of annual analyses and forecasted market demand for individual professions in the following year, which the Croatian Employment Service publishes at the end of the year in the Recommendations for Education Enrolment and Scholarship Policy.

Long-term trends in employability are visible from the *Network of Higher Education Institutions and Study Programmes in the Republic of Croatia*, which was published by the National Council for Higher Education in 2011.

3.10.2.

Admission quotas are aligned with social and labour market needs and available resources.

Admission quotas are aligned with social and labour market needs and available resources.

The data of the Croatian Employment Service about monthly fluctuations in employment, unemployment, employment and unemployment rates show a very low and mainly short-term unemployment of Faculty graduates. This is also supported by data on the annual level (see Analytical appendix, MOZVAG Table 3.7).

Over more than a decade, the *Recommendations for education enrolment and scholarship policy* and the *Network of Higher Education Institutions and Study Programmes* have shown a deficit in experts of all science profiles, especially mathematicians and physicists. The graduates of teaching study programmes find jobs very quickly. According to the recommendations of the Croatian Employment Service, teaching study programmes are listed as those programmes where the number of enrolled students and those receiving scholarships should be increased in the majority of Croatian regions, and none of these programmes are on the list of those whose numbers should be decreased.

The employee structure is described in detail in Section IV. Values of the student-teacher ratio over the last five years have been stable, and the values of the student-teacher/associate ratio have been around the 13, slightly fluctuating from one academic year to another. This ratio is in line with Article 6 of the *Ordinance on the contents of the licence and the requirements for issuing the licence for performing activities related to higher education, study programmes and reaccreditation of higher education institutions* (Official Gazette, 24/10) and Article 5 of the *Ordinance on the procedure of evaluation of study programmes of undergraduate, graduate, integrated undergraduate and graduate and vocational studies of the University of Zagreb* on the maximum number of 30 students per one permanently employed teacher and associate (without external associates).

3.10.3.

The higher education institution informs prospective students about the opportunities

The Faculty uses different ways to inform prospective students about the opportunities to continue education or find employment after graduation. Departments post basic and current information about studying and employment on their websites. Leaflets, brochures and a promotional video are also available. The *PMF Day and Night* event comprises of the *Biology*

to continue education or find employment after graduation.

Night, Geophysics Live, Physics Today, Open Door Day of the Department of Geography, Open Door Day of the Department of Geology, Open Door Day of the Department of Chemistry and *Open Door Day of the Department of Mathematics* (URL 3_10_3_1). The aim of the popular science lectures and educational workshops is to attract youth to science and for the enrolment of some of the study programmes at the Faculty. Visitors become acquainted with the work of scientists by visiting laboratories and other Faculty premises intended for teaching and research. The types of jobs that can be performed by graduates are also presented. The information about this event and other events is available on social networks and covered by the media. The *PMF Day and Night* event attracts several thousands of participants from all counties of the Republic of Croatia. Like many other activities, the 2020 event was postponed due to the spread of the corona virus, and prepared activities will be available online in 2021.

A larger amount of information about studying and partly about employment can be obtained through personal contacts every year at the Zagreb University Fair. Through its joint appearance and presentation of individual departments and study programmes, the Faculty attracts a large number of high school graduates from all over Croatia. Individual and group awards have been presented to the Faculty for its presentations at the Fair (URL 3_10_3_2)

The central event dedicated to informing and acquainting the students from all departments with the labour market is Career Day (WorkIn' Science or WISe). The students and employees from the Faculty come in contact with the companies offering employment opportunities both during and after studies, and opportunities for continuing education in Croatia and abroad. The events having the similar contents and goals are also held at individual departments (e.g., Meet the mathematicians). In recent years, study programmes from the STEM field, opportunities for continuing academic career and employment opportunities have bee also presented in schools, museums, etc. The activities were coordinated and carried out by the Vice-Dean for Teaching, department heads and teachers from all departments.

3.10.4.

The higher education institution provides students with support regarding future career planning.

The Career Centre organised within the Dean's Office provides continuous support to students in different areas including student practice and traineeships, career counselling and psychological support. The Service for Career Counselling encourages and directs students in developing career management skills, and in increasing employability and competitiveness on the labour market.

3.10.5.

The higher education institution maintains contacts with alumni.

Contacts with alumni are held at annual events of the Faculty and individual departments, at symposia organised by professional associations in cooperation with Faculty departments and via alumni clubs. The Alumni Club of the Department of Biology (URL 3_10_5_1) was established to protect the interests of the biology profession through connections and cooperation among biologists who graduated from the Faculty of Science after 1946. Alumni also form a group All Biologists (URL 3_10_5_2). The Alumni of the Department of Mathematics have a similar mission – strengthen the connections among alumni by providing additional opportunities for establishing connections, networking, cooperation, labour market analysis and mathematical pre-tertiary education, popularisation of science and inclusion of students in the labour market (URL _3_10_5_3)

Contacts with alumni are made at the already mentioned Career Day, similar events at departments, round tables, weekly, monthly and annual events taking place at the Faculty's premises (Geography Monday of the Croatian Geography Society, professional-methodology evenings of the Teaching Section of the Croatian Mathematics Society, activities of the Teaching Section of the Croatian Physics Society) or in cooperation with the Faculty and individual departments (congresses of maths teachers, winter seminar for geographers, summer seminar for geographers). Contacts with alumni are also maintained at other events organised or co-organised by the Faculty, e.g., competitions and festivals in mathematics, physics, chemistry, biology and geography, at lectures and workshops at county and intercounty professional councils, at state meetings organised by the Education and Teacher Training Agency and the Agency for Vocational Education and Adult Education, during the activities of the National Centre for External Evaluation of Education. At the invitation of alumni, Faculty staff also hold lectures and workshops in certain schools.

By establishing the Service for Cooperation with Alumni, these contacts will be strengthened and cooperation expanded to all students who have graduated from the Faculty of Science and who are willing to contribute with their engagement to the promotion of the Faculty.

IV. TEACHING AND INSTITUTIONAL CAPACITIES (ESG 1.5., ESG 1.6.)

4.1. THE HIGHER EDUCATION INSTITUTION ENSURES ADEQUATE TEACHING CAPACITIES

4.1.1.

The number and qualifications of teachers are appropriate to the delivery of the study programme, the achievement of the intended learning outcomes, and performance of scientific activity.

The number and qualifications of Faculty teachers are consistent with the requirements of delivering the current study programmes and the achievement of the learning outcomes envisages by the programmes. In the 2019/20 academic year, the delivery of 43 study programmes at the Faculty (9 undergraduate, 18 graduate, eight integrated undergraduate and graduate programmes, and eight postgraduate programmes) involved the participation of a total of 122 full professors, 70 associate professors, 96 assistant professors, two tenured scientific advisors, 41 postdoctoral researchers, 137 researchers (assistants), 10 project staff, 44 expert associates, 12 teachers (teaching ranks) and 213 external teachers in all scientific-teaching and teaching ranks (see: Analytical appendix, Table 4.1a). Teachers engaged in delivering courses are subject to appointment to the appropriate domains and fields of science (see: Analytical appendix, Table 4.3) and are active in their domain of science (Analytical appendix, MOZVAG Table 4.4) which indicates that they possess the necessary competence and knowledge to successfully deliver the courses and perform research activities. Over the past five years, 77 teachers have been recruited and 33 have retired (see: Analytical appendix, MOZVAG Table 4.2), which indicates an ongoing concern for the quality and sustainability of the teaching programme, and the monitoring and planning of staffing policy focused on sustaining a high level of teaching capacity quality.

4.1.2.

The ratio of students and full-time teachers at the higher education institution ensures a high quality of study.

There were 4,095 undergraduate and graduate students in the 2019/20 academic year. Taking into consideration the Faculty teachers (full, associate and assistant professors) the ratio of teachers to students is 1:14.2. External teachers and associates are hired on an as-required basis with the objective of improving the quality of studies and in the interest of the better education of our students. As a rule, due to the specific competences they possess, external associates participate in the delivery of advanced courses in graduate and postgraduate studies, where the share of such courses is greater. Further, the teaching of physical and health education involves the participation of two Faculty employees and one external associate. Training and educating its staff are long-term strategic objectives of the Faculty,

and these external engagements are largely temporary. Associates from the real sector are an exception, as they transfer practical experience to our students. Following on decisions of a body responsible for the organisation of teaching (e.g., committees for teaching at the departments), the Faculty Council decides on the need to engage the services of external associates, and the Faculty seeks the consent for the engagement of external associates from their parent institutions. It should be noted that the engagement of external associates is not the result solely of a shortfall in staffing capacity of the various departments; rather it meaningfully contributes to improving teaching and research activity and the transfer of knowledge and skills, especially with regard to the application of the specific knowledge and competences of individual sectors. Thus, the Faculty will continue to nurture and improve its work with external associates in specialised elective courses at the graduate and postgraduate level studies, in mentorship work with students attending methodology and student practice and traineeships, and in field courses, and in the production of graduate papers and doctoral dissertations.

Lectures are usually held in a single class group. The exceptions are mandatory lecture courses in first year undergraduate and graduate studies with high numbers of enrolled students that require lectures, seminars and laboratory exercises to be organised in coordinated parallel shifts. During the first years of study, most departments stage lectures in lecture halls that afford students a clear overview during instruction; however, this form of classroom teaching also leads to student passivation and reduced active participation in classroom instruction. In the later years of study programmes, with multiple specialisations and fewer students, lectures are staged in smaller groups, which allows for the more active participation of students in classroom instruction and significantly contributes to the effectiveness of the teaching process.

4.1.3.

Teacher workload is in line with relevant legislation and policies, regulations of competent bodies, collective agreements, etc.

Information on courses, course leaders and course workload are available for each study programme at all levels on each department website, as are the lecture schedules. The course workload of engaged teachers (see: Analytical appendix, Table 4.3) is consistent with what is envisaged in the legislation and the Collective Agreement covering science and higher education.

4.1.4.

Teacher workload ensures appropriate distribution of teaching, scientific/artistic activities, professional and personal development and administrative duties.

The teacher workload (see: Analytical appendix, MOZVAG Table 4.3) and the share of working hours dedicated to scientific research and administrative and institutional duties are consistent with what is envisaged in the legislation and the Collective Agreement covering science and higher education. This ensures quality instruction, and the continued involvement of teachers in research activity ensures that teachers are informed of the latest findings and achievements in their field of activity. Dedication to research activity provides for the professional and personal development of teachers and the transfer of acquired knowledge and competence to students, and maintains the high educational and scientific standards.

4.1.5.

Teachers are qualified for the course(s) they deliver.

Teachers engaged in the delivery of instruction are subject to appointment to the appropriate domain and field of science (see: Analytical appendix, MOZVAG Table 4.3) and possess the appropriate competence and knowledge to teach the subject for which they have been engaged. The criteria for appointment and re-appointment of teachers and associates of the Faculty of Science to scientific-teaching, teaching and associate ranks include the candidate's scientific, specialist and teaching work, and engagement in the advancement of the activities of the department, faculty, university, and social engagement. The candidate's teaching dimension is also assessed, with particular attention paid to published teaching materials (textbooks, scripts, supporting materials and e-learning materials), mentoring of the bachelor's final thesis and graduate theses, and student opinion scoring (as expressed in anonymous teacher evaluation surveys). Further, through ongoing scientific research work and international collaboration teachers achieve further training and acquire insights into research trends and achievements in the subject area they teach, which maintains the high quality of instruction and the modernisation of teaching content.

4.2. TEACHER RECRUITMENT, ADVANCEMENT AND RE-APPOINTMENT IS BASED ON OBJECTIVE AND TRANSPARENT PROCEDURES WHICH INCLUDE THE EVALUATION OF EXCELLENCE

4.2.1.

Teacher appointment (recruitment) procedures arise from the development goals of the higher education institution and they are aligned with the legislation and internal regulations in effect.

The hiring of new and advancement of existing Faculty staff is limited by the system of job complexity coefficients in force in Croatia, with a permanent total number of coefficient slots allocated to each institution. This means that new hiring or the promotion of scientific-teaching staff is only possible at the expense of coefficient slots that are freed up by the departure of an employee from the Faculty into retirement or elsewhere, which limits the opportunities for the hiring of new Faculty of Science staff, and hampers planned promotion to scientific-teaching ranks in spite of excellence in research and surpassing the national standards for scientific productivity many times over. Recent years have seen the hiring of a significant number of young staff outside the current coefficients system. These are doctoral researchers working on research projects (CSF) and associates in competitive specialist projects (national and international). For the most part their contracts do not, however, foresee their engagement in delivering courses.

Staffing policy follows the guidelines set out in the Faculty's strategy. The hiring of new staff is entirely in line with the criteria set out in the Scientific Activity and Higher Education Act, the Ordinance on the conditions for appointment to scientific ranks of the National Council for Science, higher education and technological development, and in acts of the University and the Faculty. The procedure for appointment and hiring at the Faculty of Science is set out in the Faculty Statute, elaborated in detail in the Ordinance on appointment to academic grades (ranks) and work posts at the Faculty of Science in Zagreb, which is accessible to the public on the Faculty website. Some departments have additional regulations and bodies covering staffing policy: for example, the Department of Mathematics has set up an Advisory Board on advancement and recruitment (ev. 4_2_1_1) that has been tasked with advancing research work and shaping staffing policy, while the Department of Chemistry and the Department of Geology have adopted additional rules on further requirements for appointment to (scientific-teaching, teaching, and associate) ranks and the appropriate work posts, which stipulate additional requirements for appointment to each rank and work post (ev. 4_2_1_2 and ev. 4_2_1_3).

The procedure of advancement or recruitment to a new post begins with the call for applications issued by the Faculty of

Science Council, following the procurement of the necessary consent and securing the required coefficient slot (ev. 4_2_1_4). The work post in question must also be present in the current Ordinance on the organisation of work posts (URL 4_2_1_1). Calls for applications are published in the Official Gazette, the daily press, on the Faculty's website, and on the official European research space jobs internet portal (EURAXESS). The call for applications must be open at least thirty days.

4.2.2.

In selecting, appointing and evaluating teachers, the HEI takes into account their previous activities.

In their applications, applicants are required to, among other things, submit data on their formal education and achieved academic grade (rank), employment and functions held to date, scientific training, recognitions and prizes, and their activities as teacher, researcher or expert. Applicants submit copies of their scientific publications, noting their most significant papers and achievements, and indicate their contribution in co-authored work, describing the value of these works and their impact in the global literature.

4.2.3.

The higher education institution has adequate methods for the selection of the best candidates for each position and, in addition to the prescribed national minimum conditions for each position, it has prescribed competitive criteria ensuring the selection of excellent candidates.

An expert committee appointed by the competent department council receives the submitted applications and, taking into consideration all relevant aspects of applicant activities, produces a structured report for each applicant on their fulfilment of the scientific, teaching and expert criteria. The committee gives its opinion of each candidate and recommends the selection of the candidate that best meets the call requirements. The report is submitted to the Faculty Council via the competent department council, with all reviewed material, and the reports are accessible on the Faculty Council website. All tender applicants are notified as to the selected applicant and, following the appeal period, an employment contract is signed. The results of the tender procedure are published for general public access.

4.2.4.

The promotion of teachers into higher grades is based on the evaluation and rewarding of excellence and the HEI takes into account important achievements.

An expert committee of three members holding the appropriate academic ranks evaluates the materials received for the advancement of a teacher to a higher academic grade (rank), with no more than two committee members being Faculty employees. Particular attention is afforded to the publications the applicant has indicated as having the greatest value, and the applicant's contribution to co-authored works is evaluated, as is the applicant's overall impact in the scientific literature. Detailed scientometric data (citation, impact factors, journal quartiles by category), certified in the relevant libraries, are also taken into account. The results of student assessment of teaching are also a mandatory component (see: topic I, standard 1.1, elements of the standard 6).

4.2.5.

Indicators of excellence include scientific/ artistic, teaching and professional work and contribution to the development of the higher education institution.

As an indicator of excellence, the applicant must submit with their application a curriculum vitae providing personal information, information on foreign language fluency, previous employment, scientific training and membership and posts in professional associations, organisations and institutions, and the following: information on recognitions and prizes received, information on the area of activity in science and teaching, information on intentions in further activity, information on published papers and categories, detailed scientometric data, a list of publications (evaluation papers, scientific papers, professional papers, monographs, textbooks), a list of participation in scientific and specialist meetings (invitational and sectional lectures), a list of lectures at institutions, a brief description of scientific and specialist results noting the applicant's contribution to co-authored works and an explanation of the value of these works and their impact in the global literature. Particular attention is also afforded to leadership in international and national research projects or participation in the activities of such projects, forging international collaborations, mentorship for graduate papers and doctoral dissertations, recognitions and prizes received, and activities undertaken to popularise the sciences. Evaluated along with scientific, specialist and teaching activity is the engagement of the applicant in advancing the activity of the Faculty, the profession, science and education, and their social engagement.

4.2.6.

Additional criteria for the promotion of teachers into higher grades reflect the strategic goals of the higher education institution.

Teacher advancement to higher academic ranks is done via the authorised department Council, which submits a proposal to the Faculty Council to issue the appropriate call for applications, in line with department staffing policy as established by the expanded department collegium. It also necessitates secured funds for the higher academic rank and the appropriate work post. In addition to the achieved scientific, expert and teaching results, the selection of candidates also takes into account their intention of further activity, which an applicant must state in their application.

4.3. THE HIGHER EDUCATION INSTITUTION PROVIDES SUPPORT TO TEACHERS IN THEIR PROFESSIONAL DEVELOPMENT

4.3.1.

The higher education institution provides opportunities for the improvement of teaching competencies at the level of the university or university constituent.

The Faculty invests effort to provide for the advancement of the competences of teachers, which is predominantly achieved, due to the specific nature of the professions, at the department level. Workshops are organised at the premises of the various departments, outside the Faculty (largely at the various University constituents), and at universities abroad, to which end the teachers are regularly notified by way of the Office for International Cooperation and Project Monitoring. It is particularly noteworthy that, in relation to the previous reaccreditation period, there has been growth in teacher interest and presence at workshops that aim to advance teacher competence and improve support for student learning, such as workshops on writing learning outcomes in the frame of the ProSPer project (instruction and evaluation focused on learning outcomes, education on socially beneficial learning), and workshops on the European and Croatian qualifications frameworks, the production of professions, qualifications and curriculum standards, and defining competences, groups of competences and defining learning outcomes and the method of their verification in the frame of the EkoRaMA project (three workshops in September and October 2015).

Furthermore, the Faculty regularly enables professional training for its non-teaching staff by sending its employees to courses and workshops that aim to advance their competencies in the area of work they are responsible for at the Faculty (see: Analytical appendix, MOZVAG Table 4.6).

4.3.2.

The higher education institution encourages the assessment and improvement of teaching competencies based on the peer-review recommendations and the results of student satisfaction surveys.

The assessment of teacher competences is performed on the basis of student surveys for individual types of study programmes (undergraduate, graduate, and integrated) conducted by the University of Zagreb's Office for Quality (the most recent survey was in the 2019/20 academic year, with results published on 10 January 2020). Student surveys are described in detail under topic I, standard 1.1, element standard 6. The Faculty Committee for quality assurance, and Committee for teaching systematically monitor the implementation of study programmes, and there is open discussion at the Faculty concerning all core issues related to the teaching process aimed at its improvement (the delivery and quality of classroom instruction, activities, student success rates, etc.).

4.3.3.

Teachers participate in international mobility programmes, projects, network, etc.

Teachers at the Faculty of Science are notified in a regular and timely manner of tenders under which they can apply to achieve mobility, with their colleagues and the Faculty (department) administration providing support with regard to the performance of their current teaching obligations. In relation to the previous reaccreditation period (p. 317, table 6.1. Faculty of Science self-evaluation 2015), there has been an increase in teacher mobility, especially in the frame of the international mobility programmes (Erasmus+, CEEPUS). Mobility data is shown in table 4.5 of the Analytical appendix. Particularly noteworthy is the very high rate of growth in the participation of teachers of the Faculty of Science in the COST programme via COST Actions – research platforms for scientific research networking.

PMF teachers use their right to a sabbatical year in accordance with the Ordinance on the use of the sabbatical year, and the decisions adopted by the department councils. In the past five academic years, 19 teachers have taken a sabbatical year.

With regard to motivating its teachers to increase scientific production, the Faculty of Science has, in light of the differences of the professions, set up a decentralised system of rewarding scientific excellence, with each department council independently adopting ordinances or decisions stipulating the terms under which scientific excellence is rewarded (ev. 4_3_3_1).

As part of its efforts to advance participation in technology transfer projects the Faculty of Science is currently setting up its Patents Fund. The Faculty of Science encourages and supports applications for and the implementation of technology transfer projects, providing administrative, specialist and funding support to patent applications.

4.4. THE SPACE, EQUIPMENT AND THE ENTIRE INFRASTRUCTURE (LABORATORIES, IT SERVICES, WORK FACILITIES ETC.) ARE APPROPRIATE FOR THE DELIVERY OF STUDY PROGRAMMES, ENSURING THE ACHIEVEMENT OF THE INTENDED LEARNING OUTCOMES AND THE IMPLEMENTATION OF SCIENTIFIC/ARTISTIC ACTIVITY.

4.4.1.

The higher education institution plans and improves the infrastructure development, in line with the strategic goals.

Great attention is afforded at the Faculty to infrastructure development and to reducing the spatial dislocation of department buildings. In the frame of annual financial plans, infrastructure improvement is aligned with strategic documents: Faculty Development Strategy (specific goals 4.1 and 4.2) and SciStrat (goal 6). In accordance with specific goals 4.1 and 4.2, there are plans for the construction and improvement of infrastructure under the Northern Campus project (part related to the Faculty), including: resolving property and legal matters required for the construction of the complex of the Departments of Biology, Geography and Geology (BGG), for the expansion and extension of the Physics and Geophysics building, and preparations for a location permit for C2AMN, and improving and modernizing the scientific infrastructure. A number of key strategic goals were achieved in 2018 in line with goal 6 concerning the construction of modern and advanced scientific infrastructure. A bilingual Croatian/English Catalogue of Scientific Equipment and Computer Programs (URL 4_4_1_2) has been published. The same year saw the approval of the CIuK and CeNIKS infrastructure projects, submitted within the frame of the public call for proposals issued by the Ministry of Science and Education in December of 2015 for the preparation of infrastructure projects for the 2014–2020 European Regional Development Fund. The CluK project is worth HRK 71,620,005.91, of which EU co-funding in the form of a grant is in the amount of HRK 60,877,005.02 (85%). The total approved worth of the CeNIKS project is HRK 57,806,124.58 of which HRK 49,135,205.89 (85%) is provided as EU co-funding. This has seen significant modernisation and construction of scientific infrastructure over the past two years in the domains of chemistry and physics, approaching the scientific research standards of institutions in more developed countries of the European Union. Scientists are provided access to the latest scientific equipment, and students have an open window to the acquisition of the knowledge and skills necessary for work in the profession, which has greatly improved their competitiveness on the global labour market. A detailed list of the capital equipment of the Faculty of Science procured in the frame of infrastructure projects and/or funding through other sources is provided in the Analytical appendix, Table 4.9.

4.4.2.

The space, equipment and the entire infrastructure (laboratories, IT services, work facilities etc.) are appropriate for the delivery of study programmes and ensuring the achievement of the intended learning outcomes.

The Faculty currently occupies some 35,500 m2. In total, 58 lecture halls/classrooms cover 4,219 m2, most equipped with a computer (68) and a projector. This includes four 170- to 200-seat-capacity lecture halls (one at the Department of Physics, one at the Department of Mathematics, two at the Department of Chemistry). Seventeen IT classrooms occupy 1,010 m2 of floor space and are furnished with 251 computers available to students when not in use for classroom sessions. Along with their operating systems and general-purpose software applications, they also have specialised educational and professional software that students use in practicum and/or laboratory exercises, and for other classroom teaching purposes, in line with the learning outcomes of the study programme they are attending. The modernisation of electronic equipment is planned systematically and implemented contingent on the funding available to the Faculty in accordance with public procurement procedures. There are 107 teaching laboratories/practicums at the faculty covering 3,185 m2 of floor space and, together with 68 scientific laboratories covering 2,611 m2 of floor space, form the foundation of the education of future scientists and teachers. Physical and health education is provided in the Martinovka sports hall. Detailed data on the space is available in the Analytical appendix, Table 4.8.

4.4.3.

The space, equipment and the entire infrastructure (laboratories, IT services, work facilities etc.) are appropriate for the implementation of scientific/artistic and professional activities.

Given that scientific research work and the teaching process are profoundly intertwined, it is difficult to isolate space and infrastructure intended solely for one of these activities; most of the laboratories also see multi-purpose utilisation. Teachers are provided access to basic communication infrastructure and equipment, although there are often multiple teachers and associates sharing the same cabinet (524 persons in 327 cabinets covering 6,200 m2 of floor space. The Faculty covers a number of domains of science (Mathematics, Physics, Geology, Chemistry, Biology, Geophysics and Geography) which is reflected in the scattered locations of the attendant constituent units. The bulk of the primary scientific/research, teaching and specialist activity is conducted in eight buildings in Zagreb (at Bijenička cesta 30, Bijenička cesta 32, Horvatovac 95, Horvatovac 102a, Rooseveltov trg 6, Marulićev trg 9a, Marulićev trg 19 and Marulićev trg 20) and at the open spaces and greenhouses of the Botanical Garden. Although students have relatively favourably evaluated the infrastructure capacity (awarding a grade of “very good”, i.e., 4 out of 5), further investment is needed in modernising classrooms/lecture halls, laboratories and accommodation capacities in order to achieve a better ratio of floor space available to students. This was particularly evident during the COVID-19 pandemic, when

practicum teaching had to be staged in small groups. To all this were added the negative impacts of the significant damage caused to structures by the earthquake of March 2020.

The requirements of scientific and specialist work and field courses are met by the Vrlika Ecological Station, the Hvar Observatory and Seismological Station, the Puntijarka Observatory, the Lonjsko Polje Geomagnetic Observatory, the Moslavačka Gora Seismological Station, the Lastovo Seismological Station and the Bakar Mareographic Station. The Faculty also owns a building at Ulica Kralja Zvonimira 8 in Zagreb that has been used by the Rectorate of the University of Zagreb since 2005, and, prior to the recent earthquake, hosted some of the classroom teaching of the Department of Geography.

4.5. THE LIBRARY AND LIBRARY EQUIPMENT, INCLUDING THE ACCESS TO ADDITIONAL RESOURCES, ENSURE THE AVAILABILITY OF LITERATURE AND OTHER RESOURCES NECESSARY FOR A HIGH-QUALITY STUDY, RESEARCH AND TEACHING.

4.5.1.

The library and library equipment, including the additional resources, meet the conditions for a high quality of study.

The libraries of the Faculty of Science mirror the organisational structure of the Faculty, and includes seven libraries:

- Central Biological Library, in the Department of Biology, Zagreb, Marulićev trg 20/II
- Central Library for Physics, in the Department of Physics, Zagreb, Bijenička cesta 32
- Central Geophysics Library, in the Department of Geophysics, Zagreb, Horvatovac 95
- Central Geographic Library, in the Department of Geography, Zagreb Marulićev trg 19
- Central Library of Geology, in the Department of Geology, Zagreb, Horvatovac 102a
- Central Chemical Library, in the Department of Chemistry, Zagreb, Horvatovac 102a
- Central Mathematical Library, in the Department of Mathematics, Zagreb, Bijenička cesta 30.

Along with these libraries, due to dislocation, the Department of Biology also has three division libraries at the following locations:

- Library of the Division of Zoology, Zagreb, Rooseveltov trg 6
- Library of the Division of Molecular Biology, Zagreb, Horvatovac 102a
- Library of the Division of Animal Physiology, Zagreb, Rooseveltov trg 6.

Reading rooms are integral parts of the libraries and offer a 220-seat total capacity. The spatial limits of the capacities do not provide for an expansion of the number of seats, and the demand exceeds the available capacities. Each library has a head of library that directly coordinates the affairs and operation of the library. The Faculty has a library committee charged with resolving issues related to the operation of the libraries that meets at least twice a year. There are 11 full time expert staff at the libraries of the Faculty of Science.

The library holdings currently number 123,530 volumes (books), of which 6,192 volumes are mandatory literature textbooks (Table 4.10). The holdings also include 4,052 foreign and 490 domestic print journals. The library holdings are expanded by purchases funded through the Faculty budget, by donations, and via exchanges of publications with other institutions in Croatia and abroad.

The libraries also hold the graded papers and, in accordance with current regulations, enter them into Dabar, the digital repository of the Faculty of Science. The repository currently contains 5,737 final and graduate theses and doctoral dissertations. The institutional repository also contains 1,469 scientific papers by Faculty staff, in accordance with author and publisher rules. The aspiration is towards open access publication and towards an open science system, such that 76.3 % of the objects in the repository are open access.

The libraries perform library and information referral activities for the purpose of teaching, and student and scientific research work at the Faculty. They can be used by students and faculty scientific-teaching staff, and by external users through their parent libraries. Library materials are available for use inside and outside the library.

Student surveys for the assessment of studies (undergraduate, graduate and integrated) at the Faculty of Science in the past four years have graded the equipment and offer of literature in the libraries, and the organisation of the operations of the libraries, as “very good”.

Besides at the libraries, teaching materials are also made available to students on secure websites. Usually these are Faculty of Science websites related to individual lecture courses; the Teams and Merlin platforms are also used. This manner of providing support and communication was particularly important during the period of the pandemic, when some classes were staged as

remote sessions leveraging the Zoom, Teams and Merlin platforms.

4.5.2.

The library and library equipment, including the additional resources, ensure a high quality of scientific-teaching / artistic-teaching activities.

Students and scientific-teaching staff are provided access to 36 bibliographic databases funded by the University of Zagreb and 45,754 full text electronic journals funded via the e-Source project, consortium subscription, and the state budget. In this manner we have achieved access to the following databases important to scientific and teaching activities at the Faculty: *Current Contents, Web of Science Core Collection, Journal Citation Reports, Scopus, INSPEC, MathSciNet, Medline* and a number of other bibliographic databases in individual domains of science. Also provided are access to full text databases such as *Cambridge Journals Online, Springer Nature Journals Complete Collection, Oxford Journals, JSTOR, Wiley, IOPscience extra, IEEE/IET Electronic Library (IEL), RSC Gold, Science Journals*, and to open access databases such as *ArXiv, DOAJ, PLoS, PubMed Central*.

Access to the internet and electronic sources of information is provided via user computers.

In their operation, the libraries use the Aleph integrated library system. The online catalogue is available from library websites. In addition, all libraries are searchable in the group catalogue of libraries in the science and higher education system, which is publicly available and can be searched for information about printed and electronic sources available in more than 45 library catalogues of university, higher education and specialised libraries in Croatia (including the holdings of the National and University Library in Zagreb). Users are provided with information through the online catalogue about the location of a found library holdings unit, as well as information about its accessibility and the availability of copies that can be lent out.

Library opening hours depend on the number of librarians employed and vary among the various departments. The epidemiological situation precipitated by the coronavirus (COVID-19) response in early 2020 saw libraries adapt operations to the novel situation. Reading rooms were closed to all users, and the loaning and return of books is performed in line with a new protocol.

The new measures and the operational precepts point to a clear need to increase the procurement of e-books.

4.6. THE HIGHER EDUCATION INSTITUTION RATIONALLY MANAGES ITS FINANCIAL RESOURCES

4.6.1.

Financial sustainability and efficiency is evident in all aspects of the higher education institution's activity.

The Faculty's objective is to rationally dispose of existing financial and other resources for the purpose of achieving the annual financial plan. Own income must be maximised and it must be leveraged purposefully and rationally. The Faculty plans its revenues and operating expenses in accordance with the Ordinance on budgetary accounting and the Chart of Accounts, and other acts and documents, ensuring the settling of operating expenses from revenues. This ensures the financial sustainability of the Faculty; successful implementation in accordance with financial planning indicates its effectiveness. The financial sustainability of the Faculty includes careful planning of financial operations with the aim of achieving revenue and expenditures, taking into account the assessment of the risks associated with financing Faculty operations, and is evident in the financial plans and their rebalancing. With regard to planned project activities, revenues and expenditures are planned by year in accordance with the projection of the implementation plan of individual projects.

In accordance with current legal regulations, the Faculty applies generally accepted accounting principles in its daily operations: truthfulness, accuracy, reliability and individual statement of business events.

The Faculty affords particular care to and encourages the provision of additional sources of funds that will serve as insurance for the performance of operations and the timely settling of incurred obligations. As a source of income EU funds are, therefore, critical to financial sustainability, and the Faculty of Science financial statements show that they are increasing every year. This takes into account that projects must first and foremost be efficient and sustainable, to which end the Faculty of Science provides projects with administrative and specialist support.

Table 1 shows the structure of total Faculty of Science revenue for 2019 and 2020. Total Faculty revenue in 2019 amounted to HRK 201,652,486.55, while in 2020 total revenue grew to HRK 269,239,356.10. The revenue growth relates primarily to higher revenue from international and EU institutions and bodies, related to the implementation of two high-value infrastructure projects (CeNIKS and CIuK). On average, about 60% of total revenue is from the state budget, mostly to cover employee salaries and other employee-related expenditures.

Table 2 shows revenue from the state budget, the bulk of which goes to cover employee salaries/wages (as much as 85% in 2019, and 80% in 2020). Other noteworthy segments of the state budget revenue are those covering student programme financing, for employee general medical examinations, for mentor financing, for the payment of various international membership fees, and to fund the Seismological Service.

TABLE 1. A BREAKDOWN OF FACULTY OF SCIENCE REVENUE FOR 2019 AND 2020

Faculty of Science Revenues		2019		2020	
1.	State Budget revenues	134,639,542.87	66.77%	151,556,757.38	56.29%
2.	Revenues from the budgets of other public sources	42,525,355.03	21.09%	95,094,402.23	35.32%
3.	Revenues from interest	6,611.63	0.00%	5,999.78	0.00%
4.	Revenues from own activities	12,868,571.77	6.38%	11,894,731.08	4.42%
5.	Revenues under special provisions	11,026,193.91	5.47%	9,786,298.53	3.63%
6.	Other not mentioned revenues	586,211.34	0.29%	901,167.10	0.33%
A	Total operational revenues	201,652,486.55	100.00%	269,239,356.10	100.00%

TABLE 2. A BREAKDOWN OF THE STATE BUDGET SOURCED REVENUE OF THE FACULTY OF SCIENCE

Faculty of Science State Budget Revenues		2019		2020	
1.	Employee wages and salaries and other expenditures for employees	114,224,803.34	84.84%	121,516,639.35	80.18%
2.	Operational costs (including field courses)	8,418,504.12	6.25%	7,491,464.14	4.94%
3.	Scientific and specialist activities	5,142,950.30	3.82%	5,920,025.65	3.91%
4.	Equipment	350,000.00	0.26%	8,142,814.68	5.37%
5.	Other	6,503,285.11	4.83%	8,485,813.56	5.60%
A	Total State Budget revenues	134,639,542.87	100.00%	151,556,757.38	100.00%

In 2019 revenue from the budgets of other public sources accounted for 21.09% of total revenue, and in 2020 these revenues accounted for a significant share (35.32%) of the total revenue of the Faculty of Science, which is a very good indicator of increased absorption of structural funds, while the share of revenue from Croatia's state budget has dropped. Table 3 shows individual revenue shares from other public sources. Most relate to revenue from current and capital assistance from international organisations and institutions and EU bodies. Another large share of these revenues come from the Croatian Science Foundation, earmarked forfunding science projects. Certainly noteworthy is the revenue from the City of Zagreb for regular current funding of the Botanical Garden.

Total Faculty of Science expenditure (see: Table 4.6.4) in 2019 was HRK 200,212,649.09, and grew in 2020 by 42%. This significant hike in expenditure is associated with the implementation of two infrastructure projects and the procurement of high-value equipment. Operating expenditure primarily covers employee wages/salaries (67.22% in 2019, and 51.19% in 2020), and to a lesser extent material and energy costs, service costs, non-financial assets costs, employee expenses and other expenditures (see Table 4).

TABLE 3. FACULTY REVENUE IN 2019 AND 2020 FROM THE BUDGET AND OTHER PUBLIC SOURCES

Faculty of Science Revenues from the Budgets of Other Public Sources		2019		2020	
1.	Revenues and assistance from local governments (cities, counties, etc.)	908,384.77	2.14%	1,385,066.42	1.46%
2.	Revenues from the Croatian Science Foundation	20,056,264.54	47.16%	19,627,394.58	20.64%
3.	Current assistance from international organisations and EU bodies	18,765,807.39	44.13%	67,969,011.83	71.48%
4.	Current and capital transfers between beneficiaries of the same budget based on EU funds	2,751,367.37	6.47%	6,059,027.32	6.37%
5.	Current assistance of extra-budgetary beneficiaries	43,530.96	0.10%	53,902.18	0.06%
A	Total operational revenues	42,525,355.03	100.00%	95,094,402.33	100.00%

TABLE 4. A BREAKDOWN OF FACULTY EXPENDITURE IN 2019 AND 2020

Faculty of Science Expenditures		2019		2020	
1.	Expenditures for employees	134,575,808.84	67.22%	145,687,446.36	51.19%
2.	Expenditures for materials and energy	11,201,050.13	5.59%	11,148,831.43	3.92%
3.	Expenditures for services	19,003,226.79	9.49%	19,716,292.18	6.93%
4.	Expenditures for non-financial assets	19,677,050.70	9.83%	99,646,076.56	35.02%
5.	Employee allowances	10,382,140.42	5.19%	5,159,775.39	1.81%
6.	Other not mentioned operational expenditures	5,373,372.21	2.68%	3,218,877.23	1.13%
B	Total operational expenditures	200,212,649.09	100.00%	284,577,299.15	100.00%

4.6.2.

The HEI manages its financial resources transparently, efficiently and appropriately.

The transparency of operations and funding implies the possibility of obtaining information that is complete, essential, accurate, timely and presented in an understandable manner. The higher the transparency, the more efficient the spending of funds. In addition to positive impacts on the quality of governance, budgetary transparency also brings significant financial benefits. With the introduction of a new management system the Faculty of Science has increased transparency such that all

operational processes are connected, and all services and departments have access to all business transactions. Also contributing to greater transparency is the fact that financial reports and plans are posted to the Faculty's website (URL 4_6_2_1). All financial statements are submitted within deadlines and as set out in the Ordinance on financial reporting in budgetary accounting. All reports related to the disbursement of own and dedicated funds are regularly submitted to the Ministry of Science and Education.

The Faculty of Science duly fulfils the obligations prescribed by the Fiscal Responsibility Act and regularly eliminates deficiencies encountered in operations in accordance with the Fiscal Responsibility Questionnaire.

Furthermore, transparency in financial resource management is also reflected in published procurement procedures, i.e., notices of the opening of public procurements (URL 4_6_2_2), selection decisions, procurement plans (posted on the Electronic Public Procurement Bulletin (URL 4_6_2_3), while low value procurement procedures are conducted in accordance with the Ordinance on procurement of low value.

4.6.3.

Additional sources of funding are used for institutional development and improvement.

The Faculty of Science's non-budgetary revenues relate to the collection of tuition fees and other revenues from students, scientific and specialist projects, various services and other activities (Table 5).

Table 5 shows that the bulk of these revenue streams are from student tuition and other fee payments. In 2019, the revenue from tuition and other fees paid by students was HRK 11,538,939.27, i.e., 47.12% of total non-budget revenues, and in 2020 these revenues stood at HRK 10,070,121.53 (44.58%). Funds thus obtained are allocated in accordance with the Faculty of Science Ordinance on the measures and manners for the distribution of revenues at PMF (URL 4_6_3_1), according to which 40% of these revenues are expended on advancing faculty activities (the procurement and repair/maintenance of equipment, investment, books, specialist literature, employee training, etc.). Some of this revenue is allocated to the settlement of Faculty material costs, i.e., of the departments where the activities are realised, and some to the development of the Faculty, i.e., of the department at which the activities are carried out.

Table 5. Non-budgetary revenues of the Faculty in 2019 and 2020

Faculty of Science Non-budgetary Revenues		2019		2020	
1.	Tuitions and other revenues from students (enrolment fees, applications, diplomas, etc.)	11,538,939.27	47.12%	10,070,121.53	44.58%
2.	Revenues from scientific and expert projects	9,855,758.68	40.25%	9,728,782.51	43.07%
3.	Revenues from assets (interest, rent, etc.)	717,760.88	2.93%	228,163.93	1.01%
4.	Supplemental activities (scientific symposia registration fees, sale of plants, publishing activities, etc.)	1,773,884.21	7.24%	1,656,784.64	7.33%
5.	Donations	347,269.66	1.42%	877,839.65	3.89%
6.	Other non-budgetary revenues	253,975.95	1.04%	26,504.23	0.12%
B	Total non-budgetary revenues	24,487,588.65	100.00%	22,588,196.49	100.00%

Other non-budgetary revenues are from assets (interest, rents, etc.), scientific symposia registration fees, the sale of surplus plants at the Botanical Garden, etc. Table 5 shows that the Faculty saw a somewhat greater percentage of donations in 2020 in relation to 2019 on account of donations for damage repair following the earthquake of March 2020. All donation proceeds were spent on necessary construction repair work.

4.6.4.

Additional sources of funding are secured through national and international projects, cooperation with the industry, local community, etc.

Table 5 shows that revenues from students and revenues from scientific and expert projects participate in non-budgetary revenue in almost equal percentages, averaging about 40% of total non-budgetary revenues. If we look at total revenues at the level of the entire Faculty, we see that revenues from scientific and expert projects earned on the market from economic activity amount to an average of 5%. These revenues are also allocated in accordance with the Faculty's Ordinance on revenue allocation. Cooperation with economic entities is very important to the Faculty, not only in achieving the additional sources of funding required by the Faculty, but also as it relates to the integration of future experts and scientists into economic activities aimed at collecting additional experience and knowledge.

V. SCIENTIFIC ACTIVITY

5.1. TEACHERS AND ASSOCIATES EMPLOYED AT THE HIGHER EDUCATION INSTITUTION ARE COMMITTED TO THE ACHIEVEMENT OF HIGH QUALITY AND QUANTITY OF SCIENTIFIC RESEARCH.

5.1.1.

Teachers and associates publish an appropriate number of high-quality scientific publications.

As a result of their project activities, Faculty teachers and associates publish a high number of high-quality scientific publications in international and national journals. In the previous five-year period, over 2300 papers of the highest category were published in line with the Ordinance on the criteria for appointment to scientific grades (ranks), where 86% of papers were the result of cooperation with other higher education institutions and scientific organisations (see 5.1.1 and the MOZVAG Analytic appendix, Table 5.1a).

From the above, it is evident that the Faculty teachers and associates publish a high number of publications, on average 1.6 publications per Faculty teacher per year. These papers are published in leading scientific journals, including among others *Science, Nature, Nature Communication, Nature Biotechnology, Nature Physics, Science Advances, Angewandte Chemie Int. Ed., Earth Science Review, ACS Central Science, Progress in Retinal Eye Research, International Journal of Engineering Science, Bulletin of the American Meteorological Society, SIAM journal on Scientific Computing, Journal of the European Mathematical Society* and others. In the above journals, 24 scientific papers have been published. The ten most significant papers per department are listed in ev. 5_1_1_1.

5.1.2.

The higher education institution has efficient procedures for encouraging high-quality scientific publication.

High-quality scientific publication of the Faculty is the result of high-quality scientific and research work and is a prerequisite for advancement of teachers and associates into higher grades. By providing comprehensive support to employees in applying for and executing projects, and on their reporting, the Faculty promotes high-quality scientific publication. Notifications of opportunities to apply for national and international projects, and of mobility programmes are regularly sent to all teachers and associates of Faculty departments.

Also, Faculty departments promote scientific and research activities in ways that best suit each particular profession. So, for example, the Department of Mathematics provides financial support for the realisation of a positively evaluated, but unfunded ERC project proposal, for the purpose of supporting the execution

of the scientific research planned under the project proposal. Further, the Department of Mathematics also assigns rights of use for the majority of indirect costs to the project team to encourage the publication of scientific results. Based on the recommendations received in the preceding reaccreditation process, the Department of Geography adopted the Decision on promotion of high-quality scientific research (ev. 5_1_2_1). The Department of Chemistry participates in covering part of the costs in cases when, due to a high peer review evaluation, the employee's paper is selected for special mention in a journal (such as being showcased on the cover). The Department of Chemistry also participates in covering part of the expenses of publication in top cited open access journals (Q1). Also, prints of journal covers showcasing the papers of Department of Chemistry employees are displayed in the gallery of the Department of Chemistry building.

In order to further encourage high-quality scientific work within the departments themselves, the departments regularly hold invited lectures also hosting highly renowned world scientists. In December 2018, the Department of Mathematics started the Sibe Mardešić Colloquy. Thus far, six world-famous leading mathematicians have held lectures as part of the colloquy (URL 5_1_2_1).

The departments also promote high-quality scientific papers on their respective websites (mostly papers published in top-cited journals, Q1), by publishing short bullets on employee publications to popularise and further explain the subject matters and results of their research to other professions and the wider public.

5.1.3.

The higher education institution keeps records of publications (publication index, citation impact, h-index, if applicable).

Data on the publications of its employees is kept by the Faculty via the CROSBI database. Apart from entry of data by the authors (employees) themselves into the CROSBI database, department libraries also ensure the data in the system are updated. Certain departments (such as the Department of Chemistry and Department of Geography), in addition to the *Scopus* database, also keep their own records on published papers of department employees, and this data is published in the annual department and Faculty reports (ev. 5_1_3_1). Data on the publication index, citation impact and h-index are not kept by the departments themselves, but are downloaded from the relevant data bases (*Web of Science* (WoS) and *Scopus*).

5.1.4.

HEI's scientific/artistic activity is evident in PhD theses.

Education of new doctors of science is an exceptionally important activity of the Faculty. Teachers and mentors at the Faculty's doctoral studies are active scientists with internationally relevant publications and competence in leading/implementing scientific projects. Their scientific activity is also evident from their leading of the research of young researchers (doctoral students) and from the quantity and quality of defended doctoral dissertations. In the relevant five-year period, within the framework of the Faculty's seven doctoral study programmes, 340 doctoral dissertations were defended: Department of Biology 89, Department of Physics 48, Department of Geophysics 18, Department of Geography 11, Department of Geology 25, Department of Chemistry 87, and Department of Mathematics 62 (ev. 5_1_4_1). Faculty teachers serves as mentors in approximately 50% of the defended dissertations, while the remainder of mentors are external associates.

5.1.5.

Teachers and associates of the higher education institution actively promote scientific/ artistic achievements at national and international conferences.

The presence of researchers at international conferences and promotion of their newest scientific results is of exceptional importance for creating connections and inclusion in international research trends, especially for young researchers. In the relevant five-year period, Faculty teachers and associates participated with over 2400 presentations at national and international conferences, of which 1400 were oral presentations and 332 were plenary and invited lectures (ev. 5_1_5_1).

5.2. THE HIGHER EDUCATION INSTITUTION PROVIDES EVIDENCE FOR THE SOCIAL RELEVANCE OF ITS SCIENTIFIC / ARTISTIC / PROFESSIONAL RESEARCH AND TRANSFER OF KNOWLEDGE.

5.2.1.

The higher education institution monitors and takes into consideration the needs of society and labour market in planning its research activities.

Research activities of each of the departments are reflected in the teaching programmes, especially at higher years of integrated studies and in graduate and doctoral studies, and therefore also have an impact on employment opportunities of the students. The Faculty also monitors the recommendations of the Croatian Employment Service related to enrolment in specific studies. As an example of a concrete action linked to labour market trends, the Department of Physics recently recruited an assistant professor from the medical physics field taking into account the existing deficit in that sector.

The Faculty monitors the needs of society and directly incorporates them into its research activities through frequent cooperation with the private and public sector. Faculty teachers participate in projects with companies from the private sector, thus transferring knowledge and technology into that sector and opening up job positions for staff (educated at the Faculty) in the companies in question. An is the project AiPeopleCounter (URL 5_2_1_1), as well as numerous others. Teachers also cooperate intensively with the economic and public sectors, resulting in a large number of professional projects. Some of the most important cooperation deserving mention has been realised with Hrvatske vode, Pliva Hrvatska d.o.o., Xellia d.o.o., units of local and regional government and self-government (such as the City of Zagreb, Zagreb County) and public institutions for nature protection (such as Velebit Nature Park, Biokovo Nature Park, Papuk Nature Park, Učka Nature Park, Plitvice Lakes National Park, Grabovača Cave Park, Zagreb County Green Ring), and the Croatian Conservation Institute. Alignment of the Faculty's research activities to the needs of society became particularly evident in 2020 during the SARS-CoV-2 pandemic (Department of Biology and Department of Chemistry) and during the seismic activity recorded in Croatia (Department of Geophysics and Department of Geology, in addition to the Seismological Survey and the Department of Geography).

The Faculty department premises also serve as a place for associations to carry out their activities, thus connecting the academic and economic sectors. As an example, the premises of the Department of Mathematics are used by the Croatian Association for Applied and Industrial Mathematics (CRO-MATH-IN), which maintains the Croatian national network for

cooperation of academic circles and the industrial sector as part of the European EU-MATHS-IN network (URL 5_2_1_2). In the capacity of a legal person, the Faculty is a member of the CRO-MATH-IN association and thus directly participates in aligning research activities at both the national and European level.

Also in September 2020, the Centre for Climatological Research was established at the Faculty for the purpose of carrying out interdisciplinary research of the climate and climate change aimed at mitigating adverse effects on organisms, ecosystems, the urban environment and society and the development of science and the economy.

5.2.2.

The higher education institution has an efficient support system for research and transfer of knowledge and technologies.

The Dean's Office and the department expert services regularly provide support to teachers and associates in all activities connected with the application, implementation and reporting, and when needed, external evaluation (review) of scientific, development and expert projects. In certain departments (Department of Physics) a separate Project Office has also been established (URL 5_2_2_1).

During the 2016/2017 academic year, the Faculty introduced the practice of holding kick-off meetings before beginning to implement larger projects, especially projects financed from EU funds (see standard I. 6b).

Apart from the comprehensive support to projects financed from a competitive source, the Faculty Management, with the support of the Dean's Office, developed a block financing model for science, allocated by the Ministry of Science and Education via the University of Zagreb. The model provides for the basic financing of research activities for all scientists, (head taxes), while at the same time taking into account differences existing among and within professions. Thus, scientific research in the area of natural sciences was backed by 242 grants in the period from 2016 to 2018, while research in the field of geography in that period was backed directly by the University, based on a central competition procedure. In the period from 2019 to 2020, research in all departments was backed by 191 grants. The Faculty also supports applications of scientists and associates to the Croatian Academy of Sciences and Arts (HAZU) Foundation for assisting the development of scientific research work, and in the relevant five-year period, 43 research projects were funded through HAZU grants (ev. 5_2_2_1).

Apart from fundamental research, which is the foundation of development of every society, research is also carried out as part

of the Faculty activities in cooperation with the economic sector, state administration and local self-government, public sector and institutes (see topic 1, element of the standard 1.5.). These are applied scientific and development research projects, expert opinions and professional studies applying a specific methodology, experimental technique or theory. To date, 158 professional projects, 104 studies and 2 expert opinions have been executed (see ev. 5_2_2_2 and Analytical appendix, Table 5.3).

The Faculty is directly involved in transfer of knowledge and technology by publishing a large number of papers in professional journals (ev. 5_2_2_3), organising and participating in numerous debates (ev. 5_2_2_4), registering patents (ev. 5_2_2-5) and founding spin-offs (examples are is the spin-off companyies Exaltum (URL 5_2_2_2) and the Apolon butterfly farm (URL 5_2_2_3).

Furthermore, Faculty teachers and associates continuously participate in various popularisation activities organised for the general public at the Faculty, but also in various activities in different institutions nationwide (ev. 5_2_2_6). In addition, Faculty teachers and associates publish a significant number of popular science articles (110 articles; ev. 5_2_2_7) and participate in scientific radio and television shows (on channels such as HRT, Mreža TV, Z1 and others; Moreover, teachers take exceptional care to actively transfer new knowledge to the broad professional community, doctoral candidates, and the general public, hence participating in the organisation and implementation of a series of workshops in the previous five-year period.

5.2.3.

Teachers and associates participate in the activities of scientific, arts and professional organisations.

Faculty teachers and associates are members of numerous international (ev. 5_2_3_1_) and national (ev. 5_2_3_2_) scientific and professional organisations where they hold top positions and are involved in various activities. As examples, memberships and leading functions in the branch scientific councils and central committees, management board of the Croatian Academy of Sciences and Arts (HAZU) (academic Dario Vretenar performs the function of Secretary General of HAZU), the Academy Departments (Department of Mathematical, Physical, and Chemical Sciences, Department of Natural Sciences), and various committees and scientific councils of HAZU (such as Committee for Karst areas, Committee for Geochemistry, Committee for Chemistry, Committee for Physics, Committee for Mathematics, Committee for Cooperation with Croatian Universities and Scientific Institutes, Scientific Council for Nature, Scientific Council for Crystallography – Croatian Crystallographic Association and

others), and perform leading functions in scientific bodies (such as the Management Board and Panels of the Croatian Science Foundation).

Also, they are members of several Ministry of Science and Education commissions such as the Expert commission for recognition of the right to perform and access regulated professions (Ministry of Science and Education), and Examination committees for the teacher professional exam (Education and Teacher Training Agency).

Utilising their scientific and professional expertise, scientists and associates actively participate in the activities of public organisations (ev. 5_2_3_ and ev. 5_2_3_5).

5.3. SCIENTIFIC/ARTISTIC AND PROFESSIONAL ACHIEVEMENTS OF THE HIGHER EDUCATION INSTITUTION ARE RECOGNIZED IN THE REGIONAL, NATIONAL AND INTERNATIONAL CONTEXT.

5.3.1.

Teachers, associates and professional staff have received university, national and international awards for their scientific / artistic / professional achievements.

In the five-year period, the Faculty continued its positive practice of nominating successful young and experienced scientists and students for faculty, university and national awards, as well as for awards granted by various professional associations and organisations.

Hence in the relevant five-year period, the scientific achievements of Faculty scientists were recognised and awarded a high number of different awards such as the following: Exceptional scientists received seven (7) Annual National Science Awards and seven (7) annual Andrija Mohorovičić Awards traditionally awarded on the University of Zagreb Day, and one (1) award of the Croatian Academy for Science and Arts for top scientific and artistic achievements in the Republic of Croatia (HAZU). Younger scientists, mostly doctoral and post-doctoral students were awarded eleven (11) Annual awards for young scientists and artists of the Society of university teachers, scholars and other scientists – Zagreb, and two (2) Annual National award for junior researchers, and one (1) Annual national award for the promotion of science. Younger scientists also received other awards, among which the Rector's Award and the L'Oreal Award for women in science. One external associate of the Faculty also received the Annual National Award for Lifetime Achievement (M. Šunjić).

In total, 14 renowned Faculty scientists are regular members of HAZU, while six (6) are associate members. Of the regular members of HAZU, three (3) have also been elected as members of the Academiae Europae.

A list of awarded Faculty teachers and associates is provided in ev. 5_3_1_1 and ev. 5_3_1_2.

5.3.2.

The higher education institution is a holder of an adequate number of scientific / artistic / professional projects (university, national and international projects).

A large number of scientific and professional projects at the Faculty are implemented and funded from national and international sources. In that way, project activity increases scientific productivity and strengthens international visibility of Faculty scientists, enabling the employment and scientific education of young scientists, strengthening international cooperation of the Faculty with leading scientific institutions abroad, and advancing the scientific infrastructure of the Faculty.

In the relevant five-year period, three European Research Council projects were implemented at the Faculty: ANEUPLOIDY, TheOne and CoSMass, all three at the Department of Physics. Also, projects funded from the following sources were carried out:

(1) European Structural and Investment Funds, including the Competitiveness and Cohesion Operational Programme of the European Regional Development Fund (*CeNIKS, CIuK, REMARK, CRISPR/Cas9, Klima-4HR*), Human Resources Development Operational Programme of the European Social Fund (QuantiXLie, In the company of microbes, and three projects in which the Faculty participated as a partner), Efficient Human Resources Operational Programme of the European Social Fund (BioMedMath; ProSPer; and eight projects in which the Faculty was a partner), one project financed by the International Atomic Energy Agency and one by the International Centre for Genetic Engineering and Biotechnology;

(2) EU funds, including four projects funded by the Horizon programme, one from the INTERREG MED programme, one from the NEWFELPRO programme, three projects from the Marie Curie International Training Network programme and two from the Erasmus+KA programme, along with two more financed from the same fund in which the Faculty is a partner;

(3) The Croatian Science Foundation (CSF), including seven projects financed from the UKF programme, six by the Swiss national foundation for science and by the CSF, two from the Scientific cooperation programme, one from the COVID programme and one from the Building Professional Croatian Terminology programme, and 57 projects from the Research Projects and Installation Research Projects programmes.

Furthermore, 116 expert projects and 15 bilateral projects were implemented.

Since the last reaccreditation period in most departments, the number of applications for competitive projects and the number of those approved has increased. A list of all projects can be found in the Analytical appendix, Table 5.3.

5.3.3.

Teachers, associates and professional staff participate as invited lecturers in an adequate number of national and international conferences.

In the relevant five-year period, Faculty teachers and associates presented the results of their research at numerous scientific and professional conferences and participated with over 2400 presentations at both national and international conferences, where they held over 1400 oral presentations, out of which 332 were plenary and invited lectures. The above figures clearly speak for the visibility and value of the results of the scientific and research work of the Faculty teachers and associates (ev. 5_1_5_1).

5.3.4.

Teachers and associates are members of the scientific / artistic / professional boards of conferences, and editorial boards of scientific journals.

In addition to the regular teaching and scientific research activities, Faculty teachers and associates also participate in conference organisation activities. As members of scientific and professional boards they took part in organising over 250 national and international conferences (see Analytical appendix, Table 5.4). Also in the relevant five-year period, Faculty scientists served as editorial board members in over 140 journals (see Analytical appendix, Table 5.5).

5.4. THE SCIENTIFIC / ARTISTIC ACTIVITY OF THE HIGHER EDUCATION INSTITUTION IS BOTH SUSTAINABLE AND DEVELOPMENTAL

5.4.1.

The research / arts development strategy is aligned with the vision of development of the higher education institution.

The basic strategic objectives of SciStrat are as follows: 1. Increase the presence of the Faculty of Science in the world, and especially in the scientific field of the European Union, 2. Maintain the leading role of the Faculty of Science in Croatia and secure a high position in the region, 3. Increase interdisciplinarity, multidisciplinarity and connections with the economic sector, 4. Increase the level of quality of the scientific-research staff, 5. Strengthen the connection between the educational process and the results of research work, 6. Build a modern and advanced scientific infrastructure. An important aspect of the strategic programme is strengthening interdepartmental scientific cooperation, thus further promoting the multidisciplinary strength of the Faculty which has been insufficiently utilised so far. Furthermore, the strategic programme stresses the importance of more intensive involvement in international projects, especially projects of the European Union, and of strengthening the research-based scientific commercial activities of the Faculty. The strategic programme was developed based on the analysis of business

operations performed in 2015 for the purposes of reaccreditation of the Faculty. Adoption of the Strategic plan for scientific research is in accordance with the recommendation of the reaccreditation committee as part of the 2015 reaccreditation procedure. The goals are also in line with the mission and vision of the Faculty.

5.4.2.

Scientific / artistic activities are established by the strategic programme of the higher education institution.

In order to increase the visibility of the Faculty and maintain its leading role in the Republic of Croatia, and to raise the level of quality of the scientific-research staff, the Faculty encourages application for projects and scientific excellence by passing the Ordinance on rewarding scientific excellence, which is in the process of adoption. The goal is to encourage and reward applicants whose projects have been positively evaluated, even if they end up not receiving funding. Certain departments such as the Department of Mathematics additionally stimulate applications for the European Research Council projects. In order to encourage application to projects from EU funds, the Ordinance on rewarding employees working on EU projects, was also adopted. In order to strengthen connections with the economic sector, but also to increase connections between the educational process and results of research work, the subjects *Student Practice* and *Expert Laboratory Practice* were introduced, organised by the Career Centre in arrangement with the departments. Likewise, in order to achieve the goal of increased connection with the economic sector, the Economic Council will be founded and will include representatives of large and medium-sized companies with which the Faculty fosters good business and scientific cooperation. Strengthening of interdisciplinarity and multidisciplinarity is achieved through application for joint projects of several departments and by the establishment of the Centre for Climatological Research. The project Klima-4HR can be cited as an example.

Interdisciplinarity of the Faculty is also encouraged through symposiums for Faculty of Science doctoral candidates, organised each year since 2018 (URL 5_4_2_1). The symposiums are very well attended and enable the students of the seven doctoral study programmes to mutually cooperate. In order for the symposium to be attractive to students of doctoral studies, doctoral candidates have a significant role in its organisation. Joint cooperation has also been realised through the lecture series, Scientific talks at the Faculty of Science (URL 5_4_2_2).

In order to strengthen the international visibility and international character of the Faculty of Science, intensive work is underway to attract successful scientists from Croatia but also from abroad.

The Department of Physics recruited Dr. Kosuka Nomura, winner of the prestigious project for establishing his own group from the tender Programme of excellence in higher education - *Tenure Track Pilot Program* as part of the Swiss-Croatian cooperation programme.

5.4.3.

The higher education institution has appropriate resources for its scientific / artistic activities.

The Faculty continuously invests significant efforts and financial assets in resources for scientific activities. Significant investment has been realised for equipment through the CluK and CeNIKS projects. Resources for scientific and research work are listed in detail in the Catalogue of scientific equipment and computer programmes of the Faculty.

5.4.4.

HEI recognizes and rewards scientific / artistic achievements of its employees.

The Faculty of Science works on stimulating quality through a system of rewards, but there is still much room for improvement. At the moment, at the level of the Faculty of Science only doctoral and post-doctoral students are systematically rewarded, at the proposal of the department at the Faculty Day. The recipients are proposed by departments pursuant to their own ordinances. An example is URL 5_4_4_1. Also, at the level of the Faculty of Science, rewards are given to individuals who have particularly stood out by their activity (such as the organisation of the PMF Day and Night event, establishment of the Career Centre, organisation of the University Fair). Once a year, the Faculty Student Council rewards the best assistants and teachers of every department with the *Brdo* award. Certain departments have their supplementary reward systems such as the Department of Chemistry Medal that is awarded to outstanding employees (Ordinance on award of the Department of Chemistry medal, URL 5_4_4_2). Significant progress will be achieved by the Ordinance on rewarding scientific excellence at the Faculty of Science which is in preparation, and will be used to reward the quality of the scientific research staff monitored through several criteria: i) main authorship in high-quality publications, ii) leadership in competitive projects, and iii) leadership in international competitive research groups at the Faculty of Science and mentorship of doctoral candidates. The same Ordinance will also be used to reward exceptional scientific achievements of postdoctoral students and students.

5.4.5.

HEI continuously improves its scientific / artistic activities by appropriate financing,

The Faculty continuously invests significant funds through financing the recruitment of required scientific and administrative staff. Due to the fact that recruitment was restricted by introduction of the coefficient system and the decision of the Croatian Government prohibiting recruitment in public services, in the past year the Faculty further increased these investments.

human resource management, investing in spatial resources, equipment and appropriate literature, supporting dissemination of results and development of doctoral theses.

At present, eight persons have been recruited on the Faculty budget. Also, the Faculty continuously invests in the procurement of expert and scientific literature. The method of procurement is regulated by the decisions of individuals departments. For example, at the Department of Geography, each employee is secured an amount for procurement of expert and scientific literature at an annual basis from department funds, while encyclopaedic literature and statistical data are procured through joint funds by virtue of the decision of the Department of Geography Collegium. Also from the block financing system of the University of Zagreb, software packages needed for teaching are procured (such as ArcGIS, SPSS etc.), gases needed for research at the Departments of Chemistry and Physics etc..

Furthermore, certain departments fund attendance at symposia and conferences for those presenting their work at these meetings. In accordance with the recommendations from the preceding reaccreditation procedure, such a decision was made by the Department of Geography and HRK 87,953.87 was spent for that purpose in the 2019/20 academic year.

Since most projects do not plan funds for the maintenance of equipment, after the projects are completed, equipment maintenance is usually financed from department funds.

5.5. SCIENTIFIC/ARTISTIC AND PROFESSIONAL ACTIVITIES AND ACHIEVEMENTS OF THE HIGHER EDUCATION INSTITUTION IMPROVE THE TEACHING PROCESS

5.5.1.

Space and equipment for scientific / artistic research and professional activities is used in teaching at undergraduate, graduate and postgraduate level.

Scientific and teaching activity at the Faculty of Science are strongly connected, which is evident from the high number of students of all levels of study who are included in scientific research work and participate in scientific projects (see standard 5.5.2.). Also, research activities are reflected in teaching programmes, especially in doctoral and graduate studies, i.e., in higher years of integrated undergraduate and graduate studies. In that sense, the scientific research infrastructure is heavily used in the teaching process, as part of practical teaching classes and laboratory exercises, carrying out laboratory expert practice and developing scientific research, serving as basis for diploma theses and doctoral dissertations. In graduate studies or in higher years of integrated study programmes, many students join research groups and utilise the necessary scientific infrastructure. For students of postgraduate studies, research work is the core of education (the greatest part of the ECTS load is related to research work) for which they have the entire scientific research infrastructure of the Faculty at their disposal.

Moreover, most Faculty departments have specialised computer classrooms in which dozens of computers are networked and students in undergraduate, graduate and postgraduate classes can work on their project tasks using numerous adequate software packages for which the Faculty has purchased a licence. If stronger IT resources are needed, students can use computer stations and expert software used by researchers in their laboratories. The Faculty actively works on strengthening its scientific research infrastructure which has in turn resulted in being awarded several large structural projects (*CIuK, CENIKS, Scientific Centre of Excellence for Quantum and Complex Systems, and Representations of Lie Algebras QuantiXLie*) and current applications (*BIOCRIPT, Nano-centar*). Through the projects mentioned, the most state-of-the-art equipment was obtained and is available for use by students (primarily doctoral candidates), enabling them to acquire knowledge and skills needed to develop competitiveness on the global labour market.

5.5.2.

Undergraduate, graduate and postgraduate students are involved in scientific / artistic / professional projects of the HEI.

In graduate studies (or higher years of integrated undergraduate and graduate studies), scientific research work is an important part of education and students become involved in scientific research usually as part of preparing their diploma thesis, but also through other research with which they can compete for the Rector's award or other award. Involvement often begins at lower levels of study (undergraduate) through various forms of participation, and most often through research with which they can compete for the Rector Award or through laboratory expert practice. In order to motivate students, teachers present their scientific research as part of the subject they are teaching or they hold targeted presentations for specific students or as part of invited lectures at student congresses. Active participation of students of undergraduate, graduate and integrated undergraduate and graduate studies is evident from the large number of students who participate in scientific projects of the Faculty of Science and the number of scientific publications in which students figure as co-authors. A large number of diploma theses were also the result of work in scientific projects.

Scientific activity of students is also evident from student symposiums where they present their scientific research (such as the Symposium for Chemistry Students, Symposium for students of biology-related subjects, Interdisciplinary multidisciplinary congresses of the Geography students' club.

In doctoral studies, research work is an essential part of education, and doctoral students join scientific projects under which they

develop their doctoral dissertations (ev. 5_5_2_1). Scientific activity of doctoral candidatse is visible through scientific publication. Thus, in the previous five-year period, 600 papers involving doctoral candidates were published (accounting for approximately 25% of all published papers; ev. 5_5_2_2). Furthermore, in the period from 2016 to 2020, 339 doctoral dissertations resulted from work on scientific projects of the Faculty of Science (ev. 5_5_2_3). Along with the doctoral candidates recruited using funds allocated by the Ministry of Science and Education, an increasing number of doctoral candidates are being recruited to work on projects (their salaries are funded from project funds). In the last five years, there has been a significant increase in project-based recruitment (in 2015/16 there were 29 doctoral candidates recruited for projects and 50 recruited by using Ministry of Science and Education funds, while in 2019/20 113 doctoral candidates were recruited for projects, and 86 recruited by using Ministry of Science and Education funds). This is the result of changes in financing (opening of programmes Career development for young researchers by the Croatian Science Foundation), but also points to high project activity of the Faculty of Science. Recruitment for projects further results in a more solid connection between the doctoral student and the project they are working on, and is accompanied by better planning of the research work of the doctoral candidate, in line with the goals and the duration of the project.

5.5.3.

Both teaching at the undergraduate and graduate levels, and doctoral theses reflect the scientific / artistic research and professional activities and achievements of the higher education institution.

The Faculty of Science offers seven doctoral study programmes (Biology, Physics, Geology, Chemistry, Mathematics, Doctoral Study in Geography: space, region, environment, landscape, and the Interdisciplinary doctoral study in Oceanography). Teaching programmes at the above studies significantly reflect the main fields of scientific research work of the department where the study programme is organised, and the courses are mostly directly connected with the field of scientific activities of the course leaders. Doctoral dissertations are based on the research work of the doctoral candidates, but the scientific work of mentors and the research group to which the candidates belong is also integrated. In that sense, the scientific work and development of doctoral candidates and their dissertations represent the scientific quality and potential of the Faculty of Science. This is in line with the substantial participation of doctoral candidates in the scientific production of the Faculty of Science (approximately 25%). The quality of the doctoral candidates represents the quality of the Faculty itself, so it is important to emphasize that the doctoral candidates

receive awards for their presentations at international conferences, receive prestigious scholarships (such as Fulbright Visiting Researcher, EMBO short term fellowship and others) and rewards (such as the national scholarship For Women in Science 2019 awarded by L'Oréal Adria and the Croatian Commission for UNESCO with the Ministry of Culture, the annual award of the Society to young scientists and artists for 2018). Also, Faculty doctoral candidates go to prestigious foreign institutions for postdoctoral training (such as ETH, University of Oxford, University of Cambridge, etc.) or they find employment in industry.

LIST OF EVIDENCE AND LINKS

EVIDENCE

0_0_0_1 Statute PMF_new

0_0_0_1 Statute PMF_old

0_0_0_2 Excerpt from the register of scientific organisations

0_0_0_3 Decision on the Committee for compilation of the Development Strategy of the Faculty of Science.

0_0_0_4 Business analysis with recommendations

0_0_0_5 Faculty of Science – Strategic programme for scientific research from 2018 to 2023 – SciStrat

0_0_0_6 Decision on establishment of the SciStrat Committee

0_0_0_7 Decision on adoption of the Faculty Statute

0_0_0_8 Decision of the University of Zagreb on acceptance of the Faculty Statute

0_0_0_9 Decision on the composition of the Committee for quality assurance

0_0_0_10 Decision on the composition of the Committee for teaching

0_0_0_11 Decision on the establishment of the Committee for teaching at the Department of Geography

0_0_0_12 Decision on assessment of teaching

0_0_0_13 Decision on supervision of graduate theses

Decision on co-supervision of graduate theses

0_0_0_14 Review of teaching materials

0_0_0_15 Decision on the form and manner of execution of the exemplary lecture for appointment to scientific-teaching, artistic-teaching and teaching grades (ranks)

0_0_0_16 Evidence of inclusion of the institution in the teaching process - IRB

0_0_0_17 Evidence of inclusion of the institution in the teaching process – University of Rijeka

0_0_0_18 Active inclusion of external teachers in the teaching process

0_0_0_19 Signed agreement for student practice or traineeship

0_0_0_20 Example of the work hours composition

0_0_0_21 Reduction of quotas

0_0_0_22 Example of the termination of redundant courses

0_0_0_23 Examples of alignment of the implementation plan

0_0_0_24 Example of student inclusion in the discussion on study programmes

0_0_0_25 Example of student inclusion in decisions on change to the study programme

0_0_0_26 Review of study programmes

0_0_0_27 Learning agreement

0_0_0_28 Learning agreement for traineeships

0_0_0_29 Erasmus trainee visit

0_0_0_30 Decision on maximum participation for field courses

0_0_0_31 Decision on financial support for students for field courses

0_0_0_32 Decision on the allocation of financial support for doctoral candidates

0_0_0_33 Decision on establishment of the Career Centre

0_0_0_34 Plan of extension of labour relations after age 65

0_0_0_35 Additional requirements for appointment to ranks

0_0_0_36 Human resources management plan

0_0_0_37 Plan of workload for researchers-assistants

0_0_0_38 Financing indirect project costs

0_0_0_39 Postdoctoral fellow projects

0_0_0_40 Decision on financing the project BIOCRIPT

0_0_0_41 Decision on financing C2AMN

0_0_0_42 Decision of the Department of Mathematics to stimulate ERC project applications

0_0_0_43 Participation in project evaluations

0_0_0_44 MSC projects

0_0_0_45 Kick-off meeting

0_0_0_46 List of workshops for administrative staff

0_0_0_47 Competitions for work posts

0_0_0_48 Organisation of English courses for staff

0_0_0_49 BioMedMath

0_0_0_50 Graduate study of Bioindustrial techniques

0_0_0_51 List of subjects available in English

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0_0_0_53 ERA Chairs

0_0_0_54 BGG building complex

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1_1_1_1 Quality assurance policy of the Faculty of Science, University of Zagreb

1_1_1_2 Development Strategy of the Faculty of Science, University of Zagreb for the period 2015 - 2020

1_1_1_3 Ordinance on quality assurance of the Faculty of Science, University of Zagreb

1_1_2_1 Evidence of student participation in the work of the Faculty Council

1_1_2_2 Evidence of student participation in the work of department councils and committees

1_1_2_3 Decision on establishment of the Career Centre

1_1_3_1 Work programme of the Dean

1_1_5_1 Annual report of the Department of Chemistry

1_1_5_2 Annual report of the Dean

1_1_5_3 Annual report of the Department heads

1_1_6_1 Student surveys in the Department of Mathematics

1_1_6_2 Evaluation of mathematics studies

1_1_6_3 EkoRaMa

1_1_6_4 BioMedMath

1_1_7_1 Annual monitoring of the work of researchers - assistants

1_1_7_2 Young scientist award

1_2_1_1 Report of the expert committee on reaccreditation

1_2_1_2 Response to the reaccreditation

1_2_1_3 Accreditation recommendations

1_2_1_4 Confirmation of the fulfilment of requirements

1_2_1_5 Report on internal assessment

1_3_1_1 Ordinance on the system of internal irregularity reporting at the Faculty of Science, University of Zagreb

1_3_1_2 Ordinance on student disciplinary responsibility

1_3_1_3 Decision of the ministries and opinion of the ethics committee on the use of animal for experimental purposes

1_3_2_1 Decision on the appointment of irregularity officer

1_3_2_2 Decision on the appointment of the deputy irregularity officer

1_3_2_3 Decision on appointment of the Ethics Committee

1_3_2_4 Decision on the appointment of the Disciplinary Committee

1_3_3_1 Annual report of the Ethics Committee

1_3_3_2 Decision on the appointment of the student ombudsperson

1_4_1_1 Faculty brochures

1_4_1_2 List of popular science shows

1_4_3_1 Participation of staff in state competitions

1_4_3_2 Participation of staff in state matura exams

1_4_3_3 Catalogue of approved textbooks for primary and secondary school

1_5_2_1 Examples of cooperation agreements

1_6_2_1 Agreement between PMF and the Teacher Education centre, Faculty of Philosophy

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2_1_2_2 Report of the Croatian Employment Service

2_2_5_1 Results of student questionnaires

2_2_5_2 PMF brochure

2_3_2_1 Examples of monitoring student work

2_4_2_1 Examples of amendments to study programmes

2_4_5_1 Overview of amendments to study programmes

2_6_1_1 List of schools for practice study

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3_1_1_2 Call for enrolment to study programmes

3_1_1_3 Conditions for transferring from other study programmes

3_1_2_1 Decision on the transfer of study in the Bologna programme

3_1_2_2 Criteria for the continuation of study in Bologna study programmes

3_1_2_3 Analysis of enrolment for 2016–2020

3_1_3_1 Criteria for transfer from related study programmes

3_2_1_1 Monitoring advancement through the study programme

3_1_4_1 Examples of recognising prior learning

3_3_5_1 List of e-courses and report on e-learning

3_3_5_2 List of software packages used

3_4_2_1 Results of student study evaluation surveys

3_4_3_1 Report of the faculty coordinator for students with disabilities

3_5_1_1 Monitoring the needs of students from vulnerable groups

3_5_2_1 Procedure for teaching adaptations

3_5_3_1 Financial support for students from vulnerable groups

3_6_2_1 Examples of Learning Agreements

3_6_5_1 Diploma supplement

3_6_5_2 Expert report on field courses

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4_2_1_1 Advice for advancements and recruitment, Department of Mathematics

4_2_1_2 Additional requirements for appointment to scientific-teaching ranks, Department of Chemistry

4_2_1_3 Additional requirements for appointment to scientific-teaching ranks, Department of Geology

4_3_3_1 Decision to stimulate rewarding for scientific excellence, Department of Geography

Theme 5

5_1_1_1 List of the 10 most significant publications by department

5_1_2_1 Decision on financial support for project applications

5_1_3_1 Annual report on teaching, scientific and expert work, and other activities

5_1_4_1 List of defended doctoral dissertations

5_1_5_1 List of participation of teachers and students in scientific conferences

5_2_2_1 List of grants of the Croatian Academy of Science and Arts

5_2_2_2 List of studies and reports

5_2_2_3 List of expert papers

5_2_2_4 List of workshops and round tables

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5_2_2_6 List of science popularisation activities

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5_2_3_1 Membership in international associations

5_2_3_2 Membership in expert, public and advisory bodies

5_3_1_1 List of awards and recognitions

5_5_2_1 Student activities in projects

5_5_2_2 Student papers ensuing from projects

5_5_2_3 List of defended doctoral dissertations by project

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URL 0_1_2 Centar za klimatološka istraživanja https://www.pmf.unizg.hr/aktualnosti?@=1lz0e

URL 0_1_3 Rezultati anketa https://www.pmf.unizg.hr/osiguravanje_kvalitete/rezultati_anketa

URL 0_1_4 Nagrada Brdo https://www.pmf.unizg.hr/math/izdvojeno?@=1m676

URL 0_1_5 Seizmološka služba https://www.pmf.unizg.hr/geof/seizmoloska_sluzba/

URL 0_2_2 Pravilnik o prvostupničkom / diplomskom radu i završnom ispitu https://www.pmf.unizg.hr/_download/repository/Pravilnik_o_ocjenskim_radovima_na_GO_PMF-a.pdf

URL 0_2_3 Izvedbeni plan ispita i provjera https://web.math.pmf.unizg.hr/~stojic/nebo/

URL 0_3_1 Pravilnik o doktorskim studijima na Prirodoslovno-matematičkom fakultetu Sveučilišta u Zagrebu https://www.pmf.unizg.hr/_news/42259/Pravilnik%20o%20doktorskim%20studijima-NACRT.pdf

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URL 0_3_3 Simpozij studenata doktorskih studija https://www.pmf.unizg.hr/studiji/doktorski_studiji/simpozij_studenata_doktorskih_studija_pmf-a

URL 0_3_4 Pravilnik o uvjetima i postupku izbora u zvanja na Prirodoslovno-matematičkom fakultetu Sveučilišta u Zagrebu https://www.pmf.unizg.hr/images/50017896/Pravilnik%20o%20izborima%20u%20zvanja%20i%20na%20radna%20mjesta%20na%20PMF-u.pdf

URL 1_1_4_1 Godišnja izvješća Fakulteta http://www.pmf.unizg.hr/dokumenti/izvjesca/izvjesca_o_znanstvenom_i_nastavnom_radu

URL 1_1_4_2 Analiza poslovanja Prirodoslovno-matematičkog fakulteta Sveučilišta u Zagrebu s preporukama http://www.pmf.unizg.hr/dokumenti/analiza_poslovanja

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URL 1_1_5_2 Osiguravanje kvalitete http://www.pmf.unizg.hr/osiguravanje_kvalitete

URL 1_1_6_1 Rezultati studentskih anketa http://www.pmf.unizg.hr/osiguravanje_kvalitete/rezultati_anketa

URL 1_1_6_2 Anketa o zadovoljstvu studijem http://www.unizg.hr/fileadmin/rektorat/Studiji_studiranje/Studiji/Kvaliteta/Kvaliteta2/anketa/Anketa_preddiplomski.pdf

URL 1_1_6_3 Postupak vrednovanja studijskih programa pmf.unizg.hr/osiguravanje_kvalitete/novi_studijski_programi_izmjene_i_dopune

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URL 1_3_5_1 Turnitin https://www.srce.unizg.hr/spa/turnitin

URL 1_3_5_2 Izjava o izvornosti završnog rada https://www.pmf.unizg.hr/_download/repository/Izjava_o_izvornosti_rada.pdf

URL 1_3_5_3 Izjava o izvornosti https://www.pmf.unizg.hr/_download/repository/Izjava_o_izvornosti.pdf

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URL 1_4_1_8 Smotra Sveučilišta u Zagrebu http://smotra.unizg.hr/fileadmin/smotra2020/index.html

URL 1_4_1_9 Dan i noć na PMF-u https://daninoc.pmf.unizg.hr/

URL 1_4_1_10 Dan karijera http://wise.pmf.unizg.hr/

URL1_4_1_11https://www.youtube.com/watch?app=desktop&v=XT4AefIcSps&feature=emb_logo

URL 1_4_2_1 Upisnik studijskih programa https://hko.srce.hr/usp/index

URL 1_4_2_2 Red predavanja https://www.pmf.unizg.hr/studiji/dokumenti

URL 1_4_2_3 Popis ureda za studente https://www.pmf.unizg.hr/studenti/ured_za_studente

URL 1_4_3_1 Čarolije u kemiji https://www.pmf.unizg.hr/chem/carolije_u_kemiji

URL 1_4_3_2 Festival znanosti http://www.festivalznanosti.hr/2019/

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URL 1_6_1_2 LabAmin http://www.labanim.hr/

URL 2_1_2_1 BioMedMath https://biomedmath.math.hr/

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URL 2_2_4_3 https://www.euchems.eu/

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URL 2_4_4_1 Red predavanja https://www.pmf.unizg.hr/studiji/dokumenti

URL 2_4_4_2 ISVU https://www.isvu.hr/visokaucilista/hr/pretrazivanje

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URL 3_10_5_1 Alumni klub Biološkog odsjeka https://www.pmf.unizg.hr/biol/alumni

URL 3_10_5_2 Svi biolozi https://www.facebook.com/groups/141459465614

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URL 4_6_2_2 Planovi javne nabave https://www.pmf.unizg.hr/javna_nabava

URL 4_6_2_3 Elektronički oglasnik javne nabave https://eojn.nn.hr/Oglasnik/

URL 4_6_3_1 Pravilnik o mjerilima i načinu raspodjele prihoda PMF-a https://www.pmf.unizg.hr/images/50022658/Pravilnik_o_mjerilima_i_nacinu_raspodjele_prihoda_PMF-a.pdf

URL 5_1_2_1 Kolokvij Sibe Mardešića https://web.math.pmf.unizg.hr/mardesic/sibe/hr

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URL 5_2_2_3 http://farma-leptira-apolon.hr/

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URL 5_4_2_2 Znanstveni razgovori na PMF-u https://www.pmf.unizg.hr/chem?@=1l82h

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Zakon o znanstvenoj djelatnosti i visokom obrazovanju (NN br. 123/03 do 131/17)

Zakon o osiguravanju kvalitete u visokom obrazovanju (NN br. 45/09)

Etički kodeks Sveučilišta u Zagrebu

Statut Sveučilišta u Zagrebu

Zakon o zaštiti osobnih podataka (NN br. 103/03 do 106/12)

Uredba (EU) 2016/679 Europskog parlamenta i Vijeća od 27. travnja 2016. o zaštiti pojedinaca

Zakon o pravu na pristup informacijama (NN br. 25/13, 85/15).

Strategija obrazovanja, znanosti i tehnologije.

Okvir nacionalnog standarda kvalifikacija za učitelje u osnovnim i srednjim školama,

Preporuke HZZ-a za obrazovnu i upisnu politiku 2020.

Mreža visokih učilišta i studijskih programa u Republici Hrvatskoj

Preporuke za obrazovnu upisnu politiku i politiku stipendiranja

Pravilnik o međunarodnoj mobilnosti Sveučilišta u Zagrebu

Studentska poveljom Erasmus+

Sporazum i priključivanje mreži CEEPUS III

Pravilnik o sadržaju diploma i dopunskih isprava o studiju (Uredničći pročišćeni tekst, “Narodne novine”, broj 77/08 i 149/11)

Zakon o fiskalnoj odgovornosti

Pravilnik o financijskom izvještavanju u proračunskom računovodstvu.

Pravilnik o proračunskom računovodstvu