



## EXTERNAL EVALUATION REPORT

DEPARTMENT of Mineral Resources Engineering  
TECHNICAL UNIVERSITY of Crete

September 2011

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### **External Evaluation Committee**

The Committee responsible for the External Evaluation of the **Department of Mineral Resources Engineering** of the **Technical University of Crete, Chania, Greece** consisted of the following four (4) expert evaluators drawn from the Registry constituted by the HQAA in accordance with Law 3374/2005 :

1. Assoc. Prof. Dr. Theodoros Ntaflos (President)  
(Title) (Name and Surname)

Dept. of Lithospheric Sciences, University of Vienna, Austria.  
(Institution of origin)

2. Prof. Dr. Stavros Argyropoulos  
(Title) (Name and Surname)

Dept. of Materials Science and Engineering University of Toronto, Canada.  
(Institution of origin)

3. Prof. Dr. Georges Kipouros  
(Title) (Name and Surname)

Materials Engineering, Dept. of Process Engineering and Applied Science, Dalhousie University, Halifax, Nova Scotia, Canada.  
(Institution of origin)

4. Prof. Dr. Anastassios Kotsakis  
(Title) (Name and Surname)

Dept. of Geological Sciences, University of Roma Tre, Italy.  
(Institution of origin)

**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 committee consisting of

1. Assoc. Prof. Dr. Th. Ntaflos (University of Vienna, Austria)
2. Prof. Dr. S. Argyropoulos (University of Toronto, Canada)
3. Prof. Dr. G. Kipouros (Dalhousie University, Halifax, Canada)
4. Prof. Dr. A. Kotsakis (University of Roma Tre, Italy)

visited the Department from Monday September 19 to Wednesday September 21, 2011. The committee met on Monday 19<sup>th</sup> the vice Rector of the Technical University, Crete and members of the Department.

We were not able to visit the Department Buildings and laboratories due to the strike and occupation of the Campus by the students. Therefore the presentations of the Department took place in another Building (Technical Chamber of Engineering, W. Crete) outside of the University's Campus.

The committee attended on Tuesday 20<sup>th</sup> the formal presentation of the teaching and research activities of the Department by the Faculty members of the institution. On Wednesday the individual interviews of the staff members, the graduate students and, unfortunately only two, undergraduate students in final stage of their study, were conducted. The committee found the interaction with students very useful.

Despite the fact of strike/occupation the committee considers that all these formal and informal contacts allowed it to form a global view of the status of the Department, the morale of its staff and students, and to gain an understanding of their problems, their strengths and their weaknesses, as well as their aspirations.

During the visit, the Department made available to the committee the requested information and documents (printed and electronic versions).

Due to the strike and inaccessibility of the archives it was not possible to review and evaluate examples of final examination tests. In addition, the committee was not able to visit the infrastructure and the teaching classrooms of the Department.

### **II. The Internal Evaluation Procedure**

The Internal Evaluation Report, initially circulated to the members of the committee, was focused and appropriate. However, this report was dated and additional documents were given to the committee only during the evaluation time.

See Appendix I

## A. Curriculum

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

### APPROACH

- What are the goals and objectives of the Curriculum? What is the plan for achieving them?

The main goals of the curriculum are to educate and develop modern engineers, and to conduct the research in the sector of prospecting exploring and exploiting mineral resources and mining and mineral technologies.

There are 3 major directions:

- a) [Division of Exploration and Positioning](#)
- b) [Division of Mining Technology](#)
- c) [Division of Minerals Exploitation](#)

The curriculum consists of compulsory courses (Division A=55, B=54, C=56) and elective courses (Division A=5, B=6, C=4). The latter are selected from a list of 34 courses.

The choice of courses and lab practice, according to the university calendar, are comparable with those of foreign corresponding Departments. A successful graduation requires the submission and presentation of an undergraduate thesis as a final stage of the study.

- How were the objectives decided? Which factors were taken into account? Were they set against appropriate standards? Did the unit consult other stakeholders?

The Department was created to fill the demand of Greek high-school graduates to pursue the requirements and demands of the Greek Economy and technology concerning the mineral resources of the country.

The objectives of the curriculum were decided taking into account local requirements for registration into engineering profession. To the extent possible they follow the international standards of similar Departments worldwide. It seems, according to the description that the General Department of Crete and the Department of Environmental Engineering were consulted.

- Is the curriculum consistent with the objectives of the Curriculum and the requirements of the society?

The curriculum is consistent with the set objectives and the requirements of the society at large. However, the immediate environment (the region of Crete) offers limited job opportunities to the graduates.

- How was the curriculum decided? Were all constituents of the Department, including students and other stakeholders, consulted?

Since the establishment of the department the curriculum has been modified, adapted and tailored to the current state with the financial support of two special programs of the Hellenic Ministry of Education. External advisors were involved for the revision of the curriculum. According to the available documents to the committee it is not clear whether the students participate to

<p>the design of the curriculum.</p>
<p><b>IMPLEMENTATION</b></p> <ul style="list-style-type: none"> <li>• How effectively is the Department's goal implemented by the curriculum?</li> </ul> <p>The combination of teaching, tutorials, laboratories and, where applicable, field work approach, covers the current goals.</p> <ul style="list-style-type: none"> <li>• How does the curriculum compare with appropriate, universally accepted standards for the specific area of study?</li> </ul> <p>The curriculum is comparable to the universally accepted standards.</p> <ul style="list-style-type: none"> <li>• Is the structure of the curriculum rational and clearly articulated?</li> </ul> <p>The structure of the curriculum is rational and clearly articulated in the Department's Course Guide as it is presented in its web site.</p> <ul style="list-style-type: none"> <li>• Is the curriculum coherent and functional?</li> </ul> <p>In general, the curriculum is coherent. However, it imposes a rather heavy load on the students. Inadequate preparation in Chemistry makes the Curriculum dysfunctional. Also the possibility for the students to take courses without prerequisites jeopardizes the coherence of the curriculum.</p> <ul style="list-style-type: none"> <li>• Is the material for each course appropriate and the time offered sufficient?</li> </ul> <p>The material for each course is appropriate. However, apparently there is overlapping in several courses beyond healthy repetition.</p> <ul style="list-style-type: none"> <li>• Does the Department have the necessary resources and appropriately qualified and trained staff to implement the curriculum?</li> </ul> <p>From the qualitative point of view the existing faculty staff fulfills their teaching obligations. From the quantitative point of view additional qualified teaching personnel is spread in the categories of technical and administration units and as a result their role is not clearly defined.</p>
<p><b>RESULTS</b></p> <ul style="list-style-type: none"> <li>• How well is the implementation achieving the Department's predefined goals and objectives?</li> </ul> <p>In general, the goals could be considered as achieved. However, to do so a very large number (34) of elective courses are used that make the curriculum overloaded and difficult for the students to follow. Furthermore, the ratio of mandatory to elective courses is too low and should be increased. In</p>

addition, several courses are suffering from repetition and they can be combined so that the implementation will be more effective.

- If not, why is it so? How is this problem dealt with?

The problem might be solved if the curriculum in terms of elective courses became more focused and the number of these courses decreases.

In detail:

1. The common number of semesters should be increased from 6 to 8.
  2. Reduce the number of elective courses.
  3. Courses of similar topics need to be combined and their number reduced accordingly (e.g. the two courses of ore minerals I and II and the two courses of mineral processing I and II).
  4. The course Geology of Greece needs to be compulsory and not elective.
  5. The design component must be increased. A course related to the design of a particular material or process must be mandatory for all the three directions of the department (this could be model after the existing course “Design of the mineral processing plant”)
  6. The courses in chemistry need to be increased and adapted to the necessities of the Department since chemistry is the prerequisite for many courses. Considering the deficiently education in chemistry of the beginner students it is important to increase the quality and quantity of the chemistry courses.
- Does the Department understand why and how it achieved or failed to achieve these results?

The Department according to the provided internal evaluation considers the curriculum as successful. According to the discussion with Faculty members the committee understands that changes are necessary and the Faculty members agree with it.

## IMPROVEMENT

- Does the Department know how the Curriculum should be improved?

The Department is open to any suggestion that will improve the quality and the effectiveness of the curriculum. The Faculty members agree that the suggestions offering in this report should be implemented at the undergraduate and graduate levels.

- Which improvements does the Department plan to introduce?

The department is ready to improve and adapt the curriculum as response to the new challenges and opportunities due to the possibility of discovering new energy resources in the area i.e. natural gas and oil.

## B. Teaching

### APPROACH:

Does the Department have a defined pedagogic policy with regard to teaching approach and methodology?

The Department should seek ways and methods to increase the participation of the students to the courses. The committee suggests as a possible way to modify the marking scheme, which will require participation in quizzes, midterms, projects, presentations and reports in addition to the final examination.

### Please comment on :

- Teaching methods used

The teaching methods used are up to date. The power point presentation is the common method of teaching. The majority of the presentations and other material related to the teaching are available online for the students through the *e-class* system.

- Teaching staff/ student ratio

A difficult question, not easy to answer. If only the full time Faculty members will be considered, the ratio of the undergraduate Students/ faculty members is 14.6.

For the laboratories and field work the ratio is different.

For that ratio the auxiliary scientific personnel (persons who are holding MSc and PhD titles) is used and the ratio is 12.2 which is termed students per TA (teaching assistants). These numbers are calculated according to the official available information provided by the Ministry of Education (see appendix I). The majority of the auxiliary scientific personnel officially belong to the administration unit but it is entirely responsible for guiding the students during their laboratory and field work.

- Teacher/student collaboration

Due to the strike/occupation we are not able to have meetings with the undergraduate population. The auxiliary personnel has excellent relations with the undergraduate students.

- Adequacy of means and resources

The resources according to the presentations for the teaching and research of the graduate students appear to be adequate. For the undergraduate students we did not visit the infra-structures and therefore we cannot judge.

- Use of information technologies

The majority of the presentations and other material related to the teaching are available on line for the students. Students and teachers communicate with e-mail. The Department web site is an additional tool serving the teaching facilities. Specific software are available as well.

- Examination system

The examination system is the written tests. However, some faculty members are using oral examinations. The weight of the final examinations should be reduced and more midterms need to be introduced. The counter argument presented to the Committee for the opposition to midterms in the marked scheme was the interruption caused in the lecturing of the semester. One solution suggested by the Committee was the organization of the midterms in one specific week for all the courses. The introduction of quizzes and midterms will make the students aware of their knowledge or lack of as the semester proceeds.

#### IMPLEMENTATION

Please comment on:

***The Committee was not able to examine the teaching materials and resources due to the strike/occupation. All comments are based on information provided by the Faculty and auxiliary staff.***

- Quality of teaching procedures

The students have access to the e-class system, which is also used as a communication medium.

- Quality and adequacy of teaching materials and resources.

The Committee cannot provide any comments on it (strike/occupation)

- Quality of course material. Is it brought up to date?

The Committee cannot provide any comments on it (strike/occupation)

- Linking of research with teaching

According to the presentations there is a link (Undergraduate Thesis)

- Mobility of academic staff and students

The Department participates in two Mobility programs, the Erasmus and the Erasmus Mundus, which can be used by the Department students. However

according to the provided documents students are not using extensively the Erasmus programs. Also the academic staff does not use as much as it should be the mobility programs.

- Evaluation by the students of (a) the teaching and (b) the course content and study material/resources

The evaluation of the teaching professor by the students for each course taught must be implemented.

## RESULTS

***The committee was not able to examine the teaching materials and resources due to the strike/occupation.***

Please comment on:

- Efficacy of teaching.

No data to base comments.

- Discrepancies in the success/failure percentage between courses and how they are justified.

No data to base comments.

- Differences between students in (a) the time to graduation, and (b) final degree grades.

The time of graduation ranges from 6.5 to 7 years, which is 1.5 to 2 years above the normal time for graduation. According to the provided statistics only 50% of the students are finishing their study and this with low average grades (6.98-6.99)

- Whether the Department understands the reasons of such positive or negative results?

The Department believes that the high percentage of drop out is the result of disinteresting the field of study and the fact that the students do not attend the classes.

## IMPROVEMENT

- Does the Department propose methods and ways for improvement?

The Department hopes that the new law on education will solve the accumulated problems in the teaching issues.

What initiatives does it take in this direction?

It is a “wait and see” attitude regarding the implementation of the new law on education. We should put here the improvements we suggested above.

## C. Research

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

### APPROACH

- What is the Department's policy and main objective in research?

The Department is active in acquiring research programs either national or international. Faculty members are successful.

- Has the Department set internal standards for assessing research?

The Department needs to set internal standards.

### IMPLEMENTATION

- How does the Department promote and support research?

It was not clear to the Committee how the Department promotes and supports research.

- Quality and adequacy of research infrastructure and support.

From the presentations it appears that the quality of research infrastructure in each unit is high and the support is adequate.

- Scientific publications

According to the provide CVs of the Faculty staff the quantity and the quality of the scientific publications is quite satisfactory.

- Research projects.

Research projects and funding are very good and comparable to the European standards. The utilization of the undergraduate students in conducting research is well demonstrated.

- Research collaborations.

The Faculty members have excellent contacts and collaboration with many research institutions worldwide. The internal synergy needs to be improved. The major research equipment need to be centralized in order to provide service for all units and Departments.

### RESULTS

- How successfully were the Department's research objectives implemented?

Quite satisfactorily.

- Scientific publications.

The Department exhibits high quality publications in widely recognized international journals and conferences, with a high number of citations. Several of the academic staff consistently publish at the top conferences of their respective fields.

- Research projects.

The Department has benefited in the past from infrastructure projects and had a combined research funding from the Greek Ministry of Education, the General Secretariat of Research and Technology, and the European Commission of around 1200k euros per year, for the period 2005-2010. There are additional small local research programs in the order of 10-50k euros that bring the Department closer to the local society.

- Research collaborations.

From the provided publications it is obvious that there is a very strong collaboration among the members of the Department.

- Efficacy of research work. Applied results. Patents etc.

The efficacy of research work announced to the Committee in an anecdotal way and it appears that many of the results are applied by the supporting organizations. In the last years one patent (Number 1005997) has been registered.

- Is the Department's research acknowledged and visible outside the Department? Rewards and awards.

Undergraduate students hold the first prize in the European level competition and the third prize in a worldwide competition. An award from the Academy is reported and the Department is visible in the international community.

#### **IMPROVEMENT**

- Improvements in research proposed by the Department, if necessary.

For major equipment it is important to form a service unit that will serve the whole Department.

- Initiatives in this direction undertaken by the Department.

All the faculty members recognize the necessity of centralizing the major equipment of the Department.

## **D. All Other Services**

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

### APPROACH

- How does the Department view the various services provided to the members of the academic community (teaching staff, students)

According to the provided documents and from the presentations the Department considers the services to be adequate.

- Does the Department have a policy to simplify administrative procedures? Are most procedures processed electronically?

According to the provided documents and from the presentations the administrative procedures are both electronically and in classic way.

- Does the Department have a policy to increase student presence on Campus?

The Department identify the absence of students on campus as a major problem and is seeking policies to remedy the problem.

### IMPLEMENTATION

- Organization and infrastructure of the Department's administration (e.g. secretariat of the Department).

The Committee, due to strike/occupation was not able to see and evaluate the infrastructure of the Department.

- Form and function of academic services and infrastructure for students (e.g. library, PCs and free internet access, student counseling, athletic- cultural activity etc.).

The Committee, due to strike/occupation was not able to see and evaluate the infrastructure of the Department.

### RESULTS

- Are administrative and other services adequate and functional?

According to the provided documents and from the presentations the Department considers the services to be adequate.

- How does the Department view the particular results.

The Department considers the services to the students as very good.

#### IMPROVEMENTS

- Has the Department identified ways and methods to improve the services provided?

According to the provided documents and from the presentations the Department considers the services to be adequate.

#### **Collaboration with social, cultural and production organizations**

Please, comment on quality, originality and significance of the Department's initiatives.

According to the additional documents provided to the Committee during the evaluation time only, the collaboration with social, cultural and production organizations is active and continuous. (see appendix II)

#### ***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.*

Please, comment on the Department's:

Potential inhibiting factors at State, Institutional and Departmental level, and proposals on ways to overcome them.

The Department has to overcome a large number of inhibiting factors that are common in many other Departments of the country. At the state level, this includes bureaucracy, insufficient funding, unclear chartered-status of the alumni, funding of the Ph.D. students, lack of specific actions to help young research Faculty members, delays in appointing elected faculty, long delays for receiving the funding from some programs , and very long procedures for submitting (and resubmitting) research proposals. The non-continuity of financial support of the graduate students from the available research programs makes their economic situation difficult and affects their research activities. The students have problems finding accommodation at reasonable prices. The location of the Department as a peripheral institution inhibits the attraction of potential good students from other regions of the country. From the provided documents and from the presentations was not evident that the Department has a yearly budget.

The Department is waiting for the implementation of the new law to adapt/modify the short term goals while in a medium and long term goals the perspectives of discovering and prospecting solid and non-solid energy sources has high priority.

There are trials to intensify the collaboration with the Department of

Environmental Engineering.

The Department requests from the Government to reduce drastically the number of the yearly inscribed students in the department.

## **F. Final Conclusions and recommendations of the EEC**

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

Conclusions and recommendations of the EEC on:

- the development of the Department to this date and its present situation, including explicit comments on good practices and weaknesses identified through the External Evaluation process and recommendations for improvement
- the Department's readiness and capability to change/improve
- the Department's quality assurance.

During the planned visiting period of the EEC in Crete the Campus of the Technical University was occupied by the students who blocked the entrance to any building.

Therefore the Committee was not able to visit Buildings in order to evaluate the infrastructure to discuss with students in the classes during lessons in the campus and to evaluate the examination system.

In general, the overall performance of the Department of Mineral Resources Engineering is good to very good. In particular, the human resources, the acquiring of research programs in national and international levels, the implementation of them and the research activities are in excellent state.

Weaknesses have been identified in the curriculum. It is characterized by large number of elective courses, by courses that should be compulsory and currently are elective, to some degree by different courses with similar contents and exhausting repetitions and the premature division of the curriculum in different directions.

In the teaching level the high degree of dropout, is a big disadvantage, which, unfortunately characterize the majority of the high level educational institutions in the country.

### Recommendations of the EEC

#### **Recommendations for Curriculum**

*To the department (undergraduate level)*

1. The common number of semesters should be increased from 6 to 8.
2. Reduce the number of elective courses.
3. Courses of similar topics need to be combined and their number reduced accordingly (e.g. the two courses of ore minerals I and II and the two courses of mineral processing I and II).
4. The course Geology of Greece needs to be compulsory and not elective.

5. The design component must be increased. A course related to the design of a particular material or process must be mandatory for all the three directions of the department (this could be model after the existing course “Design of the mineral processing plant”)
6. The courses in chemistry need to be increased and adapted to the necessities of the department since chemistry is the prerequisite for many courses. Considering the deficiently education in chemistry of the beginner students it is important to increase the quality and quantity of the chemistry courses.

***To the Technical University***

The curriculum for common courses among different Departments should be adapted and coordinated according to the necessities of each Department

***To the Government***

The Department should be able to change and adapt the contents of a course accordingly without approvals by the government.

**Recommendations for teaching** (only few due to strike/occupation)

***To the Department***

1. The evaluation of the teaching professor by the students for each course taught must be implemented.
2. Courses need to have clearly defined prerequisites to be fulfilled by the students in order to have legitimation to attend them.

***To the Technical University***

The university should have a transparent process to decide its budget and its allocations to the department budgets. Each department in return must decide in a transparent/consultative way how to allocate the funds to the faculty members.

***To the Government***

1. The university and the departments should define the number of students they will accept on the basis of the teaching capacity
2. The student transfer from university to university should be stopped. Students from other universities should be able to attend equivalent corresponding courses in other universities that will be fully recognized.

***To the Department (Graduate level)***

The graduate student should be given a commitment by the supervisor of a financial

support for a specific duration of the graduate studies.

The graduate curriculum should be re-drafted to contain a number of mandatory courses which will be offered every year and can be tailored according to the teaching faculty member. These courses should have a well-defined outline and a marking scheme approved by the program.

The program should take advantage of the possibilities open to it by the implementation of the new education law in terms of attracting funding for graduate students from sources other than the state granting institutions.

### **Recommendation for research**

From the presentations during the visit by the committee it appeared that students and faculty were informed for the first time of what each other are doing. To remedy this, the Committee recommends the introduction of a “research day” during which research students will present their work in the form of presentations and posters. Sponsors of the research and potential sponsors should also be invited to attend the “research day” activities.

### **Recommendation for others**

Since we were not able to visit the campus we cannot recommend anything

**The Members of the Committee**

Name and Surname	Signature
1.	_____
2.	_____
3.	_____
4.	_____
5.	_____