



ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ
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**Εθνική Αρχή
Ανώτατης Εκπαίδευσης**
Hellenic Authority
for Higher Education

Αριστείδου 1 & Ευριπίδου 2 • 10559 Αθήνα | 1 Aristidou str. & 2 Evripidou str. • 10559 Athens, Greece
T. +30 210 9220 944 • **F.** +30 210 9220 143 • **E.** secretariat@ethaae.gr • www.ethaae.gr

**Accreditation Report
for the Undergraduate Study Programme
(Integrated Master) of:**

**Applied Mathematical and Physical Sciences
Institution: National Technical University of Athens
Date: 15 May 2021**

Report of the Panel appointed by the HAHE to undertake the review of the
Undergraduate Study Programme (Integrated Master) of
Applied Mathematical and Physical Sciences of the **National Technical
University of Athens** 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 (Integrated Master) of **Applied Mathematical and Physical Sciences** of the **National Technical University of Athens** comprised the following four (4) members, drawn from the HAHE Register, in accordance with Laws 4009/2011 & 4653/2020:

- 1. Prof. Panagiotis Souganidis (Chair)**
The University of Chicago, USA
- 2. Prof. Anthimos Georgiadis**
Leuphana Universität Lüneburg, Germany
- 3. Prof. Alexios Polychronakos**
The City College of New York, USA
- 4. Prof. Alekos Vidras**
University of Cyprus, Cyprus

II. Review Procedure and Documentation

The External Evaluation & Accreditation Panel (henceforth EEAP) conducted, during the period May 10-15, 2021, the accreditation evaluation of the Undergraduate Programme (with integrated Master's) (henceforth UP) of the School of Applied Mathematical and Physical Sciences (henceforth SEMFE) of the National Technical University of Athens (henceforth NTUA).

Due to the Covid-19 pandemic, the EEAP could not visit the site physically and conducted the evaluation via Zoom teleconferencing. All meetings described in the report were by teleconferencing, a fact which will not be repeated below.

On Thursday April 8, 2021, HAHE's General Director Dr. Christina Besta gave a presentation explaining the procedures and rationale for the accreditation. Since all members of the EEAP had attended this lecture in the past, no one participated.

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

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 programme regarding the quality indexes for the years 2015-16, 2016-17, 2017-18 and 2018-19.
4. The accreditation information for the programme prepared by the School.
5. A set of annexes to the accreditation proposal, including the study guide, course descriptions, etc.
6. Statistical data regarding the School and the specific programme of studies.
7. The Quality Assurance policy of the specific programme of studies.
8. A set of documents presenting quality indicators both for the School and the programme.
9. The report of the 2013 external evaluation of SEMFE conducted by HQA.
10. The results of the internal evaluations of the specific programme of studies.

On Monday May 10, 2021 the EEAP met for 2 hours to discuss the review process, allocate tasks, and identify possible issues to be addressed during the visit. The same day, the EEAP met the Vice Rector and President of MODIP, Prof. Drossos Gintides, and the Dean of the School, Prof. Stavros Kourkoulis, who gave a presentation about the NTUA and its history, its Schools, physical infrastructure and policies and areas of possible concern. The EEAP then met with OMEA and MODIP representatives and staff including the Head of OMEA, Prof. Yannis Raptis, the directors of the Divisions (Sectors) of Mathematics, Prof. Sofia Lambropoulou, Physics, Prof. Georgios Tsiapolitis, Mechanics, Prof. Panagiotis Tsopelas, and Humanities and Social Sciences, Prof. Kostas Theologou. Prof. Raptis gave an extensive presentation about the Accreditation of the UP of SEMFE which was followed by a very informative discussion. The day ended with EEAP's debriefing.

On Tuesday, May 11, 2021, the EEAP had separate meetings with teaching staff and undergraduate students of the UP. A short break was followed by (a) an on-line tour of

classrooms, lecture halls, libraries, laboratories, and other facilities, (b) a discussion with administrative staff and other teaching members, and (c) separate meetings with a group of (i) graduates of the UP, and (ii) select employers and social partners. Due to the remote nature of the meeting, the EEAP did not have the opportunity to observe teaching. The day concluded with another short debriefing of the EEAP to discuss findings and start preparing the oral report.

On Wednesday, May 12, 2021, the EEAP had another meeting with OMEA and MODIP representatives to clarify certain points. Afterwards, the EEAP presented some key findings during a short and informal meeting with the Vice Rector and President of MODIP, the Dean of the School, the Heads of OMEA and the Directors of the Divisions as well as other MODIP staff. During the rest of the day, the EEAP worked in drafting the accreditation report.

The EEAP met on Thursday, May 13, 2021, Friday, May 14, 2021 and Saturday, May 15, 2021 to continue working on the AR.

The final draft of the AR was emailed to HAHE on Tuesday, May 18, 2021.

The e-visit was well organized. The video provided by the School was interesting but not very informative about the infrastructure. The EEAP came away with a thorough picture of the SEMFE, and its vision and efforts for the education of the undergraduate students.

Throughout the process, although all meetings were held as teleconferences because of the COVID-19 restrictions, the Panel received all necessary support and was treated with courtesy.

The EEAP wishes to thank the Vice-Rector of NTUA, the Dean of SEMFE, the Head of OMEA, the Directors of the 4 Sectors of the School, the members of OMEA and MODIP and all staff, current and former students and external partners of the School who participated in the meetings. Their cooperation, courtesy, openness, and willingness to engage in the accreditation process and to provide the Panel with all the information and clarifications it sought was greatly appreciated.

III. Study Programme Profile

The School was established in 1999 (students were accepted for the first time in the academic year 1999-2000) with the goals to advance education, research and applications in Mathematics, Physics, Mechanics and Human and Social Sciences as well as to offer to the other schools of the NTUA classes in these topics. Prior to 1999, SEMFE was known as The General Department, which had the same 4 Divisions and approximately 120 members.

Currently, SEMFE has 65 faculty members, 32 instructional and support staff, 2 adjoint scientists and 21 administration staff. More specifically, there are 28 faculty members in the Division of Mathematics (7 Assistant Professors, 7 Associate Professors, 14 Full Professors) and 8 instructional and support staff. The Division of Physics has 24 faculty members (3 Assistant Professors, 7 Associate Professors, 14 Full Professors) and 9 instructional and support staff. The lab infrastructure of the division is extensive and well-endowed (15.000.000 euros invested in equipment). This infrastructure supports practical training not only for the students at the School but also of the other Schools of NTUA. Currently, the weekly lab load exceeds training 1000 students in 2 hours sessions. The Division of Mechanics has 10 faculty members (3 Assistant Professors, 2 Associate Professors, 5 Full Professors) and 9 instructional and support staff. The Division runs 3 labs in "Material Endurance", "Applied Mechanics and Photoelasticity", and "Biomechanics and Medical Physics". Finally, the Division of Humanities and Social Sciences has 5 academic members (2 Associate Professors, 3 Full Professors) and 2 instructional and support staff. All Divisions employ periodically temporary teaching staff upon availability of funds.

In each of the last 5 years, SEMFE requested an entering class of about 100 students. Nevertheless, the Ministry of Education assigned each year approximately 180. The number of students who graduated each year over the same time period is 90.

The total number of enrolled undergraduate students is approximately 1500, with 677 over the n+2 expect duration of study.

The School also offers a Ph.D. degree, with approximately 220 participants as well as several Master's programmes with approximately 360 students.

Based on the information provided by SEMFE as well as the meetings with alumni and employers and social partners, the EEAP observed that the School over the last 20 years has produced graduates who have ended up in high-ranking international universities and/or have been very successful in the business and industrial world.

These successes have been achieved despite the financial crisis and the fact that the number of the academic personnel had been reduced by almost 50% during the last 10 years.

The School confers, after a 10 semester (5 academic years) of study, one Diploma (integrated master) with profiles in Engineering Mathematics (Μαθηματικός Εφαρμογών) and Physics Engineering (Φυσικός Εφαρμογών). About 60% of students choose the profile on Diploma in Engineering Mathematics, while the remaining 40% graduate with The Diploma in Engineering Physics. Each of the above profiles is subdivided into specializations (ροές). The specializations of the Diploma in Engineering Mathematics are Applied Analysis, Statistics, Mathematics of Informatics, and Applied Mechanics-Computational Simulation. The Diploma in Engineering

Physics has the following specializations: Computational and Theoretical Physics, Nuclear Physics and Elementary Particles, Optical Electronics and Laser, Advanced Technological Materials, and Mechanics of Materials.

Two important developments in the direction of successful employment of the graduates of the UP are (i) the successful completion, after 20 years, of the efforts to establish that graduates of SEMFE can become members of Technical Chambers of Greece, although more work is needed in this direction, and (ii) the introduction of the option for graduates to establish the qualifications needed to become teachers in the secondary level of education.

The UP, which is very challenging and intensive, has two stages. The first is a 4-semester cycle of 29 compulsory courses in Mathematics, Physics, Mechanics, Informatics, and Humanities. Upon the successful completion of these courses, the students are awarded 136 ECTS units. The second stage begins on the 5th semester and lasts until the completion of the studies (10th semester). During this cycle, the students decide their profile and attend compulsory, specialty compulsory and elective courses that are required by the respective programme. The numbers of compulsory, compulsory elective course vary within the specialties of the same profile degree and between the profile degrees as well. During the 10th semester, a 30 ECTS units, compulsory diploma thesis is undertaken. A total of 300 ECTS units are required to obtain a degree in 10 semesters, with 270 ECTS units assigned after successful course work (56 courses). The option of practical training was also made available recently.

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 realise 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 labour 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 NTUA has established an appropriate Quality Assurance Policy (henceforth QAP) which satisfies the relevant requirements. The Key Performance Indicators (KPI) are regularly provided. Through the OMEA, SEMFE follows the guidelines of the institutional policy regarding its UP. The School's general assembly has the overall responsibility for reviewing the UP and ensures its consistency with the Institutional Quality Assurance standards. The MODIP monitors and enforces the Quality Assurance.

As reported and presented to the Panel, the basic principles of the SEMFE for quality assurance are:

1. Adherence to the principles of theoretical foundation in parallel with the applied character of the 5-year integrated UP.
2. The qualitative renewal with new scientific and technological objectives.
3. The offering of lab-based classes with small number of students.
4. The cap on the required classes to 6 per semester.
5. The offering of as many interactive classes as possible.
6. The development of grading system that does not rely only on the final exam.
7. The offering of a compact schedule of classes so that students do not waste much time.
8. The optimization of number of classes offered each semester.
9. The annual planning of each academic year.

The declared objectives of the QAP are:

1. The strengthening of the governing mechanisms.
2. The improvement of the content and outcome of the UP.
3. The optimization of the procedures related the UP.
4. The increase of the funds available for the UP.
5. The continuous development of the available human resources.

The Panel was not given sufficient evidence to assess the enhancement of the quality and quantity of the research output among faculty members of the academic unit and the linking of teaching and research.

Panel Judgement

Principle 1: Academic Unit Policy for Quality Assurance	
Fully compliant	X
Substantially compliant	
Partially compliant	
Non-compliant	

Panel Recommendations

In the context of academic unit policy for quality assurance, the School should address the following two issues:

- The enhancement of the quality and quantity of the research output among faculty members.
- Ways to link teaching and research.

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 organisation, 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 labour 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 programme was designed and is approved following established national procedures and, overall, it meets the international academic standards. It covers a wide range of specializations. Its graduates can pursue academic careers or work outside academia in a wide range of areas.

The success of a good number of graduates of SEMFE is a strong indicator of the overall quality of the UP. The EEAP had discussions with several current and past students, who indicated that they are very satisfied with the programme and their education.

Although tough and demanding, the UP is well designed so that a good number of student progress smoothly and complete their degree within the n+2-time frame.

However, the Panel was surprised by the small number of students graduating with average above 8. This creates disadvantages for the graduates applying to graduate schools abroad and/or seeking jobs in the private sector.

The option of the practical training helps in the direction of linking of teaching and research. However, it is necessary to do more in this direction. Some changes are needed so that during the last 2 years the students have the opportunity for more practical and less theoretical work.

Although well designed, UP's coursework is still bloated and contains both omissions and overlaps. A concerted effort is needed to reduce, optimize, rationalize, and streamline the courses to avoid nontrivial overlaps, to introduce new courses and modernize some existing ones, to increase the number of elective courses in some directions of studies (for example, Physics has only 2 such courses) and to lessen the burden on the students. The about 10% reduction of the required course, following the 2013 external evaluation of SEFME, is a good step in this direction.

Panel Judgement

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

The External Evaluation & Accreditation Panel agrees that this Programme leads to a Level 7 Qualification according to the National & European Qualifications Network (Integrated Master)	YES	NO
	X	

Panel Recommendations

- The School should continue its efforts to improve the programme to address both the diversity in the level of preparation of the student body and the skill sets required by future employers.
- Introduce more options for project-oriented work for the students during the last 2 years of studies.
- Improve the connections between teaching and research.
- A concerted effort is needed to reduce, optimize, rationalize, and streamline the courses to avoid nontrivial overlaps, to introduce new courses and modernize some existing ones, increase the number of elective courses offered in some directions of studies, and lessen the burden on the students.
- The School should figure out the causes of the low GPA of the graduating students.

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-centred 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-centred 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 School has clear assessment criteria, and these are communicated to the students at the beginning of each course, through a functional Guide. The latter, which is posted in SEMFE's website, also contains an extensive syllabus and detailed description of the courses offered.

The EEAP suggests that the course description be sent to the students at the beginning of the semester. In addition, the instructors should provide the students, at the beginning of the semester, a detailed syllabus containing all the information about the course, including exams, homework, projects, presentations, office hours and factors determining the final grade of the student. At present this is done in a limited way via the "mycourse" platform. The recommendation of the Panel is that the syllabus should be placed either on the "mycourse" platform or the course webpage and that this becomes a standard practice.

The NTUA and SEMFE follow established procedures in handling student complaints and other student-instructor issues. This process of handling complaints should be more streamlined, and emphasis should be given to solutions at the School 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 matter should be addressed by the undergraduate student committee. If the problem persists, it can go to the University level. In the experience of the EEAP's members, the majority of the complains can, and it is better to, be resolved at the School level.

The EEAP appreciates the immense difficulties an instructor has in correcting exams and posting grades within a reasonable period for classes with many students. Further delay is caused by secretarial staff passing them into the official grade register. It is, therefore, strongly recommended that the School creates coherent and explicit rules with specific time limits concerning the exam returns and grade posting.

Although students in one diploma direction can take courses in the other, they cannot attend for credit classes in other Schools or take graduate courses. The EEAP believes that it is very important that advanced students should be given the option to take such courses as a substitute for some elective (or even required) courses. Such an option should be justified by the student and formally approved by the undergraduate committee.

The EEAP suggests that it would be useful if there were official ways which would allow undergraduates to create working groups and to interact with graduate students, who, for example, can serve as informal teaching assistants or tutors in drop-in-for-help offices. These well-established international practices would be beneficial to both groups.

Instructors perform their teaching duties with dedication. In normal (pre-pandemic) years, in addition to traditional teaching (chalk and blackboard) methods, Instructors in more advanced (specialty and elective courses) employ modern methods such as computers, videos, and other information transfer technology means. They also employ teaching procedures based on student participation via, for example, student lecturing. Moreover, in the majority of elective as well as other courses, instructors evaluate the students' progress by means complementary to those of written exams, like, for example, student presentations, homework, and even small projects). The EEAP recommends that novel information technology methods should be more broadly utilized.

Panel Judgement

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

Panel Recommendations

- Establish, as a standard practice, the posting on either “my course” platform or the webpage of each course a detailed syllabus containing all information about the course as detailed above.
- Streamline the existing process of handling complaints with emphasis given to finding solutions at the School level.
- Create coherent and explicit rules with specific timelines concerning the exam returns and grade posting.
- Advanced students should be given the option to take graduate courses as a substitute for some elective (or even required) courses.
- Establish the option for the undergraduate students to form working groups and provide the opportunity for interaction among undergraduate students with the latter serving either as informal teaching assistants or tutors in drop-in-for-help offices.
- Novel information technology methods should be more broadly utilized in teaching.

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 School has established procedures concerning student admission and certification. Incoming students are supported through information provided by the Study Guide, which includes instructions about several processes and services and is made available in SEMFE's home page. Furthermore, the School has a welcome and information day for incoming students. In addition, recently advisors are assigned to the students. However, there is evidence that these measures are not sufficient for a smooth transmission from high school to the higher education in terms of orientation and study supports. The students' progress is monitored through the registration of examinations results. No proactive individual monitoring is mentioned.

The ECTS is applied across the curriculum. Students principally have the opportunity for mobility, but during the reporting period it is very low.

The diploma supplement is issued upon student request and contains information (complementary to the diploma) which is very useful for employment purposes.

The School has well designed guidelines and requirements for writing the Thesis contained in a handbook, which is given to the students.

A practical training is in place, though optional, has been quite popular and successful according to the information provided to the EEAP by the faculty and the students themselves.

Panel Judgement

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

Panel Recommendations

- The programme should improve the organization beyond the orientation week providing further support to student's orientation.
- A mechanism should be established for a systematic oversight of the academic progress of the students.
- A serious effort is needed to encourage the students to take advantage of the ERASMUS mobility programme.

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 EEAP noted the dedication and commitment of the teaching staff, the efforts of SEMFE to develop rigorous procedures for monitoring the assurance quality, and, in general, the effectiveness of the UP.

The School's teaching staff consists of their faculty, who are all actively engaged in teaching.

The recruitment and appointment of faculty takes place according to, and in full compliance with, the relevant laws and regulations. Proper weight appears to be given to both the teaching needs and the research aspirations of SEMFE. The hiring freeze of the last several years has stalled this process, but positions have recently materialized.

The EEAP noticed that there is no long-term strategic plan in place mapping the School's aspirations for cognitive and research expansion. Such a document is of increased importance, in view of the organization of SEMFE as 4 distinct sectors. Improving the balance among them or introducing new directions is of the utmost importance.

The professional development (promotion and tenure) of teaching staff adheres to rigid procedural guidelines and seems to proceed well, judging by the evolution of its ranks over the last several academic years. The Panel was informed that the School capitalized on positions arising from development opportunities of its current personnel to hire new faculty, a process which, in principle, can create resentment and demoralization among promotable faculty. Nevertheless, SEMFE is handling the process and its necessary strains and stresses well, and its faculty is very cohesive, collaborative, and collegiate. No complaints or grievances were expressed by the staff on the timeliness, fairness, and transparency of the professional development steps.

Appropriate mobility and opportunities for professional development of the teaching staff are available through School funds for conference participation and research and development. Scientists from other Institutions also visit the School to deliver seminars, for sabbatical stays or for shorter-term visits.

The faculty is genuinely engaged in their teaching duties. SEMFE's average teaching load of 8-10 contact hours per week, plus additional time for preparation and supervision, is deemed quite high, and substantially higher than the 6 hours mandated by workload regulations. Furthermore, there is no apportioning of the teaching load in a way that considers the differences in enrolment and grading load of each course or faculty's research activity and productivity. The EEAP was informed that the current faculty to student ratio is, by one accounting, 1/140, an exceedingly low ratio that reflects a heavy burden on the teaching staff. It should be noted, however, that the information provided to HAHE (KPI indicator) by the School puts the ratio to 1/15.

According to the faculty's own report as well as reports from current students and alumni, SEMFE has established some links between undergraduate teaching and research, which are manifested through projects that several courses offer as a standard part of their curriculum. The links are also formalized by the required Senior Thesis (Διπλωματική), involving research work supervised by a faculty member, which lasts for one full semester.

A good fraction of the academic staff is involved in research, including participation in international collaborations, and there is a very good output of research work in the form of peer-reviewed papers in internationally recognized journals and presentations in conferences and workshops. The number of peer-reviewed publications and citations is, in general, very good. The total amount of external research grant funding is satisfactory but not impressive. Considering, however, the theoretical nature of much of the School's research (mathematics, theoretical physics, social sciences) and the comparatively low level of funding awarded to such activities, the overall level of research funding is deemed very good.

The process of assessment of the teaching performance of the staff, consisting of teaching evaluations submitted anonymously by the students, is rigorous. A small fraction of the students participates in these evaluations, but the relatively large number of students who stop attending lectures is completely missed. SEMFE takes the results of these evaluations seriously. However, the Panel did not become aware of any awards or prizes for excellence in teaching or service instituted by the School.

Gender balance in faculty is quite good. According to the School's website, there are 9 female faculty members in a total of 63, breaking down to 4/26 in Mathematics, 3/23 in Physics, 2/10 in Mechanics, and 0/4 in Social Sciences. These are in line with prevailing international standards but leave room for improvement.

Panel Judgement

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

Panel Recommendations

- Develop a future strategic plan of expansion concerning recruitment and development of staff needs to be developed and adopted.
- SEMFE needs to put in place a consistent and objective documentation of the teaching staff's actual teaching workload and to institute a system for balancing this load and reducing it for research-active faculty.
- It is necessary to establish awards for Teaching Excellence and Student Service, as well as to develop a system of internal sanctions for inadequate performance.
- SEMFE should build upon its existing faculty and excellent student body to institute outreach activities to female and other under-represented minorities in its academic fields.

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-centred learning and the adoption of flexible modes of learning and teaching. Support activities and facilities may be organised 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 technological resources available to teaching faculty and students are adequate and of good quality. The Panel, however, did not become aware of any substantial innovations in teaching methods, which seem to largely follow the traditional approach of lectures and laboratory work with occasional homework assignments.

The material resources available to support students and their education are in general very good. Fixed educational resources such as classrooms and desks, teaching laboratories, libraries, and IT equipment, range from very good to exceptional. Some accommodations are available for students with disabilities.

Since the review took place virtually, the Panel was not able to assess the quality and availability of student facilities (dormitories, student restaurant, and common spaces). The EEAP received, however, some complains about inadequate WIFI coverage, issues about bathrooms, and insufficient lighting around the buildings.

Financial resources devoted to student services are adequate and equitably distributed and used. Students in the School enjoy the standard benefits of public higher education in Greece, namely completely free tuition, subsidized board, and some limited possibilities for free or low-cost room.

The NTUA offers Mental and Psychological Counselling services and Professional Orientation services.

During the Panel’s discussions, it became clear that student-centred learning and flexible modes of teaching remain more of an aspiration than an actively implemented and developed plan. No paid graders or teaching assistants are assigned to large courses, the load falling squarely on the teaching faculty. The structure of teaching and evaluation of student’s progress largely follows the traditional model of lectures, labs plus one or two examinations, although several courses also involve projects and homework. SEMFE appears to be willing and eager to introduce and implement more student-centred modes of learning and evaluation. However, budgetary, and institutional constraints, and the need to accommodate the large number of students who fail to pass the course during their regular enrolment and rely on repeatedly taking the final exam, are major hindrances to the School’s efforts.

Trained technicians assisting teaching labs are available, but the School finds their number short of the required for optimal student service.

The support and administrative staff are adequate in number and abilities, but students find they are not served adequately and timely in their needs with the School.

SEFME very recently established an Academic Advisors Committee for the students of the School. Students should be required to meet this advisor at least every semester to review their academic progress.

Panel Judgement

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

Panel Recommendations

- The School should allocate some of the available financial and human resources to secure adequate numbers of graders and teaching assistants, and to establish and promote student-centred teaching methods and flexible models of learning and evaluation, embracing the full spectrum of student traits and abilities.
- The role of the academic advisor must be strengthened, making meetings between students and mentors mandatory, regular, and substantial.
- Professional orientation, and graduate study opportunity services must be established and made widely available to the 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 organisation, 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 analysing 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 analysing information and planning follow-up activities.

Study Programme Compliance

The School has established satisfactory procedures for the collection of detailed data about teaching methods, teaching progression, gender composition of the student body and other items related to undergraduate education.

The information about graduates who follow teaching and academic paths is fairly complete. However, the data about the employability of the graduates in other sectors of the economy is rather poor.

The EEAP suggests that the School utilizes and strengthens its recently established relationship with the Society of Graduates, whose employability survey is quite informative. This connection will help SEMFE to develop efficient mechanisms for the collection of data regarding the employment and carrier paths of its former students.

In parallel, the School should also create and maintain an Alumni Society.

The completion rate of student surveys is very low, and a serious effort should be made to improve the situation. However, despite the low number of completed questionnaire, the results are considered by the School. The Panel was informed that the student evaluations process has already had an impact in the quality of teaching, supporting material and the exam schemes. The School should explore creative ways to encourage students to participate in the process in larger numbers.

Panel Judgement

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

Panel Recommendations

- Utilize and strengthen relationship with the Society of Graduates and create an Alumni Association.
- Obtain more complete information about the career paths of graduates outside academia.
- Find ways to increase the participation of the students in the evaluation process.

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 programmes 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

SEMFE maintains a website in both Greek and English. The former, which is user friendly, contains information about the facilities, staff, undergraduate and graduate programmes, guides, announcements, and events. It does not, however, say anything about the policy of quality assurance and internal assessment reports. The English language version is, however, poor as it, essentially, contains only information about the content of the courses for the incoming Erasmus students. In contrast to the Greek version, there is no information about the School, its philosophy, goals, and the placement of its graduates in the economic life of the Greek society. This should be addressed since it will improve the international visibility of the School.

SEMFE should require that all faculty members maintain a webpage and a complete CV, in both Greek and English, containing information related to their education, employment, scientific interests, a complete list of publications, courses taught and developed, grants, collaborations, conference organization and participation, departmental and professional service, and any other individual significant activity.

Panel Judgement

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

Panel Recommendations

- Improve the English version of the School's website.
- Include information about the policy of quality assurance and internal assessment reports.
- Faculty should have a personal webpage and a complete CV, in Greek and English, containing information about education, employment, scientific interests, and a complete list of publications, courses taught and developed, grants, collaborations, conference organization and participation, departmental and professional service, complete list of publications and any other individual significant activity.

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 analysed and the programme is adapted to ensure that it is up-to-date. Revised programme specifications are published.

Study Programme Compliance

The annual self-assessment process of the study programme collects in electronic form data from the student's evaluation questionnaires. The outcomes of the self-assessment are recorded and submitted to the OMEA and MODIP of the Institution. Only the Dean of the School has access to the full data. The findings of the self-assessment are not shared widely within the academic unit.

Although in some cases the findings have led to changes in the content of some lectures or to other minor measures, the self-assessments do not result clearly in documented and communicated action plans. The study programmes are regularly reviewed via the traditional administrative route (study programme committee, faculty council). However, students and other stakeholders are not sufficiently involved. The revised programme is published in the course directory (Οδηγός Σπουδών).

Panel Judgement

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

Panel Recommendations

- The findings of the self-assessment should be shared within the School and discussed with the involved students generating a feedback mechanism.
- The self-assessments should result in documented and communicated action plans, which could be related to the KPIs.
- Students and other stakeholders should be sufficiently involved in the discussions about revisions, and changes of the study programme should be widely communicated.

Principle 10: Regular External Evaluation of Undergraduate Programmes

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 programme accreditation process which is realised as an external evaluation procedure, and implemented by a committee of independent experts. HAHE grants accreditation of programmes, with a specific term of validity, following to which revision is required. The accreditation of the quality of the programmes acts as a means of verification of the compliance of the programme 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

The last external evaluation of the study programme administered by HAHE took place in 2013. Since then, the School has implemented actions in response to most of the recommendations made by the External Evaluation Committee. Specific examples are the reduction of the number of courses and the establishing of the Student Advisor.

However, some of the weaknesses identified by the external evaluation, like student-centred learning and staff teaching load, still need further improvements.

The members of the School are aware of the importance of the external review and its contribution to the improvement of the UP.

However, these activities and the importance of the internal quality assurance are not sufficiently publicized. Although possible stakeholders of the programme and the academic unit participated during the present external review, there is no evidence about their participation in the preparation of the internal evaluation and, later, in the entailed follow-up actions.

Panel Judgement

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

Panel Recommendations

- The School should continue the revisions recommended by the 2013 external evaluation and the recommendations of the present Panel developing appropriated follow up actions.
- The results of the quality assurance and follow up actions must be made fully and widely available.
- The school should involve all stakeholders in the follow up actions.

PART C: CONCLUSIONS

I. Features of Good Practice

- The School provides the students with broad education.
- The ability of graduates to become members of TEE.
- The option to obtain the certification needed to teach in the secondary education.
- The dedication of the faculty to their reaching duties.
- The success of some of the graduates in academic and non-academic workplaces.

II. Areas of Weakness

- The lack of strategic planning for the future of the School.
- Heavy course load with overlaps and lack of flexibility.
- Not enough mobility for both students and faculty.
- The delay in communicating information including grades to the students.
- The fact that the results of internal evaluations are not communicating in a timely matter to all stakeholders.

III. Recommendations for Follow-up Actions

- Develop a long-term strategic planning for the future of the School.
- A concerted effort is needed to reduce, optimize, rationalize, and streamline the courses to avoid nontrivial overlaps, to introduce new courses and modernize some existing ones, increase the number of elective courses offered in some directions of studies, and lessen the burden on the students.
- Increase support for the mobility of faculty and students.
- Develop coherent and explicit rules with specific timelines concerning the exam returns and grade posting.
- Results of the internal evaluations should be communicated to all stakeholders. The findings of the self-assessment should be shared within the School and discussed with the involved students generating a feedback mechanism. The process should result in documented and communicated action plans, which could be related to the KPIs.
- Follow all recommendations in Part B of this report.

IV. Summary & Overall Assessment

The Principles where full compliance has been achieved are: **1, 4, 5, 6, 7, 8, 9 and 10.**

The Principles where substantial compliance has been achieved are: **2 and 3.**

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 External Evaluation & Accreditation Panel agrees that this Programme leads to a Level 7 Qualification according to the National & European Qualifications Network (Integrated Master)	YES	NO
	X	

The members of the External Evaluation & Accreditation Panel

Name and Surname

Signature

- 1. Prof. Panagiotis Souganidis (Chair)**
The University of Chicago, USA
- 2. Prof. Anthimos Georgiadis**
Leuphana Universität Lüneburg, Germany
- 3. Prof. Alexios Polychronakos**
The City College of New York, USA
- 4. Prof. Alekos Vidras**
University of Cyprus, Cyprus