ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ
HELLENIC REPUBLIC

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Accreditation Report

for the Undergraduate Study Programme of:

Mathematics

Institution: University of Crete

Date: 21 October 2020

Ευρωπαϊκή Ένωση
Ευρωπαϊκό Κοινωνικό Ταμείο

Επιχειρησιακό Πρόγραμμα
Ανάπτυξη Ανθρώπινου Δυναμικού,
Εκπαίδευση και Διά Βίου Μάθηση
Με τη συγχρηματοδότηση της Ελλάδας και της Ευρωπαϊκής Ένωσης

ΕΣΠΑ 2014-2020

enqa.

Report of the Panel appointed by the HAHE to undertake the review of the Undergraduate Study Programme of **Mathematics** of the **University of Crete** for the purposes of granting accreditation

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PART A: BACKGROUND AND CONTEXT OF THE REVIEW

I. The External Evaluation & Accreditation Panel

The Panel responsible for the Accreditation Review of the Undergraduate Study Programme of **Mathematics** of the **University of Crete** comprised the following four (4) members, drawn from the HAHE Register, in accordance with Laws 4009/2011 & 4653/2020:

1. **Prof. Basilis Gidas (Chair)**
   Brown University, Providence, Rhode Island, USA

2. **Prof. Nikolaos Dimakis**
   University of Texas Rio Grande Valley, Edinburg, Texas, USA

3. **Prof. Panagiotis Souganidis**
   The University of Chicago, Chicago, Illinois, USA

4. **Prof. Nikolaos Stylianopoulos**
   University of Cyprus, Nicosia, Cyprus

II. Review Procedure and Documentation

The External Evaluation & Accreditation Panel (henceforth: EEAP) conducted the accreditation evaluation of the Mathematics undergraduate program at the University of Crete during the period 12-21 of October 2020. The Department of Mathematics and Applied Mathematics at the University of Crete has two distinct undergraduate programs – the Mathematics Program and the Applied Mathematics Program. The Department's faculty, staff personnel, lab personnel, computer facilities, other infrastructures, as well as the graduate program, are common to both programs. The EEAP reviewed both programs in parallel, but it prepared two distinct reports. All scheduled teleconferencing meetings were common for both programs, except that EEAP met with separate groups of current students and past students from the two programs. This present report is for the Mathematics Program.

Due to the Covid-19 pandemic, the EEAP could not visit the site physically, but conducted the accreditation evaluation via Zoom teleconferencing. From October 15th- 21th the EEAP prepared the report using Zoom teleconferencing meetings for its members. On Monday, October 12th, the EEAP attended a Zoom teleconference briefing by HAHE's General Director Dr. Christina Besta who outlined and expanded the procedures and rationale for the accreditation. Dr. Besta' s presentation was sent to the EEAP members in advance.

The EEAP members received in advance from HAHE the following documentation and supporting material related to the Mathematics Program:

1. The guidelines for accreditation created by HAHE
2. The mapping grid created by HAHE
3. A tabulation (prepared by HAHE) of the scores of the program regarding the quality indexes for the years 2015 – 2018
4. The accreditation information for the program prepared by the department
5. A set of annexes to the accreditation proposal, including the study guide, course descriptions, etc.
6. Statistical data regarding the department and the specific program of studies
7. The Quality Assurance policy of the specific program of studies
8. A set of documents presenting quality indicators both for the department and the program
9. The two reports of the 2011 external evaluations conducted (separately) by HQA for the Department of Mathematics and the Department of Applied Mathematics (at that time the two departments were separate)
10. The results of the internal evaluations of the specific program of studies

The EEAP also had access to University and departmental websites. Moreover, during the virtual on-site visit, the Department Head, Prof. Theodoulos Garefalakis, provided additional materials (electronic versions of power-point presentations prepared and presented by the department,

selected undergraduate exams, problem sets and their solutions) for both the Mathematics Undergraduate Program and the Applied Mathematics Undergraduate Program. Also, the Vice-Rector, Prof Geogios Kossioris, gave us a presentation addressing the vision and other aspects of the entire university.

On Tuesday, October 13, the EEAP met the Vice Rector for Academic and Students Affairs and President of MODIP, Prof. Georgios Kossioris, and the Head of the Department, Prof. Theodoulos Garefalakis. Subsequently, the Head of the Department introduced the members of OMEA and MODIP and gave a brief presentation, focusing on (a) the history and structure of the department, (b) teaching, (c) research, and (d) outreach activities and other matters related to both programs in the department. Discussion followed with emphasis on the revisions of the two programs that were implemented by the new department since the merging of the two previously separate departments. The revisions accommodated the recommendations of the two external evaluations in 2011 (when the departments were separate).

The same day (Tuesday 13), the EEAP had a series of teleconference meeting with departmental personnel, including:

1. Members of teaching staff
2. Representatives of students from the Mathematics program

The day was concluded with the EEAP's debriefing.

On Wednesday October 14, the EEAP had:

1. A teleconference meeting with representatives of students from the Applied Mathematics Program
2. A video tour of classrooms, computer facilities, faculty and administration offices, break out and study rooms, library, laboratories, amphitheaters, and other facilities. The EEAP had the opportunity to evaluate the recourses available to the department and the program and to interact with the Head of the Department as well as with teaching staff and administrative staff.

The schedule of the day continued with teleconference meetings involving:

3. A representative group of past students from the Mathematics Program
4. A representative group of past students from the Applied Mathematics Program
5. Employers and industrial/social partners of the Department

The day was concluded with EEAP's debriefing.

Due to the Covid-19 pandemic the classes for both programs were online, and so the EEAP did not have the opportunity to observe teaching.

On Thursday October 15, the EEAP met again with OMEA, MODIP representatives, the Head of the department, and the Vice-Rector for additional discussions and clarifications of points that

were brought up in the previous two days. The same day, the EEAP provided the OMEA and MODIP representatives, the Head of the department, and the Vice-Rector, a preliminary summary of its key finding and recommendations. Also, the same day, the EEAP began the preparation of the two reports, which were completed during the period of October 14-18-19-21. The two reports were submitted on the due date of October 21, 2020.

The schedule of the three-day e-visit was well organized and gave the EEAP a thorough picture of the department's vision and efforts for the student education of its two separate undergraduate programs. The quality of both programs is in perfect conform with international standards. EEAP was impressed by the dedication and commitment of the teaching staff, the department's rigorous procedures for checking the assurance quality, and in general the effectiveness of both undergraduate programs. As it is also indicated in the two reports, while teaching and training of the students can be improved within the two programs, much of the weaknesses are due to factors beyond the department and the programs themselves. These are due to factors stemming from the stringent and unwise regulations imposed by the Ministry of Education and Religious Affairs (thereafter called Ministry of Education for brevity) and to economic factors resulting from the recent national economic crisis.

III. Study Programme Profile

The Department of Mathematics and Applied Mathematics was established in 2013 with the merging of the two separate departments, namely the Department of Mathematics and the Department of Applied Mathematics. The Mathematics department was established in 1977 and was one of the original departments of the University of Crete. The Department of Applied Mathematics was established in 1999 and it was the youngest department at the university. The new department is a unit within the School of Sciences and Engineering which includes the departments of Chemistry, Physics, Biology, Computer Science, and Material Science and Technology.

The Department of Mathematics and Applied Mathematics has two distinct undergraduate programs, namely the Mathematics Program and the Applied Mathematics Program. These two programs not only confer distinct degrees but also have separate admission procedures. However, the department faculty, its staff and lab personnel, its computer facilities, and other infrastructure are all common to both programs.

Currently, the department has 32 faculty members (4 assistant professors, 8 associate professors, and 20 full professors), 8 instruction staff, 8 administrative personnel, and 1 computer lab professional. In the past 7 years (i.e. since the new department was created) 13 members of the department retired or left, but only this year (2019/2021) the department was given 3 positions, one of which was just filled this year and the other two are scheduled to be filled the next couple of years. The position that was already filled was in the area of PDEs. The two positions to be filled in the future will be in the general areas of Statistics and Analysis. The EEAP is of the opinion that the subject of the position in Statistics should be expanded to Applied Probability and Learning Theory (equivalently Applied Probability and Mathematical Statistics). This would put the department in par with international trends towards BIG DATA SCIENCES.

On the basis of information given to EEAP and from meetings with alumni, the EEAP observed that the two undergraduate programs have produced graduates who have ended up in good international universities, have been successful in the business and industrial world, and have been distinguished in teaching in the lower levels of education. The EEAP believes that for the department to continue this success and maintain its high-quality mathematical education, the Ministry of Education should replace at least half of the faculty vacancies created because of retirements or departures. The current of faculty-to-student ratio (in both programs) is about 1:65, which is large in the panel's opinion. It is important that an effort should be made by the Ministry of Education to address this situation, because it has a negative impact on the quality of education. This problem can be addressed either by increasing the number of faculty or reducing the number of incoming students or both.

The department has a graduate program offering both a Master's degree and a Ph.D. degree. The master program has three distinct directions: (1) Mathematics and Applications, (2) Applications

and Computational Mathematics, and (3) Mathematics of Education. In the EEAP's view, both the Master and the Ph.D. programs are of high quality.

Both the Mathematics and the Applied Mathematics program require a minimum of 36 courses corresponding to 240 ECTS for the completion of a degree. Both programs are designed for 8 semesters or equivalently 4 years. However, the majority of the students take much longer than 4 years to complete their degree. According to the data provided to the EEAP, the last six years (2013-2019) the average of the yearly medians of the number of years to complete the degree (averaged over six years) is 5.6 years for the Mathematics program. The median is essentially unchanged over the past five years. The average of the yearly averages for the same periods (2013-2019) is 5.96 for the Mathematics program. Statistical data provided to the EEAP regarding the academic year 2017-2018 indicate that in the Mathematics program about 16.3% of the students graduated in 4 years, 24% graduated in 5 years, and 26% graduated in 6 years. The remaining students 2018 took more than 6 years to graduate. Roughly speaking, these numbers indicate that more than 2/3 of students finish in 6 or less years. The EEAP feels that this is a satisfactory time-length of graduation.

The latest data of the HAHE indicate that each program admitted about 175 students per year during the period 2013-2018. The number of admitted students for the current academic year (2019-2020) was basically the same. The number of admitted students in each program is dictated by the Ministry of Education. The EEAP strongly feels that this number, totaling 350 for both programs, not only is very high for a department of 32 faculty members, but also has a negative impact on the quality of education. The EEAP strongly recommends that the Ministry of Education reduces this number of incoming students to a maximum of 100 students per program.

The total number of currently registered ("active") students is 804 in the Mathematics Program and 722 in the Applied Mathematics Program. The total number of currently enrolled undergraduate students in both programs is approximately 2000 (approximately 1000 in each program). This amounts to about 65 students per faculty for a department with only 32 faculty members. This ratio is very high relative to international standards, and its consequences for quality of education are the same as those pointed out in the previous paragraph.

The last external evaluation was done in 2011 when Mathematics and Applied Mathematics were separate departments. Therefore, there are two distinct external evaluations both done in 2011. Since its formation, the new department made serious efforts to revise the undergraduate curricula of both programs, in a positive way. In particular, the department implemented nearly all of the recommendations of the 2011 external reviews. Naturally, the revisions and re-organization of the two undergraduate programs has been inhibited by the prolonged national economic crisis and the reduction of the faculty.

PART B: COMPLIANCE WITH THE PRINCIPLES

Principle 1: Academic Unit Policy for Quality Assurance

INSTITUTIONS SHOULD APPLY A QUALITY ASSURANCE POLICY AS PART OF THEIR STRATEGIC MANAGEMENT. THIS POLICY SHOULD EXPAND AND BE AIMED (WITH THE COLLABORATION OF EXTERNAL STAKEHOLDERS) AT ALL INSTITUTION'S AREAS OF ACTIVITY, AND PARTICULARLY AT THE FULFILMENT OF QUALITY REQUIREMENTS OF UNDERGRADUATE PROGRAMMES. THIS POLICY SHOULD BE PUBLISHED AND IMPLEMENTED BY ALL STAKEHOLDERS.

The quality assurance policy of the academic unit is in line with the Institutional policy on quality, and is included in a published statement that is implemented by all stakeholders. It focuses on the achievement of special objectives related to the quality assurance of study programmes offered by the academic unit.

The quality policy statement of the academic unit includes its commitment to implement a quality policy that will promote the academic profile and orientation of the programme, its purpose and field of study; it will realize the programme's strategic goals and it will determine the means and ways for attaining them; it will implement the appropriate quality procedures, aiming at the programme's continuous improvement.
In particular, in order to carry out this policy, the academic unit commits itself to put into practice quality procedures that will demonstrate:

a) the suitability of the structure and organization of the curriculum;
b) the pursuit of learning outcomes and qualifications in accordance with the European and the National Qualifications Framework for Higher Education;
c) the promotion of the quality and effectiveness of teaching;
d) the appropriateness of the qualifications of the teaching staff;
e) the enhancement of the quality and quantity of the research output among faculty members of the academic unit;
f) ways for linking teaching and research;
g) the level of demand for qualifications acquired by graduates, in the labor market;
h) the quality of support services such as the administrative services, the Library, and the student welfare office;
i) the conduct of an annual review and an internal audit of the quality assurance system of the undergraduate programme(s) offered, as well as the collaboration of the Internal Evaluation Group (IEG) with the Institution's Quality Assurance Unit (QAU).

Study Programme Compliance

The University has established an appropriate Quality Assurance Policy which fully satisfies relevant requirements. The Key Performance Indicators (KPIs) are regularly updated. Both the Mathematics and the Applied Mathematics programs follows the guidelines of the institutional policy. The MODIP monitors and enforces the Quality Assurance. The department's general

assembly has the overall responsibility for reviewing its two programs and ensures its consistency with the Institutional Quality Assurance standards.

The Mathematics program is continuously revising its curriculum in order to accommodate the ever-changing quality of the students and adjusting to international mathematical trends. The revised curriculum provides a very good mathematical background and the use of novel teaching methods that often engage students to undergraduate research. Nevertheless, some changes are necessary and are addressed later in this report. Overall, the program meets international standards. The EEAP met with a number of Mathematics current and past students, who indicated that they are very satisfied with the program and their education. The department has developed a relation with national and international private employers which provides an important link between mathematical education with present day industrial and societal needs and trends. The EEAP feels that this is an important aspect of the program's mission and encourages the department to continued and expand this effort.

During the last few years, the department has undertaken very interesting outreach activities related to mathematical sciences education for students at all levels of lower education (elementary schools, high school, and lyceum). Due to lack of funding and housing, these activities are currently restricted to students from Crete. However, the department hopes to expand these to the national level. The EEAP finds these summer activities/programs for students of lower education impressive and very important. We strongly encourage the department and the university to continue these activities, and to seek funds from their industrial partners, local and national governments.

The department has high caliber research faculty, which has positively influence on the students' undergraduate education. This is consistent with the fact many of their students succeed in entering top international universities for graduate studies, while others are very successful in their professional life.

At present there is no rigorous process for recording annual activities of the academic staff. While the department maintains information about research and academic activities of the faculty members, this is not done in a comprehensive way. The EEAP suggests that at the beginning of every academic year each faculty member submits an updated CV and a report of 1-2 pages for "yearly activities" (including, publications, participation in conferences, teaching, books or teaching notes, service to the department, and service to the university and the profession). More suggestions about documentation regarding faculty academic activities are given in the section of Principle 5 of this report.

The QA policy is in place and the MODIP within the university structure oversees its proper and regular implementation.

Panel Judgement

Principle 1: Institution Policy for Quality Assurance	
Fully compliant	**X**
Substantially compliant	
Partially compliant	
Non-compliant	

Panel Recommendations

1. Continue to have all relevant policy documents pertaining to the department, readily available and accessible.
2. The department's website should be improved to exhibit material useful to various aspects of education, and also to increase the visibility of the research activities of its members.
3. Each year, the faculty should provide information (1 - 2 pages) concerning their academic and scientific activities for previous academic year. [More detailed comments concerning this issue are given in Principle 5].

Principle 2: Design and Approval of Programmes

INSTITUTIONS SHOULD DEVELOP THEIR UNDERGRADUATE PROGRAMMES FOLLOWING A DEFINED WRITTEN PROCESS WHICH WILL INVOLVE THE PARTICIPANTS, INFORMATION SOURCES AND THE APPROVAL COMMITTEES FOR THE PROGRAMME. THE OBJECTIVES, THE EXPECTED LEARNING OUTCOMES, THE INTENDED PROFESSIONAL QUALIFICATIONS AND THE WAYS TO ACHIEVE THEM ARE SET OUT IN THE PROGRAMME DESIGN. THE ABOVE DETAILS AS WELL AS INFORMATION ON THE PROGRAMME'S STRUCTURE ARE PUBLISHED IN THE STUDENT GUIDE.

Academic units develop their programmes following a well-defined procedure. The academic profile and orientation of the programme, the objectives, the subject areas, the structure and organization, the expected learning outcomes and the intended professional qualifications according to the National Qualifications Framework for Higher Education are described at this stage. The approval or revision process for programmes includes a check of compliance with the basic requirements described in the Standards, on behalf of the Institution's Quality Assurance Unit (QAU).

Furthermore, the programme design should take into consideration the following:

- *the Institutional strategy*
- *the active participation of students*
- *the experience of external stakeholders from the labor market*
- *the smooth progression of students throughout the stages of the programme*
- *the anticipated student workload according to the European Credit Transfer and Accumulation System*
- *the option to provide work experience to the students*
- *the linking of teaching and research*
- *the relevant regulatory framework and the official procedure for the approval of the programme by the Institution*

Study Programme Compliance

The Mathematics program is designed by a departmental committee and is considered and approved by the university general assembly. The EEAP believes that the overall structure aligns well with similar programs in Greece and abroad. The student guide is complete, concise, appropriate and well thought of. In designing the program, the department takes into account input from the stakeholders, external experts, students and alumni. The entire process, including program revisions, is overseen by the MODIP.

As mentioned earlier in this report, the ECTS required for the degree are (minimum) 240, corresponding to 35-36 courses. According to the European Credit Transfer and Accumulation System this is relatively high. The EEAP feels that the number of 35-36 courses is somewhat too high and an effort should be made to reduce the number of courses to about 32, corresponding to 4 courses per semester (equivalently, 8 courses per year). One way to reduce the number courses, and keep the number of ECTS to 240, could be to reallocate the number of ECTS among courses.

Panel Judgement

Principle 2: Design and Approval of Programmes	
Fully compliant	**X**
Substantially compliant	
Partially compliant	
Non-compliant	

Panel Recommendations

1. The department should encourage the strengthening the Alumni Society. A strong Alumni Society could be very important in providing suggestions in the design of the educational program, and in assisting the graduates in their future endeavors.

2. The Department develops some systematics mechanism for getting input from stakeholders.

3. The department should consider the possibility of relocating the number of ECTS in order to lower the number of required courses.

Principle 3: Student- centred Learning, Teaching and Assessment

INSTITUTIONS SHOULD ENSURE THAT THE UNDERGRADUATE PROGRAMMES ARE DELIVERED IN A WAY THAT ENCOURAGES STUDENTS TO TAKE AN ACTIVE ROLE IN CREATING THE LEARNING PROCESS. THE ASSESSMENT METHODS SHOULD REFLECT THIS APPROACH.

Student-centered learning and teaching plays an important role in stimulating students' motivation, self-reflection and engagement in the learning process. The above entail continuous consideration of the programme's delivery and the assessment of the related outcomes.

The student-centered learning and teaching process

- *respects and attends to the diversity of students and their needs, enabling flexible learning paths;*
- *considers and uses different modes of delivery, where appropriate;*
- *flexibly uses a variety of pedagogical methods;*
- *regularly evaluates and adjusts the modes of delivery and pedagogical methods aiming at improvement;*
- *regularly evaluates the quality and effectiveness of teaching, as documented especially through student surveys;*
- *reinforces the student's sense of autonomy, while ensuring adequate guidance and support from the teaching staff;*
- *promotes mutual respect in the student - teacher relationship;*
- *applies appropriate procedures for dealing with students' complaints.*

In addition:

- *the academic staff are familiar with the existing examination system and methods and are supported in developing their own skills in this field;*
- *the assessment criteria and methods are published in advance;*
- *the assessment allows students to demonstrate the extent to which the intended learning outcomes have been achieved. Students are given feedback, which, if necessary is linked to advice on the learning process;*
- *student assessment is conducted by more than one examiner, where possible;*
- *the regulations for assessment take into account mitigating circumstances;*
- *assessment is consistent, fairly applied to all students and carried out in accordance with the stated procedures;*
- *a formal procedure for student appeals is in place.*

Study Programme Compliance

The Mathematics program has clear assessment criteria, and these are communicated to the students at the beginning of each course, through a Guide (the "Περίγραμμα" Guide). This Guide is elegantly designed and posted on the Department's Greek version of the webpage, but it should also be posted in the English version of the website. The Guide contains an extensive syllabus and detailed description of the course. The EEAP suggests that the course description be sent to the student at the beginning of the semester. In addition, it would be very helpful if all the instructors provide the students at the beginning of the semester detailed information about

exams, homework, projects, presentation, office hours and factors that determine the final grade of the student. At present this is done only on a voluntary basis.

The department and the university follow proper procedures in handling student complaints and other student-instructor issues. The EEAP feels that the process of handling complaints should be more streamlined and emphasis should be given to solutions at the departmental level. For example, the student should feel free to discuss her/his complaint with the corresponding instructor. If the two cannot resolve the issue between themselves, then the department itself addresses the issue, the matter should be addressed by the undergraduate student committee. If the problem persists, it can go to the University level. But in the experience of the EEAP's members, the majority of the complains can, and it is better to, be resolved at the department level.

The Department has established fairly satisfactory procedures for advising their students. Currently, there are two advisors assigned to every student. However, the EEAP was informed by students and faculty that a large number of students do not consult their assigned advisors. The EEAP suggests that a better policy would be that the department assigns one advisor per student and employs procedures that encourage the interaction of student and advisor.

In some courses there is a substantial delay in returning exams as well as posting the grades. The EEAP appreciates the immense difficulties an instructor has in correcting exams and posting grades within a reasonable period of time for classes with a large number of students (for example, 300 to 500). It is however strongly recommended that the department creates coherent and explicit rules with specific time limits concerning the exam returns and grade posting.

Students can take graduate courses as well as courses in other departments. However, students can only use 12 ECTS from graduate courses or courses from other departments, towards their degree. The EEAP feels that it is very important to change this rule and make it more flexible. More specifically, the students should have the option to take more courses from other departments or more graduate courses and use them towards the ECTS needed for their graduation. Of course, such an option should be justified by the student and formally approved by the undergraduate committee.

Traditional teaching methods (chalk and blackboard) are utilized in the required courses with large audiences. In more advanced, specialty and elective courses, many professors use in addition to traditional (chalk and blackboard) approach to teaching, modern methods such as computers, videos, and other information transfer technology means. They also employ (especially in elective courses) teaching procedures based on student participation via, for example, student lecturing. Moreover, in the majority of elective as well in some other courses, instructors employ evaluation procedures complementary to those of written exams (like student presentations, homework, and even small projects). The program offers a four-hours lab to assist the students with courses, homework, and other aspects related to the courses. The EEAP feels that this is an excellent idea and it recommends that the number of labs per week should be increased. A positive byproduct of this will be the decrease of the number of students in each lab.

Student evaluations is an important part of good education. Currently the number of students participating in the evaluation very small (no more than 5%). The EEAP strongly suggests that the department explores ways to make the evaluation process more effective. A basic effort would be to encourage the students to participate in this process. A more rigorous way to ensure participation in the evaluation process would be that a student is required to participate in the evaluation before she/he sees her/his grade. In this case the student should have the option to abstain from actually filling up the evaluation form.

As mentioned earlier in this report, the Mathematics Undergraduate program and the Applied Mathematics Undergraduate program accept students separately. Currently there is no mechanism that allows a student to transfer from one program to the other. The EEAP feels that this restriction should be relaxed. A student should have the option to transfer from one program to the other during the first or second year, after justification of the transfer by the student and approval by the department.

Panel Judgement

Principle 3: Student- centered Learning, Teaching and Assessment	
Fully compliant	**X**
Substantially compliant	
Partially compliant	
Non-compliant	

Panel Recommendations

1. There should be a systematic interaction among graduate and undergraduate students in the program. Currently graduate students are been used as tutors for labs or as assistants to instructions. The interaction of graduate and undergraduate students has a positive impact for the education of both undergraduate and graduate students and it useful for the program. For this reason, the EEAP feels that this interaction should be more extensive. For example, graduate students could be used as teaching assistants in undergraduate courses, grading homework assignments, offering recitations, or be used as tutors in a drop-in-for-help office. This is an international practice.
2. Students should have more flexibility in taking courses from other departments (or graduate courses) and use their credits towards their degree. This should be done after the student requests a formal approval from the program's undergraduate committee.
3. It is important to connect teaching and research stronger than it is currently done. The EEAP recommends that the students should have the option to do an independent study, for which they get credit. Past students met with the EEAP strongly indicated that they would prefer to have this option. The EEAP felt that the students they met were qualified to do an independent study course. By an "independent study" option, it is meant a study which is not

associated with any particular course, but it is a study (with ECTS) between an individual student and a professor.

4. The number of labs offered each week to assist the students with the courses, homework, and other aspects related to the courses should be increased.
5. The course description must be sent to the students at the beginning of the semester. In addition, it would be very helpful if all the instructors provide the students (at the beginning of the semester) with information about exams, homework, projects, presentation, office hours and factors that determine the final grade of the student. At present this is done only on a voluntary basis.
6. The department should create coherent and explicit rules with specific time limits concerning the return of the exams and of grade posting.
7. Students accepted by one of the two programs should be given the flexibility of switching programs during their first or second years of study, provided that such a switching is justified by the student and approved by the department.

The EEAP realizes that some of the above recommendations would be difficult to implement due to the small number of faculty, the large number of students and above all, the lack of funding and legal restrictions that are beyond the control of the department. However, the EEAP feels that despite these difficulties, a conscious effort should be made in this direction. The above principles are internationally accepted practices and have a definite positive impact in the educational process.

Principle 4: Student Admission, Progression, Recognition and Certification

INSTITUTIONS SHOULD DEVELOP AND APPLY PUBLISHED REGULATIONS COVERING ALL ASPECTS AND PHASES OF STUDIES (ADMISSION, PROGRESSION, RECOGNITION AND CERTIFICATION).

Institutions and academic units need to put in place both processes and tools to collect, manage and act on information regarding student progression.

Procedures concerning the award and recognition of higher education degrees, the duration of studies, rules ensuring students progression, terms and conditions for student mobility should be based on the institutional study regulations. Appropriate recognition procedures rely on institutional practice for recognition of credits among various European academic departments and Institutions, in line with the principles of the Lisbon Recognition Convention.

Graduation represents the culmination of the students΄study period. Students need to receive documentation explaining the qualification gained, including achieved learning outcomes and the context, level, content and status of the studies that were pursued and successfully completed (Diploma Supplement).

Study Programme Compliance

The Study Guide includes instructions about several processes and services and is made available through the department's home page. The department informed the EEAP that they have an orientation week, when students arrive in the campus. However, several students indicated that this orientation needs a serious improvement. The EEAP suggests that the department organizes a one or several days orientation, during which 2 to 3 faculty members present different aspects of the educational structure in the program, the department, and the university.

Apparently, the department (and to the EEAP's understanding, the entire University) does not have a well-defined student progression monitoring process. Despite this issue, the Department's undergraduate program works sufficiently well and indeed produces a relatively large body of good students. This fact is reflected by the Alumni successful careers in a wide range of professions. And the acceptance of the department's students to top graduate schools all over the world for Ph.D. studies. Despite this, the EEAP suggests that some type of student progression and monitoring method should be in place.

Student mobility is encouraged via the ERASMUS project as well as the concept of Practical Training. The students usually take advantage of these opportunities in their 6th through their 8th semester of studies. The ERASMUS option has been underutilized. It is recommended that an effort should be made at the departmental level to encourage the students to apply or at least to be aware of the program. For example, instructors should advise and encourage the students to have a closer look at the merits of the ERASMUS program. The Practical Training has been quite popular and successful according to the information provided to the EEAP by employers participating in the training.

The ECTS is applied across the curriculum for the sake of student's recognition and certification. The department has made serious efforts to take into account student and faculty feedback, as well as the recommendations of the last external evaluation 2011. The workload of the courses is adjusted to the ECTS. The students have the option of getting a Certificate of Teaching (Πιστοποιητικό Παιδαγωγικής και Διδακτικής Επάρκειας) provided that they complete 8 specific courses.

Panel Judgement

Principle 4: Student Admission, Progression, Recognition and Certification	
Fully compliant	**X**
Substantially compliant	
Partially compliant	
Non-compliant	

Panel Recommendations

1. The program should improve the organization of the orientation week upon student arrival in the campus, and provide practical information such as familiarity with facilities, housing and transportation.
2. The faculty should encourage the students to take advantage of the ERASMUS mobility program despite the underlying economic expenses.
3. The department lacks a systematic student progression monitoring, and it is suggested to establish such a process. This is important in view of the challenge posed by the lack of an upper limit for the completion of a degree.

Principle 5: Teaching Staff

INSTITUTIONS SHOULD ASSURE THEMSELVES OF THE QUALIFICATIONS AND COMPETENCE OF THE TEACHING STAFF. THEY SHOULD APPLY FAIR AND TRANSPARENT PROCESSES FOR THE RECRUITMENT AND DEVELOPMENT OF THE TEACHING STAFF.

The Institutions and their academic units have a major responsibility as to the standard of their teaching staff providing them with a supportive environment that promotes the advancement of their scientific work. In particular, the academic unit should:

- *set up and follow clear, transparent and fair processes for the recruitment of properly qualified staff and offer them conditions of employment that recognize the importance of teaching and research;*
- *offer opportunities and promote the professional development of the teaching staff;*
- *encourage scholarly activity to strengthen the link between education and research;*
- *encourage innovation in teaching methods and the use of new technologies;*
- *promote the increase of the volume and quality of the research output within the academic unit;*
- *follow quality assurance processes for all staff members (with respect to attendance requirements, performance, self-assessment, training etc.);*
- *develop policies to attract highly qualified academic staff.*

Study Programme Compliance

The teaching stall of the department consists of high-quality researchers and special teaching staff (EDIP) all of whom are committed to their duties. The department aims to attract and hire highly qualified researchers, and applies similar high standards in the promotion of the faculty. Promotions in the last few years demonstrate that the department aims at excellence. Furthermore, in addition to research, commitment to teaching weights considerably. Both hiring and promotion follow the criteria mandated by Greek law.

The student/faculty ratio is high (about 65 students per faculty) when compared to European and International standards. A few courses (primarily first year courses) have a very large number of students. The department tries to alleviate the problem by forming two sessions and Labs. The ideal case would be to create more sessions, but this is not practical due to the small number of faculty. The EEAP feels that an improvement can be made by increasing the number of labs.

Linking teaching with research is an important mechanism for student stimulation. Currently, the department has established several mechanisms towards that goal. They include regular research seminars, summer schools, conferences, and annual workshops such as the Pichoridis Distinguished Lectureship. The EEAP suggests the establishment of a weekly or bi-weekly “undergraduate seminar”, where the speakers could be graduate students and undergraduate students working on some research project with a professor, or faculty members form the Mathematics and Applied Mathematics or other departments.

Presently the department has 4 distinct sections (τομείς) representing main research areas in mathematical sciences. Since its inception, the new department has lost either due to retirement or attrition 13 positions, and only this year it was given three positions, one of which was filled this year. A current trend in mathematics is the integration of different sub-areas. This is healthy both for research and teaching. The EEAP observed good collaborative interactions among faculty members in the department. It strongly recommends that the cross-fertilization among the sub-areas be strengthened, and that the department formulates an overall coherent vision for the future. This approach will facilitate the participation of faculty in funded research projects. The EEAP hopes that the interactions with FORTH will not only be maintained but also strengthened.

A minimum requirement for maintaining and strengthening the already high quality of the department's members is the university support for research and visibility of its young faculty. This is already done, but on a limited basis. Currently, the expenses for participation of individual faculty in conferences/workshops are covered by research grants. The EEAP suggest that the University allocates part of its budget towards supporting the scientific activities of the young faculty members.

Beyond the above, the EEAP suggests that the Department in coordination with the University Administration explore creative ways for funding from non-university sources. For example, funds could be secured from The Onassis and Niarchos Foundations to support the library, students and faculty. The department could also explore the possibilities of getting some financial support from their industrial partners and local companies. In tier meeting with EEAP some of the industrial and social partners, some of the partners indicated that there is a possibility to provide such funds.

Panel Judgement

Principle 5: Teaching Staff	
Fully compliant	**X**
Substantially compliant	
Partially compliant	
Non-compliant	

Panel Recommendations

1. The university should enhance its support to young faculty in their research and visibility. In particular, it should support conference participation, visiting other institutions, research collaborations, and preparation of research proposals.
2. The department should provide mentoring to its younger members. More precisely, the department should assign a "mentor" to each new hire or young professor to guide them in teaching, interactions with students, administrative issues, research possibilities with people

across campus who have similar or overlapping scientific interests, and, in general, with the academic culture of the university.

3. The department should establish a procedure for documenting annual faculty progress in research and related activities, including research publications, teaching, distributing lecture notes/books to students in a course, departmental service, university service, professional service and conference participation. Much of this is currently documented by the department, but the EEAP feels that it should be done in a more rigorous and systematic way. In particular, the EEAP suggests that at the beginning of every academic year each faculty member submits an updated CV and a 2-3 pages "yearly activities" report containing the above items. This report is then discussed by the Department and the progress of the faculty member is officially recorded.
4. The Department as a whole should seek outside funding as indicated above.

Principle 6: Learning Resources and Student Support

INSTITUTIONS SHOULD HAVE ADEQUATE FUNDING TO COVER TEACHING AND LEARNING NEEDS. THEY SHOULD –ON THE ONE HAND– PROVIDE SATISFACTORY INFRASTRUCTURE AND SERVICES FOR LEARNING AND STUDENT SUPPORT AND –ON THE OTHER HAND– FACILITATE DIRECT ACCESS TO THEM BY ESTABLISHING INTERNAL RULES TO THIS END (E.G. LECTURE ROOMS, LABORATORIES, LIBRARIES, NETWORKS, BOARDING, CAREER AND SOCIAL POLICY SERVICES ETC.).

Institutions and their academic units must have sufficient funding and means to support learning and academic activity in general, so that they can offer to students the best possible level of studies. The above means could include facilities such as libraries, study rooms, educational and scientific equipment, information and communications services, support or counselling services.

When allocating the available resources, the needs of all students must be taken into consideration (e.g. whether they are full-time or part-time students, employed or international students, students with disabilities) and the shift towards student-centered learning and the adoption of flexible modes of learning and teaching. Support activities and facilities may be organized in various ways, depending on the institutional context. However, the internal quality assurance ensures that all resources are appropriate, adequate, and accessible, and that students are informed about the services available to them.

In delivering support services the role of support and administrative staff is crucial and therefore they need to be qualified and have opportunities to develop their competences.

Study Programme Compliance

The department is hosted in a modern new building which is well maintained. According to the material provided by the department there are teaching rooms whose capacity ranges from 199 to 30 seats. All rooms are equipped with video conference facilities and blackboards. The new building has two auditoriums with capacities 199 and 148, and the Pedridis auditorium with capacity of 500, which is also used for university-wide large-scale activities. The department has five computer labs (with 20-45 seats) equipped with Linux computers and software such as Python, R, Fortran, and C. There are student study spaces in the library and elsewhere in the building. There is a good size coffee room where students, faculty and lab personnel can meet for discussions and socialization. The EEAP was informed that the administrative support is competent and nice.

The building is located relatively far from the city of Heraklion. However, there is an excellent transportation system with buses running about every 15 minutes. The university is planning to build a new dormitory, which it could accommodate up to 1000 students. The university provides satisfactory counseling for its students and has a student a welfare office. There are also sport facilities including a swimming pool and a soccer field.

The university provides satisfactory counseling for its students and has a student a welfare office. In addition, a wide range of support services is available to students, including cafeteria, libraries,

etc. The EEAP's understanding is that the University has limited facilities for students with disabilities. The EEAP was informed that the administrative support is very nice and competent.

The EEAP feels that some of the rules and guidelines provided by the Ministry of Education about how to deal with students with disability in issues related to examinations and other aspects of courses do not conform with International practices. For example, students with dyslexia should be given twice the normal exam time. It is suggested that the department should try to address such issues above and beyond the State rules.

Panel Judgement

Principle 6: Learning Resources and Student Support	
Fully compliant	**X**
Substantially compliant	
Partially compliant	
Non-compliant	

Panel Recommendations

1. Improve the services provided for people with disabilities.
2. Improve the advising and monitoring of progress for first year students.

Principle 7: Information Management

INSTITUTIONS BEAR FULL RESPONSIBILITY FOR COLLECTING, ANALYSING AND USING INFORMATION, AIMED AT THE EFFICIENT MANAGEMENT OF UNDERGRADUATE PROGRAMMES OF STUDY AND RELATED ACTIVITIES, IN AN INTEGRATED, EFFECTIVE AND EASILY ACCESSIBLE WAY.

Institutions are expected to establish and operate an information system for the management and monitoring of data concerning students, teaching staff, course structure and organization, teaching and provision of services to students as well as to the academic community.

Reliable data is essential for accurate information and for decision making, as well as for identifying areas of smooth operation and areas for improvement. Effective procedures for collecting and analyzing information on study programmes and other activities feed data into the internal system of quality assurance.

The information gathered depends, to some extent, on the type and mission of the Institution. The following are of interest:

- *key performance indicators*
- *student population profile*
- *student progression, success and drop-out rates*
- *student satisfaction with their programme(s)*
- *availability of learning resources and student support*
- *career paths of graduates*

A number of methods may be used for collecting information. It is important that students and staff are involved in providing and analyzing information and planning follow-up activities.

Study Programme Compliance

The department periodically collects data referring to:

- Student population profile
- Student progression and success
- Student satisfaction with the program via student evaluations
- Career paths of their graduates

The completion rate of student surveys is very low, but it is taken seriously by the Department. The results already had an impact in the quality of teaching and supporting material. The Department should explore creative ways to encourage students to participate in the course/instructor evaluation process in larger numbers.

The EEAP suggests that the Department utilizes and strengthens the existing Alumni Society of the Department's graduates for developing efficient mechanisms for the collection of data regarding the employment and carrier paths of its former students.

One of the weakest points the EEAP realized was that he information about the above indicators was poorly communicated and presented to EEAP.

Panel Judgement

Principle 7: Information Management	
Fully compliant	
Substantially compliant	**X**
Partially compliant	
Non-compliant	

Panel Recommendations

A possible way to increase student response rates for teaching evaluations is to make them mandatory as follows: The students should not be able to see their grades until they participate in the surveys, with the option of abstaining.

Principle 8: Public Information

INSTITUTIONS SHOULD PUBLISH INFORMATION ABOUT THEIR TEACHING AND ACADEMIC ACTIVITIES WHICH IS CLEAR, ACCURATE, OBJECTIVE, UP-TO-DATE AND READILY ACCESSIBLE.

Information on Institution's activities is useful for prospective and current students, graduates, other stakeholders and the public.

Therefore, institutions and their academic units provide information about their activities, including the programs they offer, the intended learning outcomes, the qualifications awarded, the teaching, learning and assessment procedures used, the pass rates and the learning opportunities available to their students, as well as graduate employment information.

Study Programme Compliance

The department's website contains information about its facilities, staff, undergraduate and graduate programs and guides, announcements, events, policy of quality assurance, and internal assessment reports. The website is available in Greek and English, but the English version contains less information than the Greek version; for example, the English version does not contain information about the Quality Assurance. The website is user-friendly. However, the EEAP feels that there should be more complete information about the Faculty. In particular, the EEAP observed that a small number of faculty members do not have personal webpages. The EEAP feels that the department should require a uniform basic CV version (to be posted on the department's webpage) containing education, employment, scientific interest, and a short list of related publications. Personal webpages should include detailed information such as courses taught and resources developed by the instructors, list of grants, collaborations, conference organization and participation, departmental and professional service, complete list of publications and other individual significant activities. Many of the faculty have websites containing most if not all of the above material, but this does not seem to be true for all the faculty members.

Panel Judgement

Principle 8: Public Information	
Fully compliant	**X**
Substantially compliant	
Partially compliant	
Non-compliant	

Panel Recommendations

Improve the information the faculty provides annually, as discussed above.

Principle 9: On-going Monitoring and Periodic Internal Review of Programmes

INSTITUTIONS SHOULD HAVE IN PLACE AN INTERNAL QUALITY ASSURANCE SYSTEM FOR THE AUDIT AND ANNUAL INTERNAL REVIEW OF THEIR PROGRAMMES, SO AS TO ACHIEVE THE OBJECTIVES SET FOR THEM, THROUGH MONITORING AND AMENDMENTS, WITH A VIEW TO CONTINUOUS IMPROVEMENT. ANY ACTIONS TAKEN IN THE ABOVE CONTEXT SHOULD BE COMMUNICATED TO ALL PARTIES CONCERNED.

Regular monitoring, review and revision of study programmes aim to maintain the level of educational provision and to create a supportive and effective learning environment for students.

The above comprise the evaluation of:

- *the content of the programme in the light of the latest research in the given discipline, thus ensuring that the programme is up to date;*
- *the changing needs of society;*
- *the students' workload, progression and completion;*
- *the effectiveness of the procedures for the assessment of students;*
- *the students' expectations, needs and satisfaction in relation to the programme;*
- *the learning environment, support services and their fitness for purpose for the programme*

Programmes are reviewed and revised regularly involving students and other stakeholders. The information collected is analyzed and the programme is adapted to ensure that it is up-to-date. Revised programme specifications are published.

Study Programme Compliance

The department annually self-assesses its Mathematics undergraduate program in a meticulous way and the learning resources and support services are equally well monitored. The program conforms very well with internationally established norms for mathematical training. In addition, the department takes appropriate action for their improvement, whenever the need arises. The MODIP oversees the overall process.

Panel Judgement

Principle 9: On-going Monitoring and Periodic Internal Review of Programs	
Fully compliant	**X**
Substantially compliant	
Partially compliant	
Non-compliant	

Panel Recommendations

The EEAP comments the department for its rigorous monitoring process and urges it to continue with these sound practices.

Principle 10: Regular External Evaluation of Undergraduate Programs

PROGRAMMES SHOULD REGULARLY UNDERGO EVALUATION BY COMMITTEES OF EXTERNAL EXPERTS SET BY HAHE, AIMING AT ACCREDITATION. THE TERM OF VALIDITY OF THE ACCREDITATION IS DETERMINED BY HAHE.

HAHE is responsible for administrating the program accreditation process which is realized as an external evaluation procedure, and implemented by a committee of independent experts. HAHE grants accreditation of programs, with a specific term of validity, following to which revision is required. The accreditation of the quality of the programs acts as a means of verification of the compliance of the program with the template's requirements, and as a catalyst for improvement, while opening new perspectives towards the international standing of the awarded degrees.

Both academic units and institutions participate in the regular external quality assurance process, while respecting the requirements of the legislative framework in which they operate.

The quality assurance, in this case the accreditation, is an on-going process that does not end with the external feedback, or report or its follow-up process within the Institution. Therefore, Institutions and their academic units ensure that the progress made since the last external quality assurance activity is taken into consideration when preparing for the next one.

Study Programme Compliance

To the EEAP's knowledge this is the first external evaluation review of the Mathematics undergraduate program since the merging of the Departments of Mathematics and Applied Mathematics in 2013. There was an external evaluation review for the Department of Mathematics in 2011 before its merge with the Department of Applied Mathematics. According to EEAP opinion the mathematical education of the Mathematics program at the University of Crete is of high quality.

As indicated in other parts of the report, the procedure of verifying the quality of academic education both at the Department and the University is rigorous. Faculty and staff are overall highly dedicated to the students learning and education.

The input to the EEAP from current and students as well as industrial/social partners, was positive. In particular, they strongly indicated that their mathematical studies were sound, thorough, and prepared them in an excellent way to be competitive in academia and industry.

All the stakeholders, including lab personnel and administrative staff, appreciated the significance of the external review and were excited to participate, help, and contribute to the success of the process.

Panel Judgement

Principle 10: Regular External Evaluation of Undergraduate Programmes	
Fully compliant	**X**
Substantially compliant	
Partially compliant	
Non-compliant	

Panel Recommendations

The EEAP found the effectiveness of the monitoring mechanism satisfactory, and suggests to continue their established process of self-evaluating. Moreover, EEAP felt that the entire faculty was open to constructive suggestions from external friends, collaborators, and external evaluators.

PART C: CONCLUSIONS

I. Features of Good Practice

The EEAP feels that the following points are well addressed by the Department and/or the program:

- The department's faculty is highly dedicated
- The curriculum is well designed in terms of compulsory and elective courses
- The study guide is well designed, informative and useful
- The input of the social partners in the design of their academic program is extensively incorporated
- Excellent lecture notes for some courses
- Student feedback and comments are taken seriously into account
- Responsive to student's suggestions and requests for new courses
- The option of undergraduate students to take graduate course and courses in other programs and get credit for these courses towards their undergraduate degree

II. Areas of Weakness

In the view of the EEAP, the following items need some improvement. The EEAP recognizes that the roots of many of the shortcomings are due the severe underfunding and the national rigid constrains imposed on the universities by the State.

- The lack of framework that would allow graduate and advanced undergraduate students to tutor lower level undergraduate students
- The lack of an option for an undergraduate student to have an independent study
- Incorporating projects, in addition to exams, in advanced courses; projects which include a write-up and a presentation (this is done in a relatively small number of selective courses)
- The faculty-to-student ratio (about 1 to 65) is high
- Limited integration between teaching and research

III. Recommendations for Follow-up Actions

The EEAP strongly recommends that the following be immediately addressed:

- Strengthening the Alumni Society
- Initiating an orientation week and designing a short First-Year Student Guide
- Improving the advising of first (and second) year students
- Documentation of annual faculty research and related activities
- Making teaching evaluations mandatory for students

IV. Summary & Overall Assessment

The Principles where full compliance has been achieved are: 1, 2, 3, 4, 5, 6, 8, 9, 10

The Principles where substantial compliance has been achieved are: 7

The Principles where partial compliance has been achieved are: None

The Principles where failure of compliance was identified are: None

Overall Judgement	
Fully compliant	**X**
Substantially compliant	
Partially compliant	
Non-compliant	

The members of the External Evaluation & Accreditation Panel

Name and Surname, and Signature

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