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HELLENIC REPUBLIC

H.Q.A.

HELLENIC QUALITY ASSURANCE AND
ACCREDITATION AGENCY

EXTERNAL EVALUATION REPORT

DEPARTMENT OF MECHANICAL ENGINEERING

ARISTOTLE UNIVERSITY OF THESSALONIKI



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External Evaluation Committee

The Committee responsible for the External Evaluation of the Department of Mechanical Engineering of the Aristotle University of Thessaloniki consisted of the following five (5) expert evaluators drawn from the Registry constituted by the HQAA in accordance with Law 3374/2005 :

1. Professor Fokion Egolfopoulos (Coordinator)
University of Southern California, Los Angeles, California, USA
2. Professor Johh Georgiadis
University of Illinois at Urbana-Champaign, Champaign, Illinois, USA
3. Professor Eustathios Ioannides
Imperial College London, London, United Kingdom
4. Professor George Kardomateas
Georgia Institute of Technology, Atlanta, Georgia, USA
5. Professor Dimitris Lagoudas
Texas A&M University, College Station, Texas, USA

N.B. The structure of the “Template” proposed for the External Evaluation Report mirrors the requirements of Law 3374/2005 and corresponds overall to the structure of the Internal Evaluation Report submitted by the Department.

The length of text in each box is free. Questions included in each box are not exclusive nor should they always be answered separately; they are meant to provide a general outline of matters that should be addressed by the Committee when formulating its comments.

Introduction

I. The External Evaluation Procedure

The External Evaluation Committee (EEC) visited the Department of Mechanical Engineering (Τμήμα Μηχανολόγων Μηχανικών - the Department) at the Aristotle University of Thessaloniki (AUTH) on Monday, Tuesday, and Wednesday December 16-18, 2013.

On Monday December 16, the EEC arrived in Thessaloniki and met with Vice-Rector for academic affairs and vice-president of ΜΟΔΙΠ (unit of quality assurance), members of ΜΟΔΙΠ, and the head of the departmental administrative staff. The meeting took place at the building of Central Administration. Hardcopies of the internal evaluation report (IER) and a memory stick containing all presentations and other supporting material were given to the EEC members. The Vice-Rector welcomed EEC and presented a concise outline of the state of AUTH. Subsequently, the Chair of the Department (Πρόεδρος του Τμήματος) and the directors of the three Sections (Τομείς) gave introductory presentations outlining the state of the Department. The Dean (Κοσμήτορας) of the School of Engineering gave also an overview of the state of the School.

On Tuesday December 17, the evaluation process took place off campus. A number of presentations were given on the overall curriculum and goals of the Department, the curriculum of each section, the postgraduate and doctoral programs, the research initiatives and activities of the Department, the mobility and practical training of the students, the activities of each laboratory, and the state of the various supporting units. The EEC requested additional information regarding curricula vitae of faculty members, titles of ongoing doctoral theses, as well as distributions of research funding, publications, and citations on a per faculty basis but with de-identified data. The requested material was given to EEC in a very timely manner.

On Wednesday December 18, the evaluation process took place at the building of the Research Council. In the morning, the EEC met with members of the faculty (ΔΕΠ), undergraduate and graduate students, alumni, as well as scientific, technical, and administrative staff. In the afternoon, the EEC visited teaching, laboratory, and administrative facilities. Subsequently, the chair of the Department summarized distinctions and awards of the faculty, participation in and organization of conferences, contributions of the Department nationally and internationally, collaborations with professional and research entities, and student activities. Before returning to Athens, the EEC briefed the faculty on the preliminary consensus reached by its members regarding strengths, weaknesses, and potential remedies.

In summary, the approach of the Department to the evaluation process was very enthusiastic and rigorous, the faculty and students placed emphasis on the pertinent details, and the EEC was treated in the most cordial and collegial manner. All EEC members wish to express their gratitude to the entire Department for facilitating the visit and making the process as seamless as possible.

On Thursday, Friday, and Saturday December 19-21, the EEC met and composed collectively the first draft of the evaluation report, which was given to the Hellenic Quality Assurance and

Accreditation Agency (ΑΔΙΠ) on Monday December 23 to be forwarded to the Department for comments and rebuttal.

II. The Internal Evaluation Procedure

The EEC found the IER as voluminous, complete, and informative and its final version became available electronically a week before the visit. It is apparent that many hours were spent in preparing the document and many statistical data were included that the EEC found very useful. Overall, the EEC determined that the Department met the objectives of the internal evaluation process.

III. General Remarks

Initially part of the original Mechanical-Electrical Engineering Department established during the 1972-1973 academic year, the Mechanical Department became independent in the 1976-1977 academic year. It consists of 3 Sections and 10 laboratories, 32 faculty members, and 34 scientific, teaching, technical, and administrative staff. There are 1367 registered undergraduate students from which approximately 950 are active, and 100 doctoral students.

The typical duration of the undergraduate programme is 5 years and the Department offers 129 courses. Approximately 18% of the students graduate in 5 years, 17% in 6 years, while 22% in 7 years. The majority of the students (45-50%) graduate with a diploma grade between 6.5 and 7.0, 20-25% graduate with a grade below 6.5, while only 2% achieve 8.0 or higher.

Upon request, the Department provided the EEC with the curricula vitae of 28 faculty members whereby it was noted that 17 out the 28 (~60%) have obtained their doctoral degree from the Mechanical Engineering Department of AUTH.

During the 2007-2012 period, the annual research funding ranged between 2 and 4 million Euros for the entire department. This corresponds to approximately between 60,000 and 120,000 Euros per year and per faculty member, which is the highest level all departments in AUTH. Approximately 30-40% of this funding is provided by industrial sources. The balance of the research funding is provided by government agencies, which however is declining rapidly after the 2010-2011 period. The funding distribution is skewed towards the top 22% of the faculty who are responsible for nearly 80% of the funding. Furthermore, 37% of the faculty are responsible for approximately 80% of the publications. The research directions in the Department appear to be more of applied nature. The faculty and the students have won several national and international awards for their contribution in the general area of Mechanical Engineering.

It should be noted that several of the difficulties that the Department encounters stem from:

- The more general issues associated with the higher education system in Greece dating back to the 1980's and 1990's;
- The present challenging financial environment in Greece. Among the various consequences of financial hardship are the sub-standard working conditions such as intermittent heating during the winter months, and unsightly sanitary facilities. Such occurrences are appalling.

The EEC found the faculty and a portion of the student body very motivated, and was particularly impressed by the dedication and devotion of the administrative-supporting staff to the Department.

A. Curriculum

To be filled separately for each undergraduate, graduate and doctoral programme.

UNDERGRADUATE PROGRAMME

The undergraduate Mechanical Engineering (ME) curriculum is based on the 5-year, European model based on the European Credit Transfer System (ECTS), and consists of 48 courses offered in three cycles:

Cycle I (Years 1,2,3): Basic science and introductory mechanical engineering courses. This is the core curriculum that is required for all students independently of orientation/section. The cycle consists of 30 required courses with a total of 180 ECTS.

Cycle II (Year 4): Intermediate mechanical engineering courses, with 6 required courses from the chosen orientation/section, and 4 elective courses from the other 2 sections. The total credits in this cycle are 55 ECTS.

Cycle III (Year 5): Specialized courses, with 8 elective courses chosen from 7 groups offered from the 3 Sections (3 from Energy, 3 from Manufacturing/Structures, 1 from Industrial Management). The total credits in this cycle are 35 ECTS. The undergraduate curriculum concludes with the diploma thesis that credits the student with 30 ECTS, to bring the total to 300 ECTS.

The EEC discussed the curriculum during separate meetings with the faculty and students, reviewed the course descriptions, and concluded that:

- The Department offers a comprehensive undergraduate curriculum with emphasis on engineering technology.
- The course material consists of lecture notes, PowerPoint presentations, and textbooks.
- Recitation hours and laboratory demonstrations supplement the lectures, when appropriate.

The EEC feels that the following merit consideration and action:

1. All the available (129) courses are offered each year, resulting to an average teaching load of 2 courses per semester for each faculty member. There is some advanced material in Cycle I courses, and overlaps among the courses available, especially for Cycle III. The Department should establish an effective mechanism to include advanced material in Cycle I courses and to identify and eliminate overlaps in Cycle II and III courses.
2. There are no stated pre-requisites for the courses and the EEC strongly recommends an implementation of a pre-requisites policy. The student can take the course out of order owing to other constraints (i.e. failing a prior course and opting to retake it at a later semester). The lack of pre-requisites can result in the students being unable to follow the advanced courses and can thus disrupt their smooth transition through the programme. The ensuing disorientation and loss of motivation is probably one of the causes for the large number of inactive (“lingering”) students who swell the ranks of the undergraduate student body. It is therefore recommended that pre-requisites or co-requisites be introduced in conjunction with re-balancing the courses recommended in item 1.
3. The curriculum offers no introductory Chemistry course in Cycle I and the EEC recommends that one be established. With the emerging emphasis on surface

engineering, micro/nanotechnology, and bioengineering, such an omission might handicap the undergraduate student who will spend all of his or her career in the 21st century working in these interdisciplinary areas.

4. The current programme should be transformed to a five-year programme of combined Bachelor of Science (B.Sc.) and M.Sc. degree (4+1 Programme), especially since many international graduate programmes consider that the diploma does not fulfill the requirements for a M.Sc. degree.
5. Starting with the first semester, an academic adviser should be assigned to all students. The adviser should meet with each student each semester to help him/her select their coursework and comply with the pre-requisite structure discussed in item 2. A computerized flowchart tool can easily be created to assure this compliance.

POST-GRADUATE PROGRAMME

The Post-Graduate curriculum consists of one focused programme (Processing of Advanced Materials) in which the Department takes the lead periodically, and two inter-disciplinary ones (Erasmus Mundus THRUST, Preservation/Restoration of Cultural Monuments) in which the Department is a participant.

The post-graduate programmes offer multiple advantages:

- In the case of THRUST, the contact of AUTH students with European (Kungliga Tekniska Högskolan, University of Liege) and USA (Duke University) students and the promotion of the AUTH programme in the international arena.
- The exploitation of the long-distance learning infrastructure of the partner institutions, as well as the procurement of advanced instrumentation to be used for education or research.
- Satisfying the training needs of certain interdisciplinary technological sectors.
- Offering the opportunity to junior faculty members to teach graduate courses.

The EEC congratulates the department for aggressively pursuing any opportunities to establish such programmes, and recommends that:

- The post-graduate programme should be aligned to a strategic planning.
- Incentives should be provided so that more faculty members become engaged in the post-graduate programme. Examples of such incentives can be reduced teaching load or additional support from the Research Council.

DOCTORAL PROGRAMME

The Department does not offer an organized doctoral programme plan and therefore there is no Doctor of Philosophy (Ph.D.) curriculum. The post-graduate students wishing to pursue the Ph.D. degree are involved in ad-hoc mentoring or tutoring activities, assigned reading material for self-study, and required to attend technical seminars by their supervisors. Graduates from other departments are required to enroll in advanced courses from the departmental undergraduate curriculum in order to enable them to catch up with the requisite background knowledge. Although the involvement of the supervising faculty member in the maturation process of the candidate towards the completion of the PhD degree is intense, the absence of formal curriculum does not ensure the uniform application of this process across the department.

B. Teaching

The EEC made the following observations related to teaching:

1. Teaching within the Department undergraduate programme consists of lectures, class, and laboratory exercises. Faculty members teach courses that lie exclusively within their own Section specializations (with rare exceptions). Many courses require individual term projects (θέματα), which involve individual term paper submission.
2. Students have successfully competed in the Formula SAE student competition internationally and against well-funded and traditionally strong European teams. For the past several years they have been able, with their dedication and support from their faculty mentors, to distinguish themselves and win major awards. This new tradition is one of the highlights of their education and as an extra-curriculum activity should continue with support from industry sponsors and former students.
3. A large number of students do not attend classes regularly. This contributes to having a large number of students postponing the final examinations and a large percentage of late graduations.
4. The first year of study is especially challenging, as students try to decompress from the stressful and intensive Entrance Exams, systematically skip classes, and then pass the course with low grade. This creates problems that reflect mainly on a low average GPA (Grade Point Average) for graduating students.
5. In several cases there are graded homework assignments. In some courses students only take the final exam and pass the course.
6. Laboratory exercises are included as part of some courses or in laboratory-only courses. Due to the large numbers of students some of the laboratories involve only demonstrations.
7. Teaching loads are about two courses per semester per faculty member and they are distributed unevenly among faculty members, apparently due to the Departmental structure to rely on the self-sufficiency of Sections.
8. Multiple final examination periods play a key role in increasing the time dedicated to teaching by faculty members and create a negative atmosphere and a state of mind of constant examinations.
9. However, there is no organized process for mentoring of students whereby the students are divided in small groups, each consisting of approximately 30 students. By assigning the total student population uniformly to all faculty and higher academic staff, each group should be assigned an advisor who is knowledgeable and available to review the individual student curriculum and academic progress during a predetermined period at the beginning of each semester.
10. Incoming students, admitted through the National Entrance Examination system, have achieved high entrance scores. However, there are many transfer students with lower scores and these may hinder effective teaching and evaluation of students.
11. As indicated by the student evaluations, there appears to be concern with regard to the textbooks used in many of the courses. There is familiarity with computer usage by students but the EEC considers that the level of software utilization in courses can be significantly improved to supplement material in the textbooks and render them

more relevant.

12. Based on conversations with students, there is discontent among students, and concern on behalf of the EEC, about the high level of use of PowerPoint presentations as a mode of undergraduate class teaching. By student accounts, more than 50% of the classes are taught through PowerPoint “seminar-type” presentations.
13. Based on student responses documented in the IER, students are also discontent with the general level of support from the staff and other support services and information provided about the curriculum and the Department at-large. However, they are content with the library support and web-based information.

Major challenges, which are found not only within the Department but are persistent in many institutions of higher education in Greece, are:

- The large number of students relative to the number of faculty members.
- Low class attendance, especially for Cycle I courses.
- Outdated and insufficient computer and laboratory infrastructure.
- Large number of students deferring final course examinations.
- Persistent loss of teaching time because of protests and demonstrations.

Recommended actions by the EEC to help increase teaching quality and student involvement and participation are the following:

1. Institutionalization of graded weekly homework assignments, which the EEC considers an essential educational component.
2. Enhancement of web pages and the posting of online material for all courses including the faculty lecture notes. This can be enhanced by the uniform adoption of the system of asynchronous education "e-class."
3. Encouragement of enhancing teaching across Section boundaries and with co-instructors from multiple Sections.
4. Capping of the number of transfer students. The EEC strongly supports any effort in this regard.
5. The EEC strongly emphasizes that the current efforts to reduce the very large number of “lingering” (non-active) students must be sustained and by no means be abandoned; strict academic performance criteria must be introduced.
6. Introducing the concept of a faculty member mentor for each incoming student and until graduation.
7. The elimination of deferred student examinations.
8. The reduction of the class sizes especially in the first two years.
9. Establishment of orientation “motivational-style” seminars for incoming students, in which the Mechanical Engineering profession and Departmental curriculum are introduced. Students are also alerted to the perilous effects of class skipping and complacency.

C. Research

For each particular matter, please distinguish between under- and post-graduate level, if necessary.

APPROACH

Research efforts in the Department are extensive and they are supported by major companies with long cooperation history with the Department. The EEC notes that the emphasis is on applied research with few exceptions. The Ph.D. projects are distributed and supported in the laboratories. The equipment in the laboratories is also indicative of the applied research focus. The EEC applauds the cooperation with leading universities and prizes that have been won, as well as the dissemination of research results through publications and conference presentations. An additional important aspect of the research effort is the networking of the Department with its organization of conferences exchange of academic staff and participation in EU projects.

The research is organized by the ten laboratories in areas that evolved from the traditional “Chair” system, and the infrastructure has been built upon the distribution of resources in these laboratories. The research facilities are mainly located in three adjacent buildings and as is the case with the Metallurgy Laboratory, they are housed in unexpected locations. Some shortcomings of the infrastructure, including equipment, are compensated by the dedication of the staff and the Ph.D. students who are prepared to work long hours.

A strategic plan for the overall direction or focus of research efforts does not appear to exist. There are no internal standards for assessing research; assessment is done in an ad hoc manner by committees that supervise Ph.D. dissertation theses.

IMPLEMENTATION/RESULTS

The Department, as indicated above, has a good network of companies and tradition in EU projects that are essential in providing an almost uninterrupted stream of funding that seems to be secure in the short term. At the same time the Department has access to first class graduates within the Department and sometimes akin Departments in AUTH, who invariably fill in the available Ph.D. positions. There is a large number of Ph.D. students but the recruiting takes place without internal or external advertisement and a formal recruiting effort. The Ph.D. students submit a year-end progress report to a three member consultative committee. Only Ph.D. students who originate outside the Department have to attend selected courses.

The quality and adequacy of research infrastructure is variable across the ten laboratories. A few have developed state of the art facilities and follow up the path of continuous improvements with resources from research contracts and grants. Compared with international standards for a typical tier one research university, the research infrastructure is inadequate and needs substantial improvements with common shared facilities in high performance computing, materials fabrication and characterization laboratories, and development of new areas like mechatronics and additive manufacturing. The technical support is adequate in several laboratories and not enough in the ones without substantial external funding.

The scientific publications meet the criteria of numbers and quantity, especially in special volumes and conferences. The majority of the faculty lack in archival publications and high impact journals, which have the additional benefit of a high citation index and better exposure of the Department to the international scientific community. The Department

overall has a good standing with some of the international ranking systems and in comparison with the other similar Departments within Greece, which can further improve with the realignment of research with a more basic focus and publication in high impact journals. There is also in several areas, especially in materials, the trend to develop patents and commercialize new technologies, which is encouraging and recommended to grow further.

There are many ongoing research projects supported by European networks and industrial sponsors who are repeated customers. The collaboration with well-established Institutes like the Fraunhofer Institute brings prestige and alignment with European standards of high calibre. Applied research with industries like Toyota and commercialization efforts with spin off companies like Beta-CAE a company that was established and funded by faculty members of the Department, provide a promising landscape of the potential of the Department to become a leader in south Europe, Middle East, and beyond. Many projects seem to be of applied nature with deliverables improvement of processes or testing equipment used by industry and some of these projects could be characterized as equivalent to consulting projects. There should be a balance of such projects to satisfy the needs of both the Diploma thesis needs and also the Ph.D. more basic research requirements.

Research collaborations are extensive and with mostly European Universities. There are close to 200 collaborations established by the Department with industry, foundations, and research organizations, other laboratories, Universities, and research centers.

IMPROVEMENT/RECOMMENDATIONS

Strategic vision and planning for the research in the Department and the Sections should be systematically established. This should include more funding for fundamental research, which can enhance understanding in the overall research effort and the reputation of the Department and the Sections. This should be focused and reviewed every five years and include modern fields. Furthermore, the current practice, of performing sometimes fundamental work within applied research contracts, in order to enhance understanding, should be strengthened. As part of this effort the establishment of a Department Research Committee is recommended. This will enhance cross-section communication and synergy and identify potential of existing and/or new resources for joint utilization.

Improvement of the infrastructure for research is urgent. Appropriate laboratory space for equipment and staff, is a major problem. Improvements of the existing information technology (IT) and the attendant facilities are required. Access of the research staff and students to modern library facilities is also needed. ISO 9001 certification is recommended to all laboratories but it should be mandatory for those that provide testing services.

The EEC has recognised that the staff recruitment process may result in in-breeding that is internationally considered adverse to scientific progress. It may inhibit cross-fertilization as well as the introduction of new ideas and techniques, and can lead to the perpetuation of outdated and non-competitive scientific practices.

An internal award system should be established to award student excellence, e.g. Dean's award etc.

The establishment of cross-school links and a flexible structure that allows the formation of scientific teams on a per-project basis. This could be further enhanced by Centers of Excellence that establish formal cooperation of several Sections from different Departments.

Research should be recognized in addition to teaching and service and should be rewarded

for faculty with active research projects by reducing their teaching loads.

Opportunities should be given to junior faculty members to develop their own initiatives and start up funds should be provided to them. The current climate of the junior faculty bearing the heaviest teaching and administrative loads should be reversed.

Develop a professional career path for postdoctoral students, either transitioning them to academic careers or industry and promoting them to collaborating institutions.

An advisory board should be established with leaders from industry, academia, and other relevant organizations. The board should consist of former students and others genuinely interested and dedicated to the Department, who will provide frank input on the directions and strategic planning of the Department and will also help the Department with the placement of students, establishing connections and projects, and also with fundraising.

D. All Other Services

For each particular matter, please distinguish between under- and post-graduate levels, if necessary.

1. Library

The situation with the library is grim and critical. The Department had established its own technical library supported by permanent staff and utilized by students throughout the year. Due to recent reduction in positions implemented by the central government, the remaining librarian will be laid off and the Departmental library will close. The proposed effort to consolidate the Departmental libraries within the School of Engineering is prudent and it will be a step in the right direction in terms of providing services in a centralized location with better space and a broader collection of books. What is critical for the operations of the Department at a competitive research level is the continued access to databases and electronic access to journals.

Action Item: Consolidate library with other Departments of the School of Engineering and secure resources for subscription to electronic journals.

2. Secretariat – Registration and Administrative Services

The administrative services have been impacted by years of reduction in force through attrition and retirements without replacements. There are two experienced staff in the registration and administrative services, who have been providing quality services to faculty and students. However, reducing the staff from six to the current two will negatively impact critical operations, especially since the administration of the Department is responsible in keeping track of student status and it is responsible for the administration of graduations and certifying degrees at all levels. There is an effort to automate the process through electronic services but there is no electronic historical data, which creates challenges with filing of records and storing them. Scanning and electronically storing historical data and records should become also a priority, in addition to automating the course registration process. The secretarial/administrative support in the laboratories and divisions has been reduced to minimal permanent staff support and there is no plan for changing this in the near future.

Action Items:

- Automate fully the registration process from first year to graduation.
- Establish an electronic data storage system with access to historical data and records.
- Provide administrative support to faculty and divisions by using collectively resources from projects and non-profit organizations.

3. Information Technology Support

There is one island for public use by the students with about 30 PCs with software used by various courses. The computers are about five years old and there is an effort to upgrade old systems. The support staff does their best to provide services from helping students to scheduling exams and help sessions in the computer laboratory. A server is also housed in the same facilities in a small space not suitable in terms of cooling and capacity for upgrades. The shortcomings of the IT infrastructure are negatively affecting innovation in the curriculum and the capability of the Department to reach a state of the art teaching aligned with current needs in hardware and software. By contrast, students seem to have available at their disposal the latest laptops and electronic devices, which makes this disconnect even starker. Also access to computing seems not to be a problem at the research level. It is highly recommended that resources be allocated to the computer laboratory as the highest priority for investment. Based on discussions with the staff, an investment of about 10.000 Euros will provide for needed updates to the hardware of the computer laboratory.

Action Items:

- Emergency funds should be allocated to upgrade the computer laboratory (island) with hardware and software.
- A high-performance computing cluster should be established for the Department for the graduate students.
- Classrooms should become distance learning capable to accommodate the large numbers of students.

4. Technical Support

The main support is provided by graduate research assistants. The permanent technical staff is diminishing during the last several years and the solution of supporting research and academic operations through contracts seems to be the trend, which is compatible with trends in educational institutions world wide. Other support is non existent. For example, cleaning does not take place but once every two weeks and it has a negative effect overall in the appearance of the buildings, classrooms, and the attitude of faculty, students, and supporting staff.

Action Items:

- Permanent technical staff should be hired to replace outgoing staff due to retirements and transition temporary staff into permanent positions.
- Maintenance should be kept at acceptable levels, especially for the aging infrastructure in the laboratories and facilities.
- Support for the construction of unfinished laboratories is critical to solve urgent space problems for academic needs and equipment placement in the research laboratories.

Collaboration with social, cultural and production organizations

The Department is well connected with social, cultural and development organizations, close to 200 mentioned in the report. There are many European organizations involved in addition to local and government organizations at the state and central national levels. The collaboration with the Fraunhofer Institute is noteworthy, especially its collocation in the Department. Industries like Toyota, Bosch, and others are frequent customers and use the various laboratories for technology transfer and development. Interactions with archaeological museums and ancient monuments bring an interesting aspect to mechanical engineering technology and connect history and Greek civilization with its ancient roots.

- The main area of improvement is to move some of the interactions with development organizations into cycles of funding, beyond the voluntary work of faculty and graduate students.
- Also a departmental strategy will be needed to focus the energy of interactions on certain areas of importance, for example bringing prominence to the geographic locations as the center of Balkan crossroads.

E. Strategic Planning, Perspectives for Improvement and Dealing with Potential Inhibiting Factors

For each particular matter, please distinguish between under- and post-graduate level, if necessary.

One of the most rewarding aspects of the visit was to note the dedication and commitment of everybody involved (faculty, students, and staff) to the AUTH as an institution, and their willingness to do their best to make the Department a leader in its field.

The EEC believes that the Department should capitalize on established areas of excellence within all three Sectors and develop new areas relevant to international trends and projected regional needs in order to create a “branding” and distinguishing the Department in this context.

Detailed recommendations for strategic planning in the curriculum, teaching, research, and international visibility follow:

Curriculum and Teaching

1. The EEC strongly recommends conversion to a more flexible programme structure, namely a 4-year undergraduate programme leading to a degree equivalent to B.Sc. plus 1-year graduate programme leading to a degree equivalent to M.Sc. Although students can be admitted to the M.Sc. programme independently, there should be an option for a terminal M.Sc. programme, i.e. the student could elect to complete the 5-year programme as it is done currently, without having to apply to the M.Sc. programme once the 4-year undergraduate cycle is complete. This conversion would necessitate a thorough restructuring of the current programme that must include the introduction of new courses, both fundamental as well as in-depth postgraduate-level ones.
2. The graduate degree programme should include also the M.Sc./Ph.D. combination or the fast track Ph.D. programme for students who want to directly pursue their Ph.D. degree. The current graduate curricula should be aligned with the Ph.D. program and become the main feeding mechanisms for Ph.D. students and organized courses. A Departmental level Qualifying exam should be established for quality control and applying uniform standards across Sections and Laboratories.
3. The curriculum should be revised to include fundamental topics that are missing (e.g. Chemistry) and modernize the syllabi of traditional courses. Threads of courses should be developed with prerequisites culminating to specialized technical elective courses for undergraduates and advanced graduate courses.
4. Newly appointed junior faculty members should be systematically supported with reduced teaching load and be provided with start up funds to establish new laboratories and support Ph.D. students.

Research and International Visibility

In terms of research, the following strategic issues should be addressed:

1. Research policy should be critically revisited, with the aims of redirecting effort to more fundamental topics and of identifying new areas that are topical and have growth potential as the main drivers of research planning (e.g. bio-engineering). Fundamental and basic research should be rewarded and considered the main consideration for faculty promotions.
2. In tandem with this, a clear strategic direction is not evident in all Sections and despite the possibilities there are few synergies. The management of AUTH and the Department should establish a clearly defined research vision and the means to further promote and encourage cross- and inter-departmental collaboration and reward activities that clearly enhance the reputation of the Department/University, using transparent and internationally-accepted measures. This research vision should consider a discrete number of areas where the Department can reasonably expect to innovate and excel, based on the academic and economic realities of the country and geographic region.
3. The EEC consents that the Section-type structure may have served the Department well for many years, when disruptions in the traditional sub-disciplines of mechanical engineering were infrequent. However, this structure can no longer accommodate the rapidly changing research landscape of today: faculty should be able to encompass new activities in areas adjacent to their core research expertise, rather than expecting new appointments to cover the gaps.
4. We endorse and strongly support the Department's willingness (as outlined in the IER) to enhance collaboration between different Sections of the Department and with other Departments and Schools of AUTH both in research and teaching. It should also continue the efforts to establish joint degree programs at the M.Sc. and Ph.D. levels with peer Departments in Europe, USA, and other geographical areas around the Globe.
5. It is also refreshing to note the Department's support (as outlined in the IER) for collaboration with foreign, mostly European, universities via student and faculty visits and exchanges. The EEC strongly supports and suggests that the AUTH and the Department should urgently seek strategic alliances with top-quality European and US universities that would facilitate the aforementioned collaborations. Such a process could be launched at the Department level with a series of seminars by inspiring visiting speakers.
6. We strongly support the Department's willingness (as outlined in the IER) to invite world-renown faculty at prominent institutions as Visiting Professors.
7. In its strive for international excellence, AUTH should clarify and quantify what quality levels it strives to achieve, and assess what levels it actually achieves, through regular benchmarking exercises against measurable goals.

Legal Framework and Other Issues

1. The EEC noted with dismay the existence of an overbearing and restrictive legal framework that inhibits the rapid growth that is essential for a research and teaching environment to be world class. The Department correctly points out the difficulties associated with the severe delays in the appointment of new faculty, the award of state funding, as well as the extremely bureaucratic procurement processes.
2. AUTH should draft and implement a Code of Conduct for students (including plagiarism, vandalism, respect of opinions and persons), as well as for faculty and staff (including transparent and auditable relations with external bodies, identification of potential conflicts of interest, assurance of ethical conduct, etc.). Such Code should include appropriate disciplinary actions (e.g. with regard to AUTH property being vandalized by students, conflict of interest violations, etc.). Furthermore, AUTH should both administer the dissemination of this Code to all relevant parties whenever there are significant revisions, and connect its reinforcement to other current procedures for maintaining academic integrity (e.g. hearings, etc.).

F. Final Conclusions and recommendations of the EEC

For each particular matter, please distinguish between under- and post-graduate levels, if necessary.

The general conclusions of the EEC are:

1. The Department of Mechanical Engineering at the Aristotle University of Thessaloniki is clearly among the leading ones in Greece in terms of teaching, research, and external visibility. Furthermore, the research funding per faculty member is the highest among all departments at the Aristotle University of Thessaloniki.
2. The atmosphere in the Department is positive, with faculty members and a portion of the student body being very motivated.
3. The existing curriculum and the duration of studies need to be revised by adapting to modern practices and evolving engineering science and technology. More specifically, the EEC believes that a 4+1 curriculum (B.Sc./M.Sc.) would best serve the mission of the Department.
4. The current Section-type structure may not be an ideal model for the further growth and visibility of the Department.
5. More emphasis needs to be given to fundamental research in order to achieve a reasonable balance with ongoing applied research.
6. Efforts must be made to avoid further expansion of in-breeding in faculty hiring.
7. Mechanisms must be in place to assure quality control of teaching and research, as well as faculty hiring and promotion, among others.
8. There are several obstacles to the further growth and improvement of the Department such as:
 - The complex and inflexible state laws.
 - The current financial crisis.
 - The frequent occurrences of strikes and vandalisms.
 - The long tradition of moderate to non-existing participation of a large portion of the student body to the educational activities.

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