



ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ

HELLENIC REPUBLIC

**Α.ΔΙ.Π.**

**H.Q.A.A.**

ΑΡΧΗ ΔΙΑΣΦΑΛΙΣΗΣ ΠΟΙΟΤΗΤΑΣ

HELLENIC QUALITY ASSURANCE AGENCY

ΑΝΩΤΑΤΗΣ ΕΚΠΑΙΔΕΥΣΗΣ

FOR HIGHER EDUCATION

## **EXTERNAL EVALUATION REPORT**

DEPARTMENT **of Chemistry, University of Patras**

May, 2011

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### **External Evaluation Committee**

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

1. Professor D. Coucouvanis, Chair  
University of Michigan (USA)
2. Professor A. Efstathiou  
University of Cyprus (Cyprus)
3. Professor A. Filippou  
University of Bonn (Germany)
4. Professor E. Theodorakis  
University of California, San Diego (USA)
5. Dr. A. Stassinopoulos, Expert  
President of Association of the Greek Manufacturers of Packaging and  
Materials (Greece)

## **Introduction**

### I. The External Evaluation Procedure

- Dates of the site visit

The visit was carried out from the 4 pm of 9/5/2011 until 1:30 pm of 11/5/2011.

- Whom did the Committee meet?

#### **Day 1, Monday, May, 9, 2011:**

At the beginning of the evaluation process the External Evaluation Committee (EEC) members met with the rector, 3 vice rectors, the chairman of the department, and several colleagues of different divisions. During that time, the committee heard a general presentation of the research situation problems and future perspectives of the University of Patras (UoP). The Rector: Prof. G. Panagiotakis, Vice Rectors: Profs A. Roussou, D. Kalpaxis and Ch. Krontiras, the Dean of the Faculty of Natural Sciences: Prof. Ch. Kordulis, the Chairman of the Department: Prof. N. Karamanos and the members of the internal evaluation committees (OMEA and MODIP) outlined general aspects related to the University administration. Afterwards, the EEC moved to the Chemistry Department, where the Chairman Prof. N. Karamanos, presented research and teaching activities of the Department. Most Professors of the three divisions of the Chemistry Department participated in this meeting.

The committee met with the following personnel:

#### *i: Members of the administration of the University of Patras:*

*Rector of the University of Patras*

Prof. G. Panagiotakis

*Vice Rector of the University of Patras (Academic Affairs)*

Prof. A. Roussou

*Vice Rector of the University of Patras (Strategic Planning and Research Development)*

Prof. D. Kalpaxis

*Vice Rector of the University of Patras (Financial Planning and Development)*

Prof. Ch. Krontiras

*Chairman of the Chemistry Department*

Prof. N. Karamanos

#### *ii. Faculty Members of the Chemistry Department, University of Patras*

Prof. D. Papaioannou (Departmental undergraduate curriculum)

Prof. S. Perlepes (Departmental postgraduate curriculum)

Prof. A. Koutinas (Interstate postgraduate program in Food Biotechnology)

Prof. J. Matsoukas (Interdepartmental post graduate Program in Medicinal Chemistry)

Prof. Ch. Kordulis (Infrastructures and inter-departmental University networks)

Assist. Prof. A. Theocharis (International collaborations and students' mobility)

Assist. Prof. G. Bokias (industrial placement)

Assoc. Prof. A. Aletras (Section **A** Organic Chem, Biochemistry & Natural Products)

Prof. T. Zafiropoulos (Section **B** Physical Inorganic & Nuclear-Radiation Chemistry)

Prof. Ch. Kordulis, (Section C Applied, Analytical & Environmental Chemistry), replacing Prof S. Glavas

Assist. Prof. Ch. Papadopoulou (Hygiene and Safety at the Department of Chemistry)

**Day 2- Tuesday, May, 10, 2011**

On the second day, the External Evaluation Committee (EEC) members met with representative members of the Chemistry Department who gave an overview of the different research activities, visited the departmental facilities and also met with representatives of the postdoctoral, postgraduate, graduate and undergraduate students. On Day 2, the EEC members had the following meetings:

***Organic, Medicinal and Supramolecular Chemistry***

- Synthetic Organic Chemistry (Prof. D. Papaioannou, Assist. Prof. C. Athanasopoulos)
- Medicinal & Supramolecular Chemistry (Prof. J. Matsoukas, Assist. Profs T.Tselios, G. Tsivgoulis)
- Peptide Chemistry (Profs K. Barlos, C. Poulos, Assoc. Prof. D. Gatos)
- *Biochemistry, Biochemical Analysis & Matrix Pathobiology* (Profs N. Karamanos, D.Vynios, T. Tsegenidis, Assoc. Prof. A. Aletras, Assist. Profs A. Theocharis, A. Vlamis)

***-Inorganic, Bioinorganic and Organometallic Chemistry***

(Profs S. Perlepes, P. Ioannou, E. Manessi-Zoupa, N. Klouras, T. Zafiroopoulos)

***- Physical Chemistry***

- Physical Chemistry of Interfaces (Prof. G. Karaiskakis, Assist. Prof. A. Koliadima)
- Physical Aquatic & Coloidal Chemistry (Prof. E. Dalas)
- Quantum Chemistry (Prof. G. Maroulis)

***- Radiochemistry and Atmospheric Chemistry***

(Asist. Profs E. Papaefthimiou, M. Soupioni, V. Symeopoulos and Prof. S. Glavas)

***Catalysis and Interfacial Chemistry for Environmental Applications/Green Chemistry***

(Profs A. Lycourghiotis, Ch. Kordoulis, Assist. Profs H. Matralis, C. Papadopoulou, Lect. H. Karapanagioti)

***- Food Chemistry and Food Biotechnology***

(Profs A. Koutinas, M. Kanellaki, Assist. Prof. A. Bekatorou)

***- Polymer Science and Technology (Polymer Chemistry, Advanced Polymers & Stimuli Responsive Polymers)***

(Profs J. Mikroyannidis, J. Kallitsis, Assist. Prof. G. Bokias)

***- Analytical and Structural Chemistry***

- Analytical Chemistry (Prof. T. Christopoulos)
- X-Ray Crystallography (Assoc. Prof. V. Nastopoulos)

**Interview with post doctoral fellows**

**Interview with postgraduate and PhD students**

**Interview with undergraduate students**

**Visit of various research and educational facilities used by the Department**

### **Day 3- Wednesday May 11**

On Wednesday May 11, the EEC members met with members of the administrative staff, and visited various departmental facilities including the Departmental library, the Center of Instrumental Analysis and the athletic facilities. The on-site visit was completed with a meeting with the Department Chair and the Vice Rector of Academic Affairs. On Day 3, the EEC members had the following meetings:

#### **Interviews, meeting and visit of various facilities**

Interview with members of the administrative staff (Mrs. Z. Ntotsika, E. Mpouzamanaki, D. Kouna and Mr. F. Polychronopoulos)

#### **Interview with Departmental technicians**

Meetings and visits of departmental facilities: Departmental library (Mrs. A. Malliori), computer and multimedia labs (Prof. J. Maroulis and Mr. K. Makris)

Visit in Center of Instrumental Analysis (Prof. D. Papaioannou) and Electron Microscopy (Assist Prof. Ch. Papadopoulou)

Visit in athletic facilities and dormitories (Prof. D. Papaioannou)

Meeting with the Chair of the Department, the members of the internal evaluation committees and the Vice Rector of academic affairs and personnel

In the afternoon of Day 3 the EEC members returned to Athens.

### **Day 4 - Thursday May 12**

The EEC members worked on the final draft of the EER at facilities provided by the HQAA.

### **Day 5 - Friday May 13**

The EEC members continued working on the final draft and submission of the EER.

### **Day 6 - Saturday May 14**

The EEC members departed from Athens.

**Summary:** The Department of Chemistry managed to prepare a program that allowed meetings and discussions with all divisions of the department. In these meetings all members of the teaching staff were present. Furthermore we had the opportunity to speak to most laboratory instructors, to visit the teaching and research laboratories of all divisions, and also the core facility of instrumentation. We also discussed with representatives of the students (undergraduate, MSc and PhD students; a total of approx. 50 students). We also visited the departmental library, the departmental instrumentation

and the University athletic facilities.

## II. The Internal Evaluation Procedure

- *Appropriateness of sources and documentation used*

The documentation concerning the teaching and research activities of the Department in the period 2004 - 2009 as well as the Internal Evaluation Reports for the periods 2004-2009 and 2009-2010 were received by the EEC members prior and during the evaluation process. The documents also included detailed information on the structure of the Department, the building facilities and a short introduction of the structure of the University. Additional documents concerning several research aspects and activities (see above) were received during the visit.

- *Quality and completeness of evidence reviewed and provided*

The furnished internal report reflects the current situation (up to 2010). It clearly describes the structure, organisation, and facilities in the department.

- *To what extent have the objectives of the internal evaluation process been met by the Department?*

Overall the Internal Report met the objectives of the Evaluation Process.



## **A1. Undergraduate Curriculum**

### **Goals and objectives of the Under-Graduate Curriculum (UGC)**

The objective of the UGC is to provide students with basic and specific knowledge in both main and applied topics of chemistry. The Department generally has been successful in educating the undergraduate students who, after completion of their education, compare well with undergraduate students from very good chemistry departments in Europe and the United States. Their training and success in post-graduate education is the major criterion of success. The lack of a national or international testing, like the Graduate Record Examination (GRE), makes it difficult to quantify their excellence and compare them to undergraduate students from other institutions.

- *What is the plan for achieving excellence?*

The structure of the curriculum is similar to the one used successfully by internationally recognized, very good, chemistry departments in Europe. The attendance of lectures is, as usual in academic institutions, not mandatory. Despite this, the attendance of lectures by the students is satisfactory based on the statistics of the internal departmental evaluation. The undergraduate laboratory training is mandatory and successful. The material used in the classrooms and the laboratories is updated regularly and consequently the curriculum is kept current and successful.

- *How were the objectives decided? Which factors were taken into account?*

The best description of the undergraduate instruction is transparency and the methods used in the classroom concerning teaching and testing are decided by the instructors. A committee charged with the program of undergraduate studies evaluates the objectives and updates the curriculum in order to reflect the current state-of-the-art. The evaluation committee noted that the ratio of experimental to theoretical courses is appropriate. The majority of professors who teach the undergraduate courses have had experience, as research associates and also as visiting professors, in Universities outside Greece. Consequently, the operation of the undergraduate program reflects the faculty past experiences. The latter also are apparent in the European/American influence in the course study-guides. It should be mentioned that the Department actively participates in the European Chemistry Thematic Network (ECTN).

The good level of the undergraduate students who matriculate under this departmental curriculum is evidenced by the successful performance of a number of these students in post-graduate studies mainly in Europe but also in the United States.

The undergraduate students are encouraged to participate in technical training in industry.

This practice has been successful and should continue. We applaud the policy of the department to make mandatory the diploma thesis.

## IMPLEMENTATION

- *How effectively is the Department's goal implemented by the curriculum?*

The Department has successfully designed programs in both graduate and undergraduate education and curricula that emulate those of very good, internationally recognized, universities in Europe (European Credit Transfer System, ECTS). As such the training of graduate and undergraduate students produces chemists who adequately meet the needs of Greek and International academic institutions and chemical industry.

- *How does the curriculum compare with appropriate, universally accepted standards for the specific area of study?*

As stated previously, very well.

- *Is the structure of the curriculum rational and clearly articulated?*

Yes, as shown by the orderly operation of the classroom and laboratory instruction and availability of study guides, based on syllabi.

- *Is the curriculum coherent and functional?*

Yes, based on the above arguments.

- *Is the material for each course appropriate and the time offered sufficient?*

Yes.

- *Does the Department have the necessary resources and appropriately qualified and trained staff to implement the curriculum?*

The departmental facilities provide classrooms and laboratories of acceptable quality. The same is also true for the necessary instrumentation, library, and study halls. A group of very good instructors that supervise the laboratories, have been in the department for many years, enjoy their duties and are very effective. This is apparent in their popularity with the students and faculty. The committee is impressed by the strong effort of the laboratory staff who, often overqualified (with a Ph.D. degree) help teach the undergraduates and ensure the good and safe working practice in the laboratory.

**Recommendation 1:** The design of new experiments that use elementary spectroscopic instrumentation (such as magnetic resonance, mass spectrometry etc) should be encouraged and the necessary instruments should be purchased.

## RESULTS

- *How well is the implementation achieving the Department's predefined goals and objectives?*

The new curriculum is in the first few months of application making impossible any evaluation at present. The old curriculum is effective only for the last three years of studies and therefore is not evaluated in this report.

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

N/A

- *Does the Department understand why and how it achieved or failed to achieve these results?*

N/A

## IMPROVEMENT

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

The department has made several positive suggestions on the improvement of the curriculum in their internal evaluation report (pages 102-104). Based on this report and the site visit of the evaluation committee, the following recommendations are suggested:

**Recommendation 2:** There exists a current lack of fellowships for non-permanent teaching assistants who can support the instructive work of the professors during their laboratory courses. Funding and provision of these teaching fellowships by the State and/or the University is necessary and urgently recommended.

**Recommendation 3:** There exists a current lack of technical staff to maintain and run the instrumentation of the Department which is a basic requirement of the curriculum. The EEC committee recommends the increase of technical staff.

**Recommendation 4:** In the new program we strongly recommend the implementation of homework assignments and midterm examinations in addition to the final exams that should all contribute to the final grade.

**Recommendation 5:** The implementation of required prerequisite courses ("chain system" of instruction) is essential for the development of the curriculum.

**Recommendation 6:** The committee did not get a clear picture of the system running in Greece for the evaluation and distribution of the books recommended to undergraduate and graduate students. Early distribution of the approved books seems to be a problem and should be addressed.

## A2. Postgraduate Curriculum

### Goals and objectives of the General Post-Graduate Program (GPP).

The GPP consists of two directions that may be followed sequentially (A and B) or in the case of A be a final destination.

- A) Post graduate Diploma of specialty (Masters with thesis)
- B) Ph.D. Diploma

The current MSc curriculum offers 5 different departmental MSc degrees that represent specific specializations in the following topics (Study Guide, page 202): (a) Applied Biochemistry : clinical chemistry, biotechnology and evaluation of pharmaceutical products; (b) Advanced Polymeric and Nanostructured Materials; (c) Catalysis for Depollution and Production of Clean Energy; (d) Environmental Analysis; and (e) Analytical Chemistry and Nanotechnology. In addition, 2 interdepartmental MSc specializations have been approved by the Department and the University in the following directions: (a) Chemical Biology; (b) Green Chemistry and Clean Technologies. One interstate MSc program is run between three Universities (University of Patras, University of Ioannina and University of Ulster) in the area of Food Biotechnology , and one interdepartmental MSc program is run between the Department of Chemistry and Pharmacy in Medicinal Chemistry: Design and development of pharmaceutical products. Finally, one departmental

MSc program has recently been approved by the Department in the direction of Synthetic Chemistry.

Both diplomas are driven by research. The very good number of publications, in high-impact international journals, attests to this drive (see section C). The MSc (with thesis) diploma without continuation to a Ph.D. diploma at times satisfy most needs of the Greek industry which in many cases does not need the sophistication of the Ph.D. degree. The latter is more appropriate for preparation of supervisory and managerial industrial positions, academic positions or post-Ph.D. research positions. The success of both programs is evidenced by their effective continuation for many years. We particularly encourage the interdepartmental MSc programs.

The programs of the MSc degrees reflect the specific research interests of the professors in the diverse areas of chemistry. These programs cover topics in chemistry, which are important for the society, but are too specific. This partitioning of the MSc program into rather narrow specialties risks to create scientists with narrow specializations who may not be flexible enough and consequently not easily employed. Flexibility is necessary to address the diverse needs of the Greek industry and enterprises and also the requirements for admission by Universities outside Greece.

The department has also developed a number of inter-departmental MSc programs, where the one related to Medicinal Chemistry (since 1998) received the award of “Euromaster” by the European Chemistry Thematic Network (ECTN). We particularly encourage the inter-departmental MS programs.

**Recommendation 7:** We recommend a broader knowledge-based training at the MSc level that will satisfy both the needs of the local enterprises and the departmental requirements toward a Ph.D. degree.

**Recommendation 8:** Instrumentation and staff are needed for the training and laboratory exercises related to modern molecular spectroscopy.

## **B. Teaching**

The overarching principle in the teaching philosophy of the department is to provide basic knowledge of chemistry through core courses in the first three years to be followed with elective courses in the fourth year, and graduate courses in the MSc program.

- *Teaching methods used, course updates, student participation, grades, and average duration for the undergraduate degree*

Teaching methods employ the traditional classroom lectures based on white board and projection facilities. The content of the courses was updated through a recent critical assessment of the teaching program with full faculty participation. Faculty members of the Chemistry Department have translated popular modern textbooks in several core areas, and some of these textbooks are widely used throughout all academic institutions in Greece. Certain course lectures, notes, homework assignments and solutions are also made available through the use of Web

resources and multimedia. The combination of these methods reflects the very good quality and teaching expertise of the instructors.

The teaching staff members for course work and laboratory work are available to the students not only through regularly scheduled office hours but also on demand at any requested time by the students.

- *Teaching staff/ student ratio, interactions of faculty and students, and faculty teaching hours per week*

The ratio of the overall teaching staff to the number of undergraduate students (4 years of studies) is  $55/374 = 1/6.8$ . It should be taken to consideration that there are 222 additional undergraduate students between the 5-11 years and also 181 of unknown status "λιμνάζοντες". Considering the overall number of undergraduate students the ratio becomes  $55/777 = 1/14.1$ . The faculty have on average 6 hrs /week for teaching duties This assignment seems to be appropriate taking into consideration a) the examination load of the instructors and b) the extensive time the instructors have to invest for teaching the laboratory courses due to the lack of teaching fellowships for students and the limited technical staff

- *Teacher/student collaboration*

According to the interview with the students, this collaboration is highly satisfactory.

- *Adequacy of means and infrastructure resources*

The Chemistry department has adequate facilities. The classrooms are properly equipped and are kept, with effort, in good shape. Also the teaching laboratories are kept, with strong effort, in good shape. However, it is apparent that the equipment is old and often not sufficient to train students on a very good experimental level.

The department tries to keep a well-maintained library with wireless internet access also available to about 30 students.

- *Use of information technologies*

Use of Internet resources is widely spread, including online bibliographic databases, electronic books and wireless internet access. A separate computational facility with several personal computers in a local area network is available to the students.

- *Examination system and assessment of course work by the students*

Assessing the performance of students in each class is carried out through written exams. At the discretion of the instructor, in certain classes/laboratories the final grade is a combination of midterms, written reports and oral presentations. There is a student questionnaire for the assessment of the quality of each course.

## **IMPLEMENTATION**

- *Quality of teaching procedures*

The teaching methods are highly commended and this reflects the experience and dedication of the teaching staff. This was also pointed out unanimously during the interview with the undergraduate and master students. As a result, the quality of teaching is regarded as very good.

- *Quality and adequacy of teaching materials and resources.*

The teaching material and resources are appropriate and updated frequently (*see*

**recommendations 3, 8).**

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

The lectures in all courses are revisited and updated annually, and the quality of the course material is regarded as very good (*see recommendations 7, 8*).

- *Linking of research with teaching*

The Department of Chemistry has implemented in the curriculum, during the fourth year of undergraduate studies as well as the final year of MSc studies, a mainly experimental thesis that brings students closer from teaching to research.

- *Mobility of academic staff and students*

Within the ERASMUS program, the Department is participating with about 20 Universities. This program has given to a lot of students the opportunity to spend between 3-12 months abroad. The Department of Chemistry also participates in several research collaborations with other Universities and Institutes. These efforts should be maintained and increased in the future.

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

The evaluation of the students during the interview was very positive on both aspects.

**Recommendation 9:** The formal evaluation process through a questionnaire presented to the students, in a hard copy form, at the end of each course could benefit from a more systematic process that will be done via access to a secure internet university site at which each student will provide his/her comments anonymously.

**Recommendation 10:** It is also suggested that the undergraduate and MSc students create awards for the best teachers annually, where the nomination, assessment and selection process is exclusively student-controlled.

**RESULTS**

- *Efficacy of teaching*

(see Implementation section)

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

There exist major discrepancies in the success and failure percentage among courses the justification of which has not become apparent to the EEC members.

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

There is a distribution in the final degree grades of the undergraduate students with a maximum line (58% of all students) between 6-7. The average grade of the undergraduate degree is 6.2/10 with an apparent increase to 6.9/10 for the year 2009-2010. The time of graduation averages 5.4 years (academic years 2002-2009) which is considerably more than the expected 4 years.

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

The reason of the extensive length of graduation time is due to: (a) the indefinite possible repetitions following failure in examinations; (b) the need of certain students to support their education expenses by working; and (c) the lack of fellowships in support of education.

#### **IMPROVEMENT**

- *Does the Department propose methods and ways for improvement?*

The faculty members and laboratory personnel are eager to introduce the most modern teaching methods and tools. The Department has suggested several recommended ways for improvement that include: (a) the introduction of a selected number of fellowships for postgraduate students to support teaching in the laboratory courses of the undergraduate curriculum; (b) the replacement of old technical infrastructure especially in the introductory laboratory courses (e.g. general and inorganic chemistry); (c) the financial support for the implementation of security and safety regulations in the laboratories; and (d) the financial support for the employment of technical staff to enforce a continuous maintenance of the laboratory equipment and infrastructure.

- *What initiatives does it take in this direction?*

The Department has undertaken several initiatives to get the necessary financial support in order to achieve the goals given above. However, due to the very limited amount of University money covering the running costs, the Department is forced to use mainly money from highly competitive programs for research in order to guarantee a basic level of operation.

## **C. Research**

### **APPROACH**

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

The Department of Chemistry has 39 faculty members. It is very active in research, which covers a broad range of areas including main areas, such as inorganic chemistry, organic, physical, analytical chemistry and biochemistry, but also more specialised areas such as medicinal chemistry, atmospheric chemistry, food chemistry, polymer chemistry and radiochemistry.

The Department policy in research is to provide students access to a broad areas of research including those ones, which can be specifically important for the economy of country. This policy is guided by the desire of most faculty members to achieve excellence. The creation of resources for the Open University is also remarkable informing the public about the significant contributions of chemistry to the wealth of a society and higher quality of life.

- *Has the Department set internal standards for assessing research?*

The Department has set up an internal committee for the evaluation of the scientific work and the presentation of the most important results. It uses common international standards for the assessment of the scientific work, such as the number of publications and citations, the impact factor of journals, in which the results have been published, the h-index (ISI Web of Science), the number of invited talks on conferences and the recognition of faculty members with domestic or international awards.

### **IMPLEMENTATION**

- *How does the Department promote and support research?*

The Department of Chemistry has set up a series of initiatives promoting research: a) Several research collaborations with chemistry departments of the country and abroad have been set up, many of them with distinguished researchers; b) The participation of faculty members in several national and international funding programs, have attracted significant amounts of research money in the form of contracts and grants, which improved the infrastructure; the research initiatives and achievements in specific areas, such as medicinal chemistry, biological chemistry, polymer chemistry and catalysis, are remarkable; c) Several faculty members of the department have also initiated collaborations with industry that led to patents and have yielded results beneficiary for the national economy. Most notably in this respect is the set up of an industrial plant producing peptides by solid-phase synthesis and the creation of spin-off companies developing new materials and systems for renewable energy technologies and drugs.

- *Quality and adequacy of research infrastructure and support.*

The research achievements of the Department are highly appreciated given the limited infrastructure resulting from the very limited financial support by the University and the state. This lack of core support is evidenced by: a) the limited and in several cases antiquated small laboratory equipment; b) the limited modern instrumentation necessary to carry out state-of-the art research; c) the absent or very limited number of fellowships for postgraduate and Ph.D. students and d) the



technical conditions of the building, which need improvement. The Department has set up a list of large instruments, which should be invested. Another prioritization might become necessary based on the amount of money needed to be invested for each instrument. For example, the purchase of a single-crystal diffractometer should become the priority number one given the fact that structural chemistry is a research focus of at least one faculty member of the Department.

**Recommendation 11:** The EEC members suggest that for the future development of the Department the State and the Department has to invest in the following instruments for teaching and research using the following priority list: (a) single-crystal X-ray diffractometer; (b) supplementary equipment for the existing Electron Microscope; (c) a high field NMR; and (d) an FT-IR/MS. The other instruments cited in the list, which has been already approved by the department and the university and has been submitted to the State should be purchased afterwards as money become available.

- *Scientific publications*

The department of chemistry is very active in research as evidenced by a) the large number of publications in peer-reviewed journals, b) the appreciable number of contributions to books and participation on conferences (invited talks, keynote and plenary lectures), c) the invitation of faculty members to act as guest editors for special issues and d) the number of patents. It is noteworthy, that the Department of Chemistry is apparently the most productive within the University of Patras as indicated by the number of publications/per faculty member. An increasing number of publications in journals with an impact factor > 3 during the last six years indicates furthermore an overall increasing quality of the scientific work carried out. According to the Internal Evaluation Report, during the period 2004-2009 the Academic Staff of the Department has published about 800 papers in peer reviewed academic journals and had more than 11,000 citations. About 260 of these publications have appeared in scientific journals of high Impact Factor (>3.0). Moreover, during these years, the faculty members of the Department participated in more than 500 presentations in international meetings. It is noted that in the recent years we observe an increase of the number of publications and citations. Specifically, in 2009 the faculty members have produced about 160 publications and received about 3,000 citations.

- *Research projects*

The Department of Chemistry has been successfully involved in several competitive research projects that for the period 2007-2008 amounting to 1,7 MEuros. The EEC members note that most of this support has come through domestic sources and considerably less through the European Union. After the visit to the department, the EEC was informed that the department has attracted further national competitive grants of the order of 3 MEuros.

**Recommendation 12:** The EEC members strongly recommend that the faculty members increase their efforts to secure funding from EU-framework programs and other external sources.

- *Research collaborations*

The Department apparently has had numerous research collaborations with domestic and international academic and research institutions. The internal evaluation report provides an extensive list of collaborating institutions and this list could benefit from specific information on the nature of each collaboration. The Department is encouraged to enhance these collaborations through active participation in joint publications.

## RESULTS

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

The departmental objective of excellence in research is attained to a high degree (see above).

- *Scientific publications*

See comments in the IMPLEMENTATION section above.

- *Research projects*

See comments in the IMPLEMENTATION section above.

- *Research collaborations*

See comments in the IMPLEMENTATION section above.

- *Efficacy of research work. Applied results and patents*

There is a limited number of patents resulting from the research work. An improvement of the patent office and the technology transfer office and their adequate financial support would benefit the results of research work and could lead into an increase of the patents and licenses.

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

There are faculty members with international recognition as reflected in awards and publications in high visibility journals (see comments above).

## IMPROVEMENT

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

The Chemistry Department is commended for its heroic effort to efficiently use the available pool of money to support its educational and research activities. The Departmental suggestions for improving the research activities are:

- funding of fellowships and teaching assistantships for the masters program
- funding of fellowships for doctoral studies
- adequate funding for departmental operational expenses
- additional funding for technical staff and timely replacement of retirees

*Initiatives in this direction undertaken by the Department*

The aforementioned improvements rely primarily upon the support by the Ministry of Education and the University of Patras, as well as funding from industry and the European Union.

## **D. All Other Services**

### **APPROACH**

- *How does the Department view the various services provided to the members of the academic community (teaching staff, students).*
- *Does the Department have a policy to simplify administrative procedures? Are most procedures processed electronically?*

The Department recognizes that there are financial difficulties related to the transport of students and staff to the University. The faculty members make very good efforts to facilitate such transport using their own cars.

The effectiveness of administrative and technical services is good to very good. When compared to other countries (panel member's impressions) the current chemistry community in the Department of Chemistry at the University of Patras appears to have a larger proportion of happy staff members.

The admissions of students and the recording of course grades are handled in the chemistry department by a capable albeit under-manned, overworked, secretarial staff. By comparison these duties are handled in other universities by the central administration.

**Recommendation 13:** The University should create a centralized e-system to handle student admissions, student grades and other student-related inquiries. This will alleviate the heavy load currently handled by the chemistry secretarial staff. The grades for a given course should be available on line and in a safe manner to students' inquiries.

**Recommendation 14:** The IT support of the departmental library facility should continue to improve in the retrieval of journal articles and searches of the scientific literature.

### **IMPLEMENTATION**

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

The Department of Chemistry is composed of three major sections on the basis of teaching and research responsibilities. However, the administration staff is

mainly available for a large load of administrative duties imposed on the Department, that reflects an inefficient and overinflated bureaucracy. This leads to the unacceptable situation where the faculty members have essentially no administrative support (see recommendation 13).

Technical support by the University, that is necessary to address the specific safety issues for a running Chemistry Department, seems to be inappropriate causing a lot of operational problems. This is intensified by the technical conditions of the building which are in a lot of cases antiquated.

**Recommendation 15:** The EEC recommends the creation of a central modern facility for the storage of chemical solvents, waste and reagents.

**Recommendation 16:** The EEC recommends the modernization of the air-ventilation system.

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

The student secretariats are quite efficient, the library is well organized. Excellent sport facilities are available within the university campus (also available to the city of Patra)

## RESULTS

- *Are administrative and other services adequate and functional?*

See comments above.

## Collaboration with social, cultural and production organizations

The Department has successfully attracted eminent and distinguished scientists, to mention Nobel Laureate in Chemistry (Prof. Jean Marie Lehn, Andrew Schally), who were nominated as Honorary Doctorates, a very important honor for an academic unit.

Members of the Department of Chemistry participate in various local activities including the annual symposium of poetry and the theatrical group of the University of Patras. They also present various public lectures related to chemistry. In addition, the Department collaborates with the Hellenic Union of Chemists to organize National Chemistry Symposia and presents chemical demonstrations and educational seminars in high schools. Specifically in 2010 the Department organized the Chemistry Week to honor the 100 years of chemistry.

A number of the faculty members actively participate in the councils of various Greek and international scientific unions. It should also be noted that one of the laboratories have been ISO certified and is often used in monitoring the quality of food by the local agencies.

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

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

The inhibiting factors are:

(a) the lack of funding opportunities and negligible support from the Ministry of Education and the General Secretariat of Research and Technology. Especially it is noted the lack of fellowships and teaching assistantships for the MSc and Ph.D. program;

(b) the small number of technical staff;

(c) the long delays in the approval and hiring of new faculty. This is particularly worrisome given the expectation that several faculty members will be retiring in the next 5 years;

(d) the lack of a system to provide start-up grants for new faculty members

(e) the problems in building and maintaining a safe storage facility for flammable solvents;

(f) the lack of clear criteria for the promotion of faculty members to the different levels and the lengthy tenure in the early ranks;

(g) the limited number of non-antiquated laboratory equipment and large instrumentation needed for state-of-the-art research;

(h) the non-introduction of transparent metrics for the distribution of funds from the institution principals to the departments which need (i) to reflect the quality of the research and teaching programs, (ii) to be distributed based on documented excellence and recognition, and (iii) to attain the goals of maintaining and enhancing the fine examples of excellence so as to compete with their respective departments at international level.

(i) the lack of appropriate support for securing intellectual property rights through patents;

***In addition to the recommendations given above for the instrumentation and personnel (e.g. fellowships etc) the EEC have the following recommendations:***

***Recommendation 17:*** The hiring of faculty with the aim of completing the constitution of chemical expertise within the Department, such as a physical chemist in the field of molecular spectroscopy.

**Recommendation 18:** It will be necessary to replace all positions that become soon vacant in a particular area with experts from the same area. In particular, this is important for the field of Inorganic chemistry where all experts will be retiring within the next decade.

**Recommendation 19:** The Department should formulate transparent and measurable guidelines for the timely promotion and tenure based on excellence in both research and teaching.

**Recommendation 20:** The introduction of criteria at the University- and Departmental-level for the distribution of funds for educational and research needs.

**Recommendation 21:** The state should introduce a committee to evaluate the administration of the entire University.

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

### **Conclusions:**

The Chemistry Department of the University of Patras has established a high quality research and teaching program that is commensurate with international standards.

- The great majority of faculty members have active research programs.
- The group of young faculty members (albeit small in number) lead vibrant research initiatives.
- Most faculty members pursue creative and modern teaching initiatives.
- Some Ph.D. graduates follow academic careers at domestic universities and perhaps too many in the Patras Department of Chemistry.
- To maintain state-of-the-art research and teaching funding is necessary for personnel, instrumentation and technical infrastructure.

In summary, the strengths of the Department are the broad areas of teaching and research covered and the presence of active and devoted faculty members. The main weaknesses are the lack of fellowships for students at the MSc and Ph.D. program, the limited number of technical staff and the limited number of modern instrumentation.

### **Recommendations:**

The EEC members make the following recommendations for the future development of the Department. Some of these recommendations are departmental others are directed to the University and state authorities:

Education:

**Recommendation 1:** The design of experiments that use elementary spectroscopic instrumentation be encouraged and the instruments should be purchased.

**Recommendation 2:** There exists a current lack of fellowships for non-permanent teaching assistants who can support the instructive work of the professors during their laboratory courses. These fellowships should be provided by the State and/or the University. Funding of these teaching fellowships is necessary and urgently recommended.

**Recommendation 3:** There exists a current lack of technical staff to maintain and run the instrumentation of the Department that is basic part of the curriculum. The EEC committee recommends the increase of technical staff.

**Recommendation 4:** In the new undergraduate and graduate program we strongly recommend the implementation of homework assignments and midterm examinations in addition to the final exams that should all contribute to the final grade.

**Recommendation 5:** The implementation of required prerequisite courses ("chain system" of instruction) is essential for the development of the curriculum.

**Recommendation 6:** The committee did not get a clear picture of the system running in Greece for the evaluation and distribution of the books recommended to undergraduate and graduate students. Early distribution of the approved books seems to be a problem and should be addressed.

**Recommendation 7:** We recommend a broader knowledge-based training at the MS level that will satisfy both the needs of the local enterprises and the departmental requirements toward a Ph.D. degree.

**Recommendation 8:** Instrumentation and staff are needed for the training and laboratory exercises related to modern molecular spectroscopy.

**Recommendation 9:** The formal evaluation process through a questionnaire presented to the students, in a hard copy form, at the end of each course could benefit from a more systematic process that will be done via access to a secure internet university site at which each student will provide his/her comments anonymously.

**Recommendation 10:** It is also suggested that the undergraduate and MSc students create awards for the best teachers annually, where the nomination, assessment and selection process is exclusively student-controlled.

Research:

**Recommendation 11:** The EEC members suggest that for the future development of the Department, the State and the Department have to invest in the following instruments for teaching and research using the following priority list: (a) single-crystal X-ray diffractometer; (b) supplementary equipment for the existing Electron Microscope; (c) a high field NMR; and (d) an FT-IR/MS.

**Recommendation 12:** The EEC members strongly recommend that the faculty members increase their efforts to secure funding from EU-framework programs and other external sources.

Other Services:

**Recommendation 13:** The University should create a centralized e-system to handle student admissions, student grades and other student-related inquiries.



This will alleviate the heavy load currently handled by the chemistry secretarial staff. The grades for a given course should be available on line and in a safe manner to students' inquiries.

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Strategic planning:

**Recommendation 17:** The hiring of faculty with the aim of completing the constitution of chemical expertise within the Department, such as a physical chemist in the field of molecular spectroscopy.

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## The Members of the Committee

Name and Surname	Signature
1. Professor D. Coucouvanis, Chair University of Michigan (USA)	-----
2. Professor A. Efstathiou University of Cyprus (Cyprus)	-----
3. Professor A. Filippou University of Bonn (Germany)	-----
4. Professor E. Theodorakis University of California, San Diego (USA)	-----
5. Dr. A. Stassinopoulos, Expert  President of Association of the Greek Manufacturers of Packaging and Materials (Greece)	-----