

# STRATEGIC PLAN OF EDUCATIONAL AND RESEARCH ACTIVITIES OF THE FACULTY OF MATHEMATICS AND PHYSICS OF CHARLES UNIVERSITY FOR 2021-2025

The strategic plan of the Faculty of Mathematics and Physics of Charles University (MFF UK) for the years 2021–2025 represents a basic document from which specific faculty activities regarding not only educational and research activities, but also administrative and development activities, are derived in order to achieve the goals laid out in Charles University's strategic documents, as well as more specifically defined faculty goals.

The faculty's priorities for the defined period include improving the quality of education provided, regardless of external circumstances and any negative impact they may have, increasing the share of international cooperation in teaching and research, maintaining or strengthening the quality of research output, achieving balanced and well-established partnerships with businesses and collaborating scientific institutions, and increasing interest in mathematics, physics, computer science and teaching in society as a whole. The symbiosis of scientific and pedagogical activities is one of the main strategic goals, advantages and privileges of life at MFF UK.

By fulfilling the priorities defined in this document, the faculty intends to help develop not only activities in the specified areas, but also help maintain the good name of the faculty and the University, including fulfilling the third role of the University.

## 1. CREATIVE ACTIVITY - SCIENCE AND RESEARCH

### **Current situation**

MFF UK's scientific activities centre around the faculty's four natural areas of interest – mathematics, physics, computer science and teaching, with a primary focus on the three technical areas. For many years, MFF UK has been one of the best-performing institutions in the Czech Republic; measured in RIV<sup>1</sup> points, its output represents about a quarter of the total research output of Charles University. However, quantity is not the main reason for the faculty's numerous evaluations as “excellent” or “very good”. Of equal importance is the maintenance of a high standard of research output, which in some fields is comparable to universities and research institutes across the world. The quality of research work is both conditional on and proven by its success, especially in international grant competitions. MFF UK is one of the most successful Czech applicants to the *Horizon 2020* programme, in particular due to the six ERC grants won by MFF UK in the last seven years (3x Starting, 2x Consolidator, 1x Synergy). Active international cooperation and the intensive involvement of not only doctoral students, but also students at lower levels of study, in research are the necessary prerequisites for success in grant competitions and excellent research work in general.

Despite certain reservations about the quality of processing of results, the evaluation of the international panel, which the faculty recently received as part of Charles University's internal evaluation, gives a relative realistic reflection of the situation in which the faculty

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<sup>1</sup> Information Register of R&D results.

finds itself. If we were to evaluate the faculty as a whole on the basis of these materials with a single grade mark on a scale of A-D, it would be rated B+. Specifically, the faculty received a B in most of the evaluated fields, with two receiving a B+ and one an A. This rating shows that the faculty has some room for improvement, and also represents a challenge for bringing the faculty's grade closer to A in the next five years.

The University is currently at a turning point in its organization of scientific research, in the final year of the existence of its *Progres* research programmes, and on the threshold of the new *Cooperatio* research programmes, which focus more on the research structure at the University and on interfaculty cooperation in these fields.

### **Plan of activities for the defined period**

- Maintain the quality of basic research in all disciplines at the faculty at the top international level. Maintain the role of the faculty as an institution that determines the development of these disciplines in the Czech Republic and – in relevant cases – also in a European or global context.
- Develop applied research, including in cooperation with partner companies, strive for the transfer of knowledge into practice, and apply for application projects in national and international competitions.
- Analyse the results of the evaluation of research activities performed by both the RVVI<sup>2</sup> (Methodology 2017+) and Charles University (Internal Evaluation of Charles University) and prepare measures to strengthen aspects that are positively evaluated, and in particular lead a discussion aimed at eliminating identified weaknesses. Prepare and implement the principles of research evaluation into the evaluation of the quality of research at MFF UK, including overlap with the creation of the budget of MFF UK.
- Transform the structure of the existing *Progres* programmes into *Cooperatio* programmes, consolidate MFF UK activities in *Cooperatio* programmes in areas/fields in which the faculty was not previously active within CU structures, and support interdisciplinary research across departments and faculties.
- Address the quality of research teams, for example in terms of their balanced composition, age profile, in-breeding and internationalization, address the sustainability of teams that have established themselves in projects.
- Make maximum use of the possibility of cooperation with non-faculty partners, especially in the field of joint projects.
- Make more intensive use of tools to support the recruitment of high-quality international specialists to research positions (FC, FM, Postdocs Fund, MSC Actions, strategic partnerships of Charles University).
- Continued involvement of international specialists as members of commissions or external examiners in habilitation or appointment procedures and application of experience gained from the Research Board's remote negotiations for the active involvement of these persons in the habilitation and appointment process.
- Improve the system for the search for, motivation and administrative and professional support of applicants for international grants (especially *ERC* and *Horizon Europe*).
- Streamlining and reorganization of the work of departments dealing with the administrative support of research.

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<sup>2</sup> Research, Development and Innovation Council

## 2. EDUCATIONAL ACTIVITY IN BACHELOR (BC.) AND MASTER (NMGR.) STUDY

### **Current situation**

In the last monitored period, study programmes were newly accredited at all three sections of the faculty for all levels of study, including teacher training programmes. This stabilized the conditions for the further development of teaching at MFF UK. In the long run, student numbers at the faculty are stable despite a declining trend in the number of secondary school graduates in recent years. The demonstrable dependence of the number of students on the population status of the relevant year represented one of the critical parameters in the past period, which was overcome relatively successfully and without impacting the quality of education offered. In this respect, the concept of faculty schools, which will be further developed, proved to be an important and useful one. Based on population data, a slight increase in the number of students can be expected in the next period.

The faculty's study support service can be considered stable and established. However, one long-standing issue that was highlighted by the COVID-19 epidemic is the need to be more active in helping students to bridge the gap between secondary school and university. This year saw the introduction of tutors and mentors, the restoration of the position of group leader (VUS) and, on the initiative of students, the introduction of student guides, all with the aim of helping students in their first year of bachelor's studies. There is still room for improvement in the use of the possibilities offered by UK POINT, and a further point to be addressed was the lack of uniform scripts and teaching materials, especially in electronic form. In the following period it will be necessary to focus on the publishing policy for teaching and supplementary study texts, especially in electronic form.

The number of students in English-language courses is gradually increasing, at least in computer science and mathematics. The number of applicants for study is constantly growing, although the complexity of study means that the number of students who graduate from these programmes is relatively low. Here, too, there is room for improvement. The faculty will introduce physics courses in English in the near future.

In addition to full-time study, the faculty offers extracurricular vocational training courses and also makes a significant contribution to developing the University of the Third Age.

### **Plan of activities for the defined period**

- Monitor the quality of newly accredited programmes and further develop and modernize them using the option of changes that do not require "re-accreditation".
- Maintain the support system for first-year students (tutors, mentors, student guides, VUS) even after the transition to standard in-person teaching, evaluate its success and, if appropriate, modify it. Make full use of the possibilities offered through cooperation with UK POINT, especially in the field of professional psychological and career counselling.
- Increase the involvement of students in bachelor's and master's courses in research projects using student faculty grants (SFG) and other tools.
- Improve and clarify the structure of the study component of the faculty website under the supervision of the Vice-Dean for Student Affairs.

- Develop English-language bachelor's and master's courses by supporting, among other things, the introduction of English-language courses in selected physics study programmes. Extend the financial support provided to talented applicants by increasing the number of existing faculty scholarships.
- Support joint degree projects with international universities at bachelor's and master's level. Prepare and launch the accreditation process for joint degree study programmes. Make full use of cooperation in shared teaching within the 4EU+ initiative, ideally leading to the creation of follow-up master's programmes in the form of a double or joint degree.
- Given the critically low numbers of teachers in our fields (M, P, I) and the government's proposal for the involvement of professionals, with the requirement to gain a teaching qualification within three years, we need to provide greater support for the study of teaching at the faculty. We could do this with various motivational tools, including the option of expanding the range of lifelong learning and advanced teacher training courses, with the aim of creating a modular system that is more accessible and more permeable. This would enable anyone who is interested in studying to complete the most suitable combination of course content and length.
- Based on experience from the first years of training future teachers in the major/minor system, evaluate the calibration and, if necessary, adjust the curricula for teacher training programmes.
- Respond to developments in the field of teaching at primary and secondary schools (in computer science and physics in particular) and adjust and modernize the curricula of teacher training programmes so that they are more attractive to applicants and give students greater motivation to work as teachers.
- Support and develop MFF UK's Faculty Schools project and thus increase awareness of the faculty among both teaching staff and future students. Focus on establishing direct contacts with motivated and gifted secondary school pupils in the form of consultations and the supervision of secondary school pupils' work and projects by professional guarantors from the faculty, and giving talented secondary school students more opportunities to attend professional faculty seminars.
- Improved accessibility of University of the Third Age courses and seeking of suitable (primarily) technological innovations. Targeted offer of University of the Third Age courses to members of Matfyz Alumni, Alumni UK and the intersections of these groups. Review the current organization of the University of the Third Age, introduce pilot online courses, and continuously evaluate effectiveness and coordinate activities with the CU Rectorate.
- Prepare a system of teaching scripts in electronic form (e-script) in the MatfyzPress faculty publishing house beyond the so-called professional edition, and in particular pedagogical texts for lectures in basic bachelor's courses, taking into account the needs of units and the financing of e-scripts.
- Draw on the experience of online teaching during the COVID-19 pandemic and apply it to complement in-person teaching.

### 3. DOCTORAL STUDIES

#### **Current situation**

While doctoral study programmes are established at the faculty, in some cases they are proving to be less attractive compared to work in applied and industrial research. Problems include both the remuneration of doctoral students and, to a lesser extent, the complexity of the topics addressed, which leads to a disproportionate prolongation of studies. Although the length of doctoral study programmes at the faculty exceeds the standard expected time, it is one of the shorter courses at Charles University. Nevertheless, it is desirable to continue to the evaluation and adjustment of the conditions in place for doctoral students, as well as their professional and intensive guidance towards their own work in order to increase the number of students who successfully complete their studies within 4-5 years.

For both the above reasons and others, a decreasing trend in the number of students on Czech-language programmes is becoming evident; on the other hand, it is worth noting the increase in the number of applicants for English-language programmes. However, the range of countries from which these applicants come is rather heterogeneous, meaning that the faculty is not yet able to develop a consistent policy in this area.

A separate issue is the promotion of doctoral studies, which is closely related, on the one hand, to the quality, clarity and simplicity of the faculty website, and on the other, also the activities of subject-area boards in the promotion of the relevant doctoral programme.

#### **Plan of activities for the defined period**

- Continued promotion of doctoral studies, improved information for applicants on the range of study programmes, topics and supervisors, not only through the SIS, but especially through the pages in individual study programmes and their integration into the structure of the faculty website.
- Increased proportion of high-quality international doctoral students (especially from developed countries) and effort to ensure their active involvement in both ongoing and new projects and current research topics.
- Reduction in the incidence of courses that significantly exceed the standard study time. Closer checks on the fulfilment of individual study plans, including their adequate evaluation.
- Robust monitoring of the quality of doctoral programmes to ensure that ISPs focus mainly on the acquisition of skills and knowledge related to the topic of the doctoral dissertation.
- Seeking of ways to improve the financial situation of doctoral students at MFF UK.
- Creation of the position of *industrial Ph.D. student* as an integral part of doctoral studies at MFF UK as a means of seeking ways to work more closely with businesses and use this position as one means of improving the financial situation of doctoral students in accordance with the criteria of the faculty partner company programme.
- Expand international cooperation in doctoral studies through internships, cotutelle and joint degree programmes.

#### 4. ORGANIZATION OF ACTIVITIES AND DEVELOPMENT

##### **Current situation**

In recent years, investment construction projects have expanded the spatial capacity of the faculty, in particular through the brand new IMPAKT pavilion on the faculty campus in Troja. The pavilion's modern concept, including related technological equipment, creates facilities that meet the current requirements for teaching (including online teaching) and the comfort of employees. Although this has largely resolved the issue of the lack of classrooms and lecture halls, MFF UK still suffers from a lack of workspaces and offices for its staff, especially in connection with its (welcome) success in winning projects. At the end of the last monitored period, the faculty commissioned a study and implementation project entitled "Attic installations in the Ke Karlovu 3 building" with the aim of expanding the office space capacity. However, due to the recently identified state of disrepair of the Heavy Equipment Laboratories building in Prague-Troja, it is highly likely that some construction and investment plans will be subject to careful consideration and, if necessary, postponed. The investment plan must be conceived so that the faculty is still able to invest in routine maintenance and major necessary repairs so as to ensure the smooth continuation of research and teaching at the institution.

The faculty's website has undergone significant technological innovation in the past period. A major milestone was the introduction of a content management system (CMS) on the faculty's main website, which could potentially allow the involvement of multiple website administrators with defined rights. The system is already being used by some departments, and the pages of the units of the faculty, and now also the pages of the MFF UK library, have been switched to the new system. The system should be gradually extended to other workplaces in the next period. One of the current goals is to create an internal website ("intranet") so that faculty management can gradually fulfil its promise to create and, in particular, make available internal instructions and procedures.

In the past period, the faculty has successfully developed partnership cooperation between the business and academic environments through the so-called partnership programme. The faculty expects to utilise the potential of this programme to increase the involvement of businesses in, in particular, research and doctoral studies, as well as joint projects to support talented secondary school pupils and university students.

MatfyzPress (and the faculty reprographic department) mainly produces printed books in professional and popular editions. Some of these are teaching materials, while others fulfil a promotional and popular educational function. A current topic in this respect are electronic teaching materials.

Probably the most pressing issues to be addressed at present are the need to transform some areas, including the restructuring of some important administrative activities (e.g. support for project preparation and grants), enhanced IT support, legal support, and support for small-scale procurement through small public contracts). In many cases, the current inappropriate combination of electronic formats and the traditional hard copy, combined with the need to perform activities exclusively "on paper", has not resulted in the declared simplification of work and represents a major challenge in improving faculty life.

## Plan of activities for the defined period

- Increase the efficiency and effectiveness of the work of the Dean's Office through the gradual electronicization of activities, including the training of officials at the Dean's Office in connection with new procedures and software. Strive for the integration into existing systems of new modules for electronicization that are already used elsewhere at the University.
- Reform the current organization of some departments of the Dean's Office, with an emphasis on changes to project and grant support, as well as to electronic issues and IT support of activities of the Dean's Office.
- Focus on the activities of the department dealing with small-scale public procurement, strive for purchases within the dynamic purchasing system (DPS), but at the same time utilise framework agreements and contracts in order to streamline the purchase of small machinery and equipment.
- Establish the position of full-time faculty lawyer.
- In connection with the MFF UK intranet project, increase awareness of faculty staff members and students (clear instructions, guides, procedures), organize workshops, regular meetings between the Dean's Office and secretaries of departments, regular information on newly adopted measures of faculty management.
- Continuously develop the faculty website system from a graphic and technical point of view, increase the degree of autonomy of administration of individual thematic units of the website and integrate content management systems across platforms. Expand the hierarchy of administrators of faculty and other websites, involve individual workplaces, including administrative ones, in the generation of website content, continuously develop other content management system functionalities as required, and connect newly created websites (including so-called promotional micro-sites) primarily to the faculty content management system.
- Improve the economic efficiency of MatfyzPress both through the small-series custom production of educational texts and publications and through the development of digital production and distribution. Prepare a technical framework for the easy operation of production in *print-on-demand* mode and define the related process and administrative framework. Expand the range of additional sales of promotional items with appropriate promotional targeting according to the current communication needs of the faculty and conference sets. Prepare and deploy a system of publications in electronic form (including e-scripts) and distribution (faculty) channels and define the legal and business framework for electronic publications, including in relation to previously published works and their reprints.
- Participate in the preparation, implementation and promotion of the university-wide Hyb4City project on the Hybernská Campus in selected activities (especially the science centre, support for spin-off companies and a student company incubator), as well as evaluation of its effectiveness and specific benefits for the faculty.
- Extend the partner company programme with other options and combinations, including cooperation on the establishment of the position of industrial doctoral student (see also section 3 Doctoral studies), and define the related legislative, organizational and administrative framework.

## **Plan for the defined period in the field of building management**

- The main investment activity in the period under review will be, in particular, the replacement of the cladding and the reconstruction of the roof of the Heavy Equipment Laboratories building, which is in a state of disrepair. In addition to routine repairs and planned small-scale investments (repairs to the terrazzo in Karlín, partial reconstruction of rooms and seating in corridors, master key systems, repairs to relaxation room in Karlín), the short-term plan includes, for example, modifications to the Ke Karlovu 3 building, where part of the attic installation had to be postponed due to the transfer of funds to the aforementioned cladding project. Instead, the existing rooms of the Dean's Office will be used more efficiently (thanks to some workplaces of the physics department that agreed to move) through the reconstruction of one library room into a study, transformation of the lower meeting room into a multifunctional meeting room, modification of some other rooms so that the Department of Corporate Cooperation and Career Counselling (OFSKP), which is still based in Troja, could move to Ke Karlovu. In connection with this transfer and the transfer of the Troja library to IMPAKT, it will be possible to make building modifications in the area behind the Troja canteen, which will allow both the extension of the canteen and the creation of a student relaxation room in Troja and several offices. A relaxation room is also planned at the Rotunda in Malá Strana. Larger-scale investment activities in the period under review include a new computer centre in Troja and the last stage of installation of new cladding, this time in the department building in Troja. All of this will depend on the funding available to the faculty, the possibilities of profit from projects, etc.
- Active search for and utilisation of grant and other non-faculty sources of investments for larger projects, especially the aforementioned high-cost construction investment projects.
- Monitor developments in OP JAK projects and seek ways to utilise the potential of these projects to address the current needs of the faculty.
- Actively monitor developments related to the construction of the Albertov Campus and support, in cooperation with the CU Faculty of Science of and the 1st Faculty of Medicine, efforts to achieve efficient and functional structure of the Campus, its administrative organization and the financing of staff and operating expenses by the faculties.
- Strive to improve transport services to the faculty and dormitory buildings in Troja in cooperation with the Faculty of Humanities (FHS UK) and in connection with other Charles University construction activities concerning dormitories and the FHS UK building in Troja.

## **5. ACADEMIC COMMUNITY**

### **Current situation**

The main currency of any institution are fair and open working relationships between staff members. This applies in full to the university environment. In the past, the faculty has made considerable efforts to look after students and staff. Although the COVID pandemic has had a negative impact on the faculty's activities in some areas related to gath-



erings of people (concerts, social events, balls, staff meetings, Albeř, silver and gold graduations ...), the faculty will strive to resume these activities as soon as the situation allows. The chief communication channels during this time have become the electronic channels, in particular promotional faculty websites, communication via social networks, and the activities of the graduate association. Some members of the academic community are active members of Matfyz Alumni, through whom the faculty maintains contact with its graduates across the academic and commercial spheres.

The faculty's main areas of interest in HR policy are both open, high-quality selection procedures and a transparent policy for the career development of staff members. Regarding the first of these points, it can be stated that in the period between September and December 2020, the faculty conducted 19 recruitment procedures for professional positions and functional positions, which attracted a total of 79 applicants, 60 of whom were foreigners, with six applicants from abroad eventually approached with a job offer. Maintaining a positive trend in this area is one of the goals of the current management.

Career development and advancement are closely related to the newly emerging career code of Charles University. Although at the moment the concept proposed by the University seems to entail a certain administrative burden, some parts of the prepared career code represent a shift towards further improvement of the staffing structure.

### **Plan of activities for the defined period**

- Enhancement of the professional quality and knowledge of pedagogical, research and administrative staff at the faculty, particularly through open competitions for not only for the positions of assistant professors, but also for AP3 and AP4 positions.
- Monitor and influence the development of the career code of Charles University, specify its principles with reference to MFF UK, and increase the transparency of the possibilities for career advancement or "transfer".
- When conditions allow, renew selected or introduce new activities to enhance the quality of meetings between members of MFF UK staff.
- In cooperation with the trade union, improve the conditions of employees of the MFF UK.
- Maintain and further cooperation with graduates through the Matfyz Alumni club, search for suitable synergies of specific collaborations and test new activities for various groups of graduates.
- Strengthen the autonomy of the Matfyz Alumni Association, which should be the basic point of contact between graduates and the faculty. Introduce innovations in activities for graduates in different age groups, including in cooperation with the Alumni UK graduates' club.
- Support the greater involvement of students in faculty activities: participation of SKAS representatives in KD meetings, student membership in some committees, involvement of students in the pedagogical process, including student assistants, and possibly assistance in finding more effective ways implement faculty policies.

## 6. EXTERNAL RELATIONS AND PROMOTION

### **Current situation**

The basic mechanisms for promoting MFF UK can be considered stabilized following the implementation of reforms in 2016–2020. These are divided into direct promotion of the faculty (participation in education fairs, organization of information days – DOD, JDF, JDIM, advertising for study, etc.), targeted work with talented youth (correspondence seminars, training centres and camps with an educational programme, the newly established Universum award - part of České hlavičky) and longer-term projects, usually in co-operation with other institutions that seek to cultivate public debate on a particular issue (e.g. lack of teachers of mathematics, physics and computer science) and to create a broader social basis for its resolution. The latter projects are usually the most visible when fulfilling the so-called third role of the University and the faculty.

In the previous monitored period, significant reforms were implemented in faculty PR, where current promotional activities are performed, organized, supervised or otherwise supported in the operational sense by the Department of Promotion and Media Communication of MFF UK (OPMK). Its scope includes both the content and, to some extent, technical administration of the faculty's website, as well as other forms of presentation (printed and electronic media), including the placing of targeted advertising (print, social networks, etc.). Although the methodology of the department is the responsibility of the vice-dean for the relevant field, it also addresses the direct requirements of professional and administrative workplaces, especially with regard to the editing of websites or the publishing information. Direct promotional activities are linked to the implementation dates for the cycle of the academic year, and other projects are then based on the current needs or schedule of cooperating institutions. In a number of practical activities, OPMK actively cooperates with faculty departments (e.g. the Department of Corporate Cooperation and Career Counselling (OFSKP) and the MatfyzPress publishers) or the central promotional and media departments of the CU Rectorate, and responds to set goals in accordance with the specific needs of the faculty.

Customarily, promotional activities also include support with issues concerning career counselling, the partner company programme and lifelong learning, particularly with reference to the University of the Third Age. Although media communication and promotion is mainly an external component, it is necessary to also continue to focus on improving internal communication processes within the faculty.

### **Plan of activities for the defined period**

- Strengthen the promotion of the faculty abroad - both the range of fields of study at all levels and the possibilities of scientific or industrial cooperation. Develop the faculty's foreign-language communication on the faculty website and social networks, and disseminate original promotional content. Increase staff capacity for promotion in English, or other languages, with a view to special foreign-language promotional projects.
- Appropriate thematization of the content of existing promotions. Discuss topics from units and implement consensual plans that are most appropriate from a content, formal and contextual perspective.

- Expand the faculty's promotional and information service on social networks, follow current trends and adapt their presentation to them. In this context, consider the creation of targeted intra-faculty information channels on certain issues (e.g. the Partner Company programme).
- Continuously refine the institutional and administrative legislation concerning correspondence seminars and summer camps and seek suitable organizational synergies, while maintaining the specificity of individual events. Modernize the service for participants in these events.
- Improve the registration of participants in faculty promotional events and evaluate the data obtained so as to, in turn, improve the effectiveness of these events. Introduce and operate new types of database records of participants in long-term promotional events, including in relation to faculty schools of MFF UK.
- With respect to work activities with talented youth, continue to develop all long-term distance and full-time activities and seek alternative sources of funding, including co-financing by participants. Promote one-off awards for talented youth (e.g. České hlavičky) through appropriate forms of cooperation and provide winners in the relevant categories with additional professional assistance from the faculty.
- Support the dissemination of selected awards that are appropriate from a societal and media perspective, e.g. the Albertus Award for outstanding teachers, to include other collaborating institutions or partners, continuously raise awareness of this award, and further utilise examples of good practice in communication with faculty schools and the general public.
- Strengthen the promotion of teaching disciplines and lifelong learning in our fields of study, including DVPP courses.
- Use student initiatives in designing new content with emphasis on the primary promotion of MFF UK and its study offer for all levels of study.
- Commemorate the 70<sup>th</sup> anniversary of the founding of MFF UK (which falls in 2022) in appropriate contexts, and prepare several promotional events and souvenirs commemorating the anniversary of the founding of the faculty. If the situation allows, hold a gathering to mark this anniversary.

Prague, 28 February 2021

Associate Prof. RNDr. Mirko Rokyta, CSc.  
Dean of MFF UK

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