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ΣΤΗΝ ΑΝΩΤΑΤΗ ΕΚΠΑΙΔΕΥΣΗ

HELLENIC REPUBLIC
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HELLENIC QUALITY ASSURANCE AND
ACCREDITATION AGENCY

EXTERNAL EVALUATION REPORT

DEPARTMENT of Mechanical Engineering Educators

School of Pedagogical and Technological Education (ASPETE), Marousi, Athens

June 2012

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External Evaluation Committee

The Committee responsible for the External Evaluation of the Department of Mechanical Educators in the School of Pedagogical and Technological Education (ASPETE), Marousi, Athens consisted of the following four (4) expert evaluators drawn from the Registry constituted by the HQAA in accordance with Law 3374/2005:

1. **Prof. Michael Delichatsios**

   School of Built Environment, University of Ulster, UK

2. **Dr. Demetra Evangelou**

   School of Engineering Education, Purdue University, West Lafayette IN, USA

3. **Dr. Lucas Amiras**

   Department of Mathematics, University of Education Weingarten, Germany

4. **Dr. Ioannis Papadakis**

   Expert, CEO of IQCert, Certification Organisation, Greece

Introduction

I. External Evaluation Procedure

The external evaluation committee (EEC) visited the site of the Department of Mechanical Engineering Educators from 28th May till 30th of May of 2012.

In the first day of the visit, the EEC arrived before noon and met with the President and the Vice President of ASPETE, the Chair of the Department, and members of the departmental staff. After this informative meeting and open discussion, there was a presentation by the Chair of the Department.

The second and third days of the visit included:

1. group and individual meetings with staff, including faculty (ΕΠ) and teaching/research associates (ΕΤΠ)
2. meetings with students and alumni of the Department
3. lab visits
4. observation of teaching of a mechanical engineering lecture
5. visits of the library and office of practicum experience (ΔΑΣΤΑ)
6. meeting with administrative and secretarial staff
7. visit and use of the cafeteria and brief visit of the dormitory facilities
8. teleconference with the President and the Vice-President of ASPETE (and Chair of the Internal Evaluation Committee, ΜΟΔΙΠ)

During these meetings and visits there was discussion on related topics where several members of staff were present and responded to questions by the EEC.

The EEC appreciated the hospitality of the ASPETE administration and its willingness to facilitate our visit and access to premises, facilities and materials pertinent to the external evaluation process. In particular, the EEC wishes to extend its heartfelt gratitude to the Chair of the Department and the coordinator of the Internal Evaluation Committee (IEC-OMEA) for their tireless commitment to accommodating our requests and facilitating the overall process.

List of reports, documents and other data examined by the Committee

There were a number of documents submitted to the EEC:

1. Internal Evaluation Committee (IEC) report, dated September 2010, supplemented April 2012.
2. course guides
3. ASPETE website documents
4. updated program of study
5. textbook list
6. recent faculty publication lists and samples of publications
7. samples of the work from laboratories and classes
8. samples of undergraduate theses, lab regulations, reports and exam papers
9. history and legislation about Σ.Ε.Λ.Ε.Τ.Ε and ASPETE

The EEC was impressed by the exemplary level of cooperation and hospitality of the Chair and all members of the Department.

II. The Internal Evaluation Procedure

The members of the EEC found that the evaluation report prepared by the IEC was informative. It was however pointed out that important constituents such as students and auxiliary staff participated to a lesser extent in the process.

The Department, with regards to the technological aspects of the curriculum, met the objectives of the internal evaluation process. Minimum references were found about the pedagogical aspects of the program.

A. Curriculum

The detailed assessment below refers to the current two-cycle curriculum: the first cycle (4 years = 8 semesters) provides a degree that makes graduates eligible to teach in secondary vocational schools (ΕΠΑΛ); the second cycle (1 year = 2 semesters) leads to a degree in mechanical engineering technology.

Currently there are no master and doctoral programs offered by the Department.

APPROACH

The goal of the curriculum is to offer the knowledge of mechanical engineering from the perspective of technology education. The curriculum is decided through the participation of all Department stakeholders and is consistent with the goals of graduating educators and technologists in mechanical engineering.

The curriculum consists of a sound core of basic courses and a limited number of electives. Although not reviewed regularly in a formal way, individual instructors update their course material under the same generic description as it appears in the course guide. In addition, proposals for specific modifications of the technological curriculum including possible course deletions, changes to avoid overlapping between courses and the like, have been developed and handed to the EEC. Formal curricular revisions and updates appear to be somewhat discouraged in the current climate of economic crisis and severely limited resources.

Moreover, even though technology fundamentals are covered sufficiently, it was identified by various stakeholders e.g. students, auxiliary personnel, that keeping up with updated knowledge in the area of technology is difficult. It is the opinion of the EEC that an even greater challenge exists with regular updates and developments in the pedagogical areas of expertise

IMPLEMENTATION

The curriculum appears to be rational, clearly articulated, coherent, and functional. The material and duration of each course emphasizes the area of practice. Recommended books, notes, etc. for each course are appropriate. The curriculum includes a practicum.

Notwithstanding the above, the EEC has identified a number of drawbacks. There is a lack of course prerequisite structure and insufficient integration of the technological and pedagogical aspects of the curriculum. In addition, the curriculum is rather long consisting of separate offerings of technological and pedagogical courses. The EEC is in agreement with comments made by students that more visits in technical workplaces are highly desirable.

Of significant concern is the number of staff who implement the curriculum. To start with, the ratio of permanent faculty over temporary (limited contract) instructors (about 30 to 70 per cent) is totally unacceptable for the integrity / stability of an academic program. The EEC feels that this is a critical issue that needs to be addressed as soon as possible. In view of the current austerity measures in Greece, a substantial reduction of personnel has already been implemented and – possibly –more is coming. This trend poses a serious threat to the delivery of the programs. It should be stressed that even at the current budgetary levels the staff make extraordinary efforts to meet the teaching needs at marginal or nil compensation levels. For several teaching staff, further budgetary reductions would

render their involvement impossible undermining curriculum integrity and quality.

Given the intensive lab and teaching practice character of the program, the lack of lab assistants, technicians and practicum supervisors is highly problematic, including problems of safety.

Issues relating to building size, space adequacy, and other forms of support are discussed in Part D.***RESULTS***

In spite of all aforementioned - recently accentuated - burdens and difficulties, the effectiveness of the curriculum is adequate regarding the technological preparation, particularly for the students, approximately 50%, who complete the 2nd cycle.

The EEC feels that the curriculum in the first cycle, attended by 100% of the students, presents significant limitations with regards to the highly desired integration between education and technology. The EEC believes that addressing this challenge is possible, given the human capital resources available in the Department.

Additional evidence of the overall good quality of the curriculum is reflected in the fact that some final diploma theses / reports have led to publications in international conference proceedings. It should however be taken into account that any further reduction of personnel or resources would adversely affect curriculum quality.

IMPROVEMENT

The Department can improve and streamline the curriculum by integrating pedagogical aspects in several technological courses (for example, following the strand of work in education known as *Pedagogical Content Knowledge* and *Engineering Education research*). This might require joint teaching and other curriculum innovations. The EEC would like to encourage this kind of implementation as a possible means towards curriculum reorganization.

As identified by various stakeholders (e.g. students, auxiliary personnel) challenges in keeping up with state of the art technological knowledge must be balanced with adequate coverage of technology fundamentals. In this light, the EEC strongly recommends that members of the Department adopt a dynamic approach to curriculum revision with a frequent and systematic examination of course offerings. For example, duration and content of each course should be reviewed in detail for potential adjustment in relation to a course prerequisite structure.

Furthermore, in order to enhance students' professional awareness, the EEC recommends the introduction of more visits in technical workplaces and industrial sites and more guest lectures by experienced practicing engineers and educators.

Finally, the Department needs to urgently address the essential problem of the number of staff on short-term contracts delivering the bulk of the curriculum.

B. Teaching

The EEC had the opportunity to discuss issues related to teaching with staff and students throughout the three days of its visit. Discussions were confidential and anonymity was guaranteed to all those who shared their perspectives with us. While we did not have the opportunity to extensively observe lectures or lab sessions, we participated in a number of lengthy lab visits and briefly observed a lecture on a core subject as well as a student presentation of a lesson on inductive classroom teaching. All above were highly informative and the EEC appreciated the availability, enthusiasm and openness of staff and students throughout the discussions and visits of the laboratories.

The EEC was not offered the opportunity to closely observe functions relevant to the pedagogical orientation of the Department.

More generally the EEC felt that there is good rapport between staff and students and considered this to be strength of the Department's culture.

APPROACH

Overall the Department's pedagogic policy with regard to teaching aims at **coverage of extensive content** (see Curriculum section). Not having had the opportunity to observe instances of actual laboratory or classroom teaching we are unable to determine the teaching approach related to student participation and active learning engagement.

Meeting the particular learning needs of the Department's cohort of students, while covering the substantial content of the curriculum is a challenging balance. However, in some courses there is discrepancy between student background knowledge and course content – for example, in mathematics and physics.

Teaching approaches used in the Department are suitably varied. The bulk of teaching is conducted in lectures and in lab sessions taught to groups of students whose numbers exceed the ideal instructor to student ratio. Lecturers tend to use visual means – largely PowerPoint presentations, video footage, real-life materials and computer-generated simulations. Labs are sufficiently equipped for student experimental work and practice. However staff expressed concern for the lack of adequate technical staff for maintenance, service and safety of the equipment (see also Research and Services sections).

IMPLEMENTATION

Student level can be low in terms of background in some disciplines for example, in mathematics and physics. Teaching takes place primarily in classrooms and labs with limited access to remedial processes such as recitations, peer tutoring, and homework support services.

Attendance is compulsory for lab sessions but not for lectures. A fundamental misunderstanding seems to lie at the heart of the students' perception: students are led to believe (e.g. by legislation that allows non attendance) that course completion is possible without lecture attendance. However, according to staff, the students who succeed in exams tend to be those who attend.

In terms of their studying practices, students partially rely on **E-Class** mostly in order to access course materials and information. In some courses, tests and more interactive ways to engage students in learning are employed but these are still in relatively rudimentary stages of development. Most material and information is still distributed in paper, a practice that, in

terms of efficiency, as well as environmental awareness, perhaps needs to be restrained.

As reported by students, all faculty (ΕΠ) members have set office hours, and students tend to make use of this opportunity while **Email** is also used as a means of communicating with teaching staff. Communication with part time lecturers is not always feasible as they do not have permanent offices in the Department.

Students make good **use of the library** and its electronic resources. The Department's electronic access to journals is relatively recent (about a year old) and lecturers and students referred to it as an increasingly crucial part of student learning. Several hundreds of books are steadily on loan from the library and their availability can now be checked via the electronic library catalogue.

The EEC appreciated the opportunities that students have to participate in **exchange programs** (e.g. Erasmus) and encourages the Department to maintain and strengthen activity in this direction.

RESULTS

The Department collects **course evaluation forms from students**. The EEC is convinced that it is essential to conduct these evaluations at the completion of each and every course. The evaluation form is detailed and addresses most key issues of the student learning experience. In our discussion with the students it was revealed that many students do not believe that their participation in the course evaluation exercise will result in substantial addressing of their concerns. We felt, strongly, that the Department needs to engage with changing the students' attitudes and demonstrate how the students' concerns expressed in the course evaluation forms are acted upon.

The EEC also felt that the **policy on student appeals** relating to exam paper grading is neither clear nor sufficiently known to students. We therefore strongly recommend that the Department works towards a clearer and more explicit policy on this matter including the formation of an independent grade student appeal committee.

See also ***IMPLEMENTATION*** above for comments on student performance, particularly with regard to some of the more challenging courses.

IMPROVEMENT

As evident in part in the Internal Evaluation Report and in the discussion with staff, there is adequate awareness of most of the issues raised here. In the light of the above the EEC wishes to propose that:

- Student learning needs, particularly in challenging courses such as mathematics and physics, are addressed more explicitly and systematically. Ways forward may include:
    - bridging/transitional courses
    - embedding of the more complex parts of these courses into applications and contexts with which students are familiar
    - streamlining of course content so that more time can be allocated to its more complex parts
    - in service training that equips lecturers with the skills required for aforementioned addressing of student learning needs
    - given the Department's unique expertise in pedagogical and technological education, research in this field (at university level) would be a niche area of

research expertise and would assist with a systematic tackling of all above.

- The Department needs to work actively and systematically towards encouraging students to attend lectures and to realise that lecture attendance is highly likely to improve the quality and timeliness of their studies' completion.
- The Department needs to engage with changing student attitudes with regard to course evaluation, primarily with demonstrating effective addressing of student concerns expressed in the course evaluation forms; also with making evaluation forms available electronically and reaching the entire cohort of students.

C. Research

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

APPROACH

The following review relates to current situation in the Department. Research should be encouraged and pursued in the area of pedagogical and technological education. Currently research is undertaken in the areas of scientific interest of the individual members of the staff such as *heat transfer and thermodynamics, fluid mechanics, manufacturing and metrology*. Even though this research is of *very good quality* in some areas, it is not clear that it addresses the primary objectives of pedagogical and technological education.

The Department has six laboratories and eight permanent members in the academic staff. Given the current resources, it would be advisable to consolidate the labs in two areas Thermofluids and Manufacturing which can incorporate all current labs and staff.

There is no clear research policy and objectives. For example, staff is pursuing research in areas of their special field not necessarily integrated with engineering education. However, there is an effective effort to maintain the labs in good order and the desire to attract post graduate students and some external funding. There are no clear standards to motivate research (for example how many papers per year or what level of quality) and what type of research: namely specific research related to the technological interest of the staff or research related to the field of pedagogical and technological education.

IMPLEMENTATION

There is great individual enthusiasm in the Department to do research but not clear institutional advice and support on how to achieve these objectives. Nevertheless, there is good commendable research output as an outcome of individual efforts as well as limited success in attracting MSc and PhD students and obtaining sporadic support from externally funded programs. However, research implementation is limited owing to the heavy teaching load and to the pending need of updating the labs with new equipment and the lack of a legal framework (and Policy and Procedures) for ASPETE and the Department.

RESULTS

It should be noted again that research output is of good quality but mainly related to the individual interests of the permanent staff but not clearly and completely integrated with educational engineering. Some of the research work is done in collaboration with Universities instead of carrying out the work at the Department.

IMPROVEMENTS

The critical areas that need changes to improve research are:

1. The infrastructure (buildings and labs) need updating
2. The teaching load has to be reduced
3. But more importantly the Department has to focus research on pedagogical and technological education in all Mechanical Engineering areas (where the uniqueness

lies) .

4. Promotion should be based on research and papers in Technology Education and not exclusively on research in Mechanical Engineering areas.
5. Training and research labs should be consolidated in two laboratories: Thermofluids and Manufacturing.
6. Subsequently, a post graduate degree should be developed. The postgraduate program may consist of a Masters degree in pedagogical and technological education.

D. All Other Services

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

Support services

There are two secretaries responsible for processing records for hundreds of students.

Some processes are electronic - student files - but there is room for improvement as in signing up for courses electronically. Grade submissions and progress reports should also be processed electronically.

Grant management

A brief visit with staff indicated that a budget surplus exists from research overhead and program management funds while any decisions of spending are made by the central administration. Staff can request internal funding support for purchasing of lab equipment or other related items from the central administration. The decision making process does not seem to be clear to staff.

Safety

Instances of safety issues were reported to the EEC by lab instructors attributed to the large number of students in each section resulting in very low instructor to student ratio ~1/25. A number of staff reported on the urgent need for lab support staff hiring to secure safer working and learning conditions.

Library

The ASPETE library is small but seems to be running well. The holdings are available in an electronic catalogue; there is access to journals and free internet. A trained librarian shared encouraging facts with the EEC regarding the number of students using the resources, checking out books, responding respectfully to the rules and regulations set by the library staff.

Student placement and employment support services

The EEC met with staff from the Enterprise and Employability Service (ΔΑΣΤΑ). This type of service is important in the professional preparation of graduates as it facilitates access to the

work environment and offers students opportunities to experience real life work conditions in industry.

Space and buildings

ASPETE is located on a beautiful lot with great views of the Olympic Stadium facilities and beautiful vistas of Athens. The facilities are accessible through two train lines - one stop within the premises - as well as a bus line.

The grounds are beautiful with buildings spread along spacious paths and cobble stone walkways. However, the current state is one of disrepair as evidenced in overgrown hedges, bushes and flowers.

Most buildings date back to the 1950's – original construction - or 1970's. Buildings are unevenly heated, inadequately ventilated and, based on our observations, either overcrowded or underused. Very little, if any, maintenance appears to take place and the EEC was told that there is practically no budget for repairs or maintenance.

Classroom space seems adequate for the number of attending students. Classrooms are equipped with instructional IT. In some cases lab space is limited with courses being 'hosted" in other units' lab space.

Some old equipment has been upgraded to digital facilitating continual use for instructional purposes. Under these conditions, with labs appearing to be in use 100% of the time, it is not clear how maintenance and upgrades are handled.

Safety and security are of concern as evidenced in the graffiti-covered walls, piles of trash and reports of vandalism. There is one security person per shift and staff report challenges in staying late in their offices and otherwise moving freely on campus afterhours.

Cafeteria

The ASPETE Cafeteria operates under the aegis of the National Youth Foundation. Three meals are available to all students on a daily basis. The quality of the food is good, seems to be nutritionally balanced and includes fresh seasonal salads and fruits. The dining room and cooking facilities are spacious but otherwise basic.

Student housing

The quality of student accommodation is adequate.

Overall, the EEC strongly recommends that significant steps are taken to address the issues of maintenance, safety and hygiene of the premises. Furthermore, upgrading of processes related to student life, administration and learning should be implemented.

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.

In general, the EEC believes that the strategic goals of the Internal Evaluation Report are applicable to the technological aspect of the Department and recommends that they could be augmented to integrate the educational goals of the Department.

The following issues are identified as fundamental to the Department's strategic planning:

- The EEC identified as a major inhibiting factor the low levels of synergy between the pedagogical and technological culture within the Department.
- At the Department level, every effort should be made to bridge the pedagogical and technological cultures in both teaching and research. This will result in the creation of a niche linking pedagogical and technological education, a unique academic area in Greece.
- Budget allocation managed centrally by ASPETE discourages long term planning affecting the quality of the work environment in the Department.
- The EEC feels that creating a *Policy and Procedures Manual* at the Institutional (ASPETE) level will **streamline** a number of issues such as obligatory attendance, curriculum updates, examinations, course assessment and grades appeals, all significant for the long term strategic planning of the Department.
- The ratio of permanent staff to students presents a major challenge for all operations within the Department. In view of the recent economic environment, fewer and fewer auxiliary staff resources will be available resulting in significant erosion of the time that permanent staff can allocate for research, future planning, administration work, extra curriculum activities.

Recommendation

The EEC feels that a unique professional identity of Technology and Engineering Educators can be cultivated, enriched and strongly supported through fusion of pedagogical and technological disciplines of the Department. The current dual degree character of the Department detracts rather than enhances the professional identity of the graduates.

Historically the pedagogical direction was strong, offering satisfactory job security and almost immediate job absorption, while in the last decade the balance tipped and the technological direction offered additional opportunities for employment. However the EEC feels that the emerging social and economic conditions do not fully support the dual degree character, given that a large number of graduates from other Technological Departments (approximately 14 TEI) with equivalent degrees compete for the same positions.

Therefore, a unique opportunity exists in exploiting the educational niche of developing Technology and Engineering Educators ready to adapt and excel in the emerging global and wide ranging educational market from school to industry.

F. Final Conclusions and recommendations of the EEC

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

Overall, it is the EEC's view that the Department functions adequately in spite of several existing resource constraints and limitations. The Chair of the Department, as well as the majority of faculty and staff, is admirable for their commitment and dedication. Specific recommendations to rectify drawbacks have been made in this report. The EEC's major recommendations follow.

GENERAL RECOMMENDATIONS

The EEC strongly recommends that:

- The Institution (ASPETE) creates a *Policy and Procedures Manual* to enhance transparency, communication and efficacy.
- Every effort is made to effectively integrate the pedagogical and technological cultures in both teaching and research.
- The Department tackles the challenges of hiring and maintaining high quality professional staff through infrastructural updates and professional development opportunities at all levels.

SPECIFIC RECOMMENDATIONS

The EEC strongly recommends that the Department:

1. improves and streamlines the curriculum by integrating pedagogical aspects in several technological courses and including state of the art technological knowledge with adequate coverage of technology fundamentals
2. adopts a dynamic approach to curriculum revision with a frequent and systematic examination of course offerings
3. introduces more visits in technical workplaces and industrial sites and more guest lectures by experienced practicing engineers and expert technology educators
4. tackles the essential problem of the number of staff on short term contracts delivering the bulk of the curriculum
5. supports in service training that equips lecturers with skills required and creates bridging/transitional courses to effectively address student learning needs
6. works actively and systematically towards encouraging students to attend lectures as an essential element of student success
7. engages in changing student attitudes with regard to course and instructor evaluation
8. maintains buildings, updates lab infrastructure and addresses issues of safety and security
9. reduces the teaching load

10. develops a post graduate program consisting of a Masters degree in Technology/Engineering Education
11. consolidates training and research labs in two laboratories: Thermofluids and Manufacturing where all current labs and staff can be incorporated

In addition the EEC recommends:

1. further research collaborations between the technologists /engineers and pedagogues through joint proposals, joint supervision of students, faculty and student exchanges
2. the university administration streamlines the procurement process to facilitate the Department research activities

EEC ENCOMPASSING POSITION REGARDING PROGRAM STRUCTURE

The EEC examined the current structure of the program and makes the following recommendations:

- Critically examine the current structure of the two degrees and improve it according to above recommendations in order to **integrate** its technological and pedagogical aspects.
- Alternatively, design a new program which offers a unique degree in Technology/Engineering Education whose graduates can find employment in educational settings ranging from classroom to industry (see also Section E)

In either case develop a post-graduate program and encourage staff research activity in the field of Technology Education.

The Members of the Committee

Name and Surname Signature

1. Michael Delichatsios _____
2. Demetra Evangelou_____
3. Lucas Amiras_____
4. Ioannis Papadakis _____