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 ACCREDITATION AGENCY

EXTERNAL EVALUATION REPORT

DEPARTMENT of **Chemistry, National & Kapodistrian
 University of Athens**

June, 2012

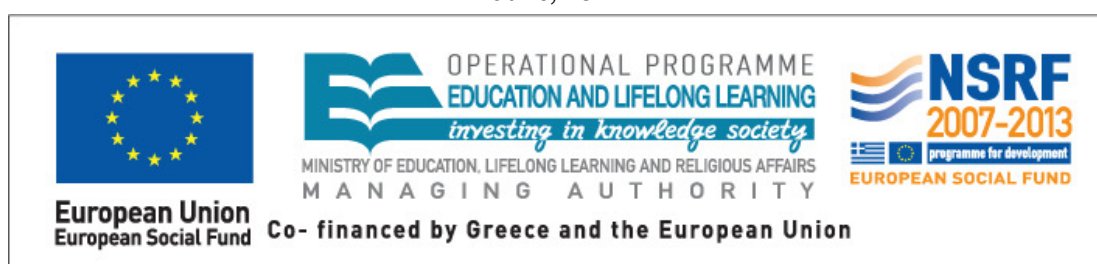


TABLE OF CONTENTS

The External Evaluation Committee

Introduction

I. The External Evaluation Procedure

- Brief account of documents examined, of the Site Visit, meetings and facilities visited.

II. The Internal Evaluation Procedure

- Comments on the quality and completeness of the documentation provided and on the overall acceptance of and participation in the Quality Assurance procedures by the Department .

A. Curriculum

APPROACH

- Goals and objectives of the Curriculum, structure and content, intended learning outcomes.

IMPLEMENTATION

- Rationality, functionality, effectiveness of the Curriculum.

RESULTS

- Maximizing success and dealing with potential inhibiting factors.

IMPROVEMENT

- Planned improvements.

B. Teaching

APPROACH:

- Pedagogic policy and methodology, means and resources.

IMPLEMENTATION

- Quality and evaluation of teaching procedures, teaching materials and resources, mobility.

RESULTS

- Efficacy of teaching, understanding of positive or negative results.

IMPROVEMENT

- Proposed methods for improvement.

C. Research

APPROACH

- Research policy and main objectives.

IMPLEMENTATION

- Research promotion and assessment, quality of support and infrastructure.

RESULTS

- Research projects and collaborations, scientific publications and applied results.

IMPROVEMENT

- Proposed initiatives aiming at improvement.

D. All Other Services

APPROACH

- Quality and effectiveness of services provided by the Department.

IMPLEMENTATION

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

RESULTS

- Adequateness and functionality of administrative and other services.

IMPROVEMENTS

- Proposed initiatives aiming at improvement.

Collaboration with social, cultural and production organizations

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

- Short-, medium- and long-term goals and plans of action proposed by the Department.

F. Final Conclusions and recommendations of the EEC on:

- The development and present situation of the Department, good practices and weaknesses identified through the External Evaluation process, recommendations for improvement.

External Evaluation Committee

The Committee responsible for the External Evaluation of the Department of Chemistry of the National & Kapodistrian University of Athens 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 D. S. Argyropoulos
North Carolina State University (USA)
3. Professor L. Bachas
University of Miami (USA)
4. Professor C.A. Floudas
Princeton University (USA)
5. Professor A. Giannis
University of Leipzig (Germany)

Introduction

I. The External Evaluation Procedure of National Kapodistrian University of Athens ,NKUA, (or EKPA).

Remark: The External Evaluation Committee (EEC) received the internal evaluation report timely and in electronic form.

II.

- Dates of the site visit

The visit was carried out from the 9.30 am of the 18/06/2012 up to the 20/06/2012.

- Whom did the Committee meet?

At the beginning of the evaluation process (18.6.12) a briefing took place at the ADIP offices from 9.30 to 11 am. Subsequently, an informal meeting with Prof. A. Doukoudakis (Vice rector of NKUA), Prof. Papageorgiou (Dean of the School of Sciences of NKUA), Prof. A. Calokerinos (President of the Chemistry Dept of NKUA), Prof. P. Minakaki (as substitute President of the Chemistry Dept of NKUA) as well as Prof. M. Pitsikalis , Prof. Ch. Mitsopoulou and Prof. E. Lianidou took place in the morning of 18/6/12. During this meeting the external evaluation committee (EEC) had the opportunity to discuss the department of Chemistry at NKUA.

Day 1, Monday, June, 18, 2012:

At the beginning of the evaluation process, Prof. A. Calokerinos gave a general presentation of the actual operation and procedures of the Department of Chemistry at NKUA. He also presented a short history of the Department, teaching, the funding situation, the curriculum, organisation, administrative structure, and social activities.

Subsequently, the EEC met Prof. K. Efstathiou (Head of Section I: Theoretical Chemistry, Physical Chemistry, Instrumental Analysis), Prof. E. Iatrou (Head of Section II: Organic Chemistry, Chemical Technology, Food Chemistry, Biochemistry, Clinical Chemistry) and Prof. Ch. Mitsopoulou (Head of Section III: Inorganic Chemistry, Inorganic Chemical Technology, Environmental Chemistry). They presented section-specific operations, issues and general problems. In the afternoon Prof. M. Pitsikalis presented the Undergraduate Curriculum. The EEC , at the end of the first day, met also the Directors of the interdepartmental graduate studies Prof. Kokotos, Prof. Ch. Tzougraki, Prof. M. Koupparis. and Prof. Dasenakis who outlined the Graduate Curriculum.

Day 2, Tuesday, June, 19, 2012:

The second day of the evaluation was devoted to presentations by the laboratories comprising the whole Department of Chemistry.

The following laboratories presented evaluations: Physical Chemistry, Analytical Chemistry, Organic Chemistry, Industrial Chemistry, Food Chemistry, Biochemistry, Inorganic Chemistry, and Environmental Chemistry.

All presentations were uniformly informative and detailed, and the corresponding lab directors / representatives outlined research activities, publications, staffing, and future plans. A variety of questions were asked and problems discussed. All presentations were given to the members of the EEC in printed form and in a USB-stick.

After a short break, the EEC met with members of the administrative staff (IDAX, ETEP, EEDIP) as well as with interested undergraduate, graduate and doctorate students. The EEC discussed the problems of the administrative staff as well as those of the students. Both groups suggested several changes and improvements for the department.

Several undergraduate, graduate and doctorate students participated in the meetings. We had the opportunity to visit most of the departmental laboratories as well as the teaching laboratories (food chemistry, inorganic chemistry, organic chemistry, physical chemistry, environmental chemistry, and biochemistry). Due to time limitations it was not possible to visit all teaching labs. During these visits we also had short discussions with the corresponding group leaders, laboratory instructors and students. In addition, the EEC requested and had an unscheduled meeting with most of the young faculty members. During this discussion we addressed several issues concerning their status and research.

Summary: The Department of Chemistry of NKUA managed to prepare a program that allowed meetings and discussions with members of all divisions of the department. In these constructive meetings the majority but not all members of the teaching staff or group leaders were present. Furthermore the EEC had the opportunity to speak to laboratory instructors, to visit a few laboratories, as well as the research laboratories of all divisions. We also talked with representatives of the students (masters and PhD students; a total of 18 students).

II. The Internal Evaluation Procedure

- *Appropriateness of sources and documentation used*

The internal evaluation report (2007-2011) was received by all members of the EEC about 7 weeks prior to the evaluation process. Additional material with extensive detailed information concerning several research and educational aspects and activities was received during the visit.

- *Quality and completeness of evidence reviewed and provided*

The internal evaluation report detailed and complete and describes the current situation (i.e., number of students up to 2011 and the actual number of current departmental staff), the organisation, structure, and the length of study of the entire degree.

- *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 since it accurately presented the department and its challenges.

A1. Undergraduate Curriculum

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

- *What is the plan for achieving excellence?*

During the academic year 2003-2004 the Department of Chemistry at the National Kapodistrian University of Athens (NKUA) implemented a rejuvenated undergraduate educational program that was aimed at:

- A reduction of the number of compulsory core courses with special attention at modernizing course content, course curricula and eliminating possible material overlap.
- Introduction of new laboratory exercises aimed at creating a more productive educational experience
- A concerted effort at ensuring that core courses are concentrated during the initial three years of a student's educational experience at NKUA, while the electives are concentrated at their final year.
- New core courses promoting proficiency, understanding and use of computers as well as focused electives aimed at offering an augmented and effective degree of thematic specialization.
- Application of modern methods of material dissemination that goes beyond the traditional lecturing approach as well as novel examination techniques.

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

The overall duration of these studies requires a minimum of 8 semesters leading to the award of the Chemistry degree. Overall the modernized structure of the program, the allocation of credit hours and in general the overall approach of providing the undergraduate experience to the chemistry students is comparable to, and compatible with those of international peer institutions.

It is important, however, to underline that while the department has instituted mandatory undergraduate laboratory attendance, (a practice not required by law), it has not imposed a similar requirement for in class instruction. This omission (although not required by law) is problematic. The mandatory laboratory attendance is considered successful as indicated by the degree of timely completion of such core activities; while the degree of timely core class completion is significantly lower.

The lack of a series of pre-requisite (non-laboratory) courses within the structure of the undergraduate curriculum induces notable deficiencies in the effectiveness of the curriculum. For example the phenomenon of students postponing taking core classes until they are forced to, and just prior to graduation, is not educationally acceptable. It seriously affects (reduces) the *in depth* understanding of the subject matter. In this respect the committee is aware of the restrictions of the law and is recommending that the law regarding pre-requisites must be repealed.

The instructional materials provided to the evaluators used for the classrooms and the laboratories were in general satisfactory. It should be pointed out that some of the professor's textbooks that are provided to the students (notably free of charge) are considered classics in their disciplines. In addition, the fact that a significant number of internationally known textbooks in core subject areas are provided to the students, translated in Greek, offers additional credibility and confidence as to the adequacy of the instruction.

Overall, the academic background of the instructors is considered excellent and well suited for offering a high quality educational experience.

A general coherence (amongst the three sections of the department) is usually desirable within any undergraduate curriculum, and the Department of Chemistry at NKUA shows this coherence. This allows for the effective and complimentary dissemination of the educational material.

Another issue that may require some departmental attention is the fact that in the recent past the average grade received by 917 recent undergraduate students was 6.23. While it is well known that the Chemistry department at NKUA is of high standards and that "grade inflation" is not an issue here, the departmental leadership may want to consider the possibility that such low average grade could well be the result of the lack of prerequisite course requirements which causes ineffective learning. Although the department has carefully thought the sequence of core courses and electives, in practice this cannot be enforced due to the

restrictions of the current law.
We note that, despite some “political” tensions, the relations between faculty and students were found to be respectful of each other with elements of professional demeanor.

IMPLEMENTATION

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

Overall, the department of chemistry at NKUA, represented by a long tradition of fine educators, offers a strong undergraduate curriculum (despite the fact that it is somewhat overloaded) and provides solid chemical foundations to its graduates.

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

The examined curricula emulate those of peer national and international institutions.

Is the structure of the curriculum rational and clearly articulated?

The classroom and laboratory instruction when coupled with the thorough textbooks provided to the students are indicative of a well-structured curriculum. It should be noted, however, that the committee did not have the chance to examine specific detailed syllabi in major core courses that may have supplemented our view. Syllabi are available via e-class.

- *Is the curriculum coherent and functional?*

Yes, based on the above considerations.

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

In general this is seen as adequate, especially within the structure of the revised curriculum.

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

The departmental facilities within the existing buildings provide ample space for classrooms and laboratories. There were however, some notable deficiencies as far as safety aspects in the operations of some undergraduate laboratories (emergency escape routes, inadequate operation of hoods and smoking violations).

The committee appreciates the solvent collection program initiated and exercised by the department. This promotes an understanding of environmental issues by the students and the need for professional accountability.

Ample space also is available to support modern instrumentation, library, and study halls. One needs to underline here that these facilities and the overall programs are maintained and executed under conditions of financial constraints. As such, the overall success of the program is most likely due to the efforts of dedicated faculty and staff.

RESULTS

<ul style="list-style-type: none"> • <i>How well is the implementation achieving the Department's predefined goals and objectives?</i> <p>See above</p> <ul style="list-style-type: none"> • <i>If not, why is it so? How is this problem dealt with?</i> <p>N/A</p> <ul style="list-style-type: none"> • <i>Does the Department understand why and how it achieved or failed to achieve these results?</i> <p>N/A</p>
<p>IMPROVEMENT</p> <ul style="list-style-type: none"> • <i>Does the Department know how the Curriculum should be improved?</i> <p>The new curriculum that has already been implemented does not necessitate any apparent immediate improvements other than the ones noted (pre-requisite courses, safety issues and the somewhat enlarged course selection).</p> <ul style="list-style-type: none"> • <i>Which improvements does the Department plan to introduce?</i> <p>N/A</p>

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) PhD Diploma in Chemistry

Under the auspice of these directions a variety of options and specializations is offered and is mostly driven by excellence in research as evidenced by an impressive number of original contributions to knowledge in reputable journals of varying and continuously improving impact factor. More specifically the department offers the following programs:

- General Postgraduate Program
- Polymer Science and Applications
- Chemical Analysis –Quality Control
- Organic Synthesis & Applications
- Teaching of Chemistry
- Catalysis and Applications an Integrated Approach
 - In addition it participates to two graduate programs that span in a more than one department ; oceanography and clinical biochemistry-molecular diagnostics

More specifically the masters (with thesis) diploma offers a variety of specializations with

a diverse array of skills that meets and sometime exceeds the needs of the national industry.

The cumulative time required for obtaining the undergraduate diploma is extremely long by most standards, at times this also applies to the Masters and the Doctorate diplomas. This is due to an overloaded curriculum and concerted efforts to shorten them should be made. It is the case that lengthy residency times often create an uncompetitive candidate when he/she arrives in the market place.

It is also objectionable that most of the post-graduate students must fully support their education.

A considerable number of the Masters graduates proceed toward doctorate degrees within the Athens University chemistry department, other Greek University departments and at times chemistry departments in European or American Universities.

B. Teaching

APPROACH

The most important 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 masters program.

The undergraduate diploma is a four year degree with 2 semesters per academic year. A diploma thesis is compulsory, and the courses are defined as compulsory (23 courses) and elective (from a selection of 34 courses). In 2010-2011 the degree requirements were: 23 compulsory courses (175 ECTS credits) and 9 elective courses (53 ECTS credits).

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

Teaching methods employ the traditional classroom techniques. Some evidence for state of the art tools that include laptops and projection facilities as well as a departmental website was available.

The updates for elective and Masters courses are performed annually. The average undergraduate degree grade is 6.23 out of 10 (based on a sample of 917) and the average duration for the completion of the undergraduate degree is approximately 6.0 years based on data reported at the oral presentation of the undergraduate program. For the period 2006-2010 (typical percentages for graduation in 6 years were 48/170, 35/174, 29/159 and 21/180 and in 7 years 30/170, 25/174, 31/159 and 33/180 as reported in the internal evaluation report.

The extended length of time towards graduation could jeopardize the possible employment opportunities.

The content of the courses was updated through a recent critical assessment of the teaching program (vide supra). Faculty members of the Department of Chemistry have translated popular modern textbooks in several core areas. Some of these books are used in other academic institutions in Greece. We became aware of facilities and activities like wireless internet, the availability of course lecture notes, homework assignments and problem solutions.

• Teaching staff/ student ratio, interactions of faculty and students, and faculty teaching hours per week.

The ratio of students per faculty member (in 2011) was $1860/64 = 30$.

According to interviews with students, the interaction of faculty and students seems satisfactory.

• Adequacy of means and infrastructure resources

The Department of Chemistry is housed in a large building and has impressive facilities that are regarded as state of the art based on international standards. Both the classrooms and the teaching laboratories are properly equipped, quite spacious, and can accommodate future faculty additions.

There were ample computational facilities.

• Examination system and assessment of course work by the students

Multiple methods of assessing students are applied: assessing the performance of students in each class is carried out through written, or written and interim exams at the discretion of the instructor. There is a student questionnaire for the assessment of the quality of each course. **This is not a required activity and its completion at desirable levels must be improved.**

IMPLEMENTATION

• Quality of teaching procedures

The teaching methods are mainly classical but highly professional and reflect, the

experience, dedication and excellence of the teaching staff. This was also pointed out during the interview with masters students.

In general, the quality of teaching is regarded as very good.

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

The teaching material and resources are appropriate, updated frequently with international standards, and serve well the departmental mission for excellence. Most of the textbooks used are recent and appropriate.

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

The lectures in most courses are revisited and updated; the quality of the course material generally is regarded as high. The new undergraduate program demonstrates the revision of the teaching program.

- **Linking of research with teaching**

During the fourth year of undergraduate studies, the students are exposed to research through the dissertation “diplomatiki ergasia”. The students have a formal option to join a research laboratory for research which is given credit as a course.

Also, industrial practical activity and experience in applied research is available to students.

Mobility of academic staff and students

The department has numerous collaborations with academic and research institutions within Greece and abroad, and the program ERASMUS has been used by faculty members and students. These efforts are encouraged to be maintained in the future.

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

The evaluation of the faculty and course structure by students during the interview was positive on both aspects. The formal evaluation process through a questionnaire presented to the students, in a hard copy form, is now being replaced by a systematic process that will be done via access to a secure internet university site at which each student will provide his/her comments anonymously. In addition provisions can be made that will assure a high degree of student participation in these surveys.

RESULTS

- **Efficacy of teaching**

(See above in the APPROACH and IMPLEMENTATION sections).

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

Based on Tables of the Internal Assessment Report, we consider that there are no major discrepancies.

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

(see above in the APPROACH section)

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

Based on extensive discussion with faculty members and instructors, they are fully aware of their strengths. They also recognize the challenges that certain students face when they need to work outside the university so as to support their academic studies. It appears that the faculty tries to accommodate the needs of such students and encourage them to complete their studies. This is a vital issue for a fraction of undergraduates and for the vast majority of students who pursue their master’s degree without receiving any fellowship or teaching assistant stipend support.

IMPROVEMENT

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

The department is eager in maintaining the very good teaching staff/student ratios and at

improving the interactions among faculty, undergraduate and graduate students.

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

The new undergraduate program of studies, reformed in 2003-2004, has been instrumental in improving many previous problems in the teaching of undergraduates. (See section A1)

Towards improving the quality and conditions of graduate studies at the Master's level, the admitted students need to receive fellowships or teaching assistantships that will alleviate the financial issue and allow them to participate in both teaching and research. This is not a direction that the department can address in its totality, and requires the attention and consistent action of the Ministry of Education.

C. Research

APPROACH

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

The research in the department is carried out currently (June 2012) by 61 Faculty Members (Professors, P; Associate Professors, AP; Assistant Professors, AsP; Lecturers, L) in three sections and eight research laboratories. Section I consists of the Laboratory of Analytical Chemistry (5; 2; 5; 1) and the Laboratory of Physical Chemistry (2; 2; 3; 3). Section II consists of the Laboratory of Organic Chemistry (3; 4; 2; 1), the Laboratory of Industrial Chemistry (0; 4; 0; 3), the Laboratory of Food Chemistry (0; 2; 5; 1), and the Laboratory of Biochemistry (2; 2; 0; 0). Section III consists of the Laboratory of Inorganic Chemistry (1; 5; 5; 1), and the Laboratory of Environmental Chemistry (3; 0; 0; 0).

The department offers masters and doctoral degrees.

The department offers and supports (6) masters program alternative directions: (a) general masters program (in the areas of the (8) laboratories and clinical chemistry); (b) polymer science and applications; (c) chemical analysis & quality control; (d) organic synthesis and applications in chemical industries; (e) catalysis and applications; and (f) teaching of chemistry and new educational technologies. Furthermore, the department participates in two masters programs on (i) oceanography and (ii) clinical biochemistry-molecular diagnostics in collaboration with the department of geology & geo-environment, and department of biology, respectively. For the period of 2005-2012, a total of 230 masters were completed.

The doctoral program addresses the research areas reflected in the eight laboratories. Students pursue the doctoral degree upon completion of the masters program, take a compulsory course during the first semester, perform original research under the supervision of a faculty member, submit annual progress reports to an assigned advisory faculty committee, submit and defend the thesis upon publication or acceptance of at least one refereed paper in a scholarly journal with impact factor. The typical duration of the doctoral program is three years. During the period of 2005-2012, a total of 135 Ph.D. degrees were awarded from the Department of Chemistry.

The Department carries out research in the eight aforementioned research areas/labs.

Section I: In the Laboratory of Physical Chemistry, the theoretical and experimental research topics of primary interest include: dense molecular systems; dynamics of ions moving in fluids; *ab initio* calculations for small molecules; micellization of surfactants; cyclodextrin complexes; surface science; synthesis of solid compounds and their properties; dynamics of nuclear reactions and their stability; and structure/morphology of macromolecules. In the Laboratory of Analytical Chemistry, the main research areas include: electroanalytical chemistry; separation techniques (GC, LC, IC); mass spectrometry (GC-MS, LC-MS, LC-MS/MS); atomic absorption spectrometry; chemiluminometric techniques; biomolecular analysis; automation of analytical systems; flow injection techniques; and chemometrics.

Section II: In the Laboratory of Organic Chemistry, research areas of main interest include: free radical mechanisms in organic reactions and oxidative stress; carcinogenesis mechanisms by suspended particulates; antioxidant mechanisms; organocatalysis; design and synthesis of PLA2 inhibitors; de novo synthesis and characterization of DNA lesions; structure-based design of inhibitors of GPB; synthesis of urea derivatives and 2-pyrrolidinones; rational drug design of anti-hypersensitive and HIV inhibitors; design and synthesis of Zn-metalloproteases; synthesis of phosphinic peptides and natural products; organic synthesis using microwaves; inhibitors of enzymes of the endocannabinoid system and human digestive lipases; and hydrolases in removing carboxyl protecting groups. In the Laboratory of Industrial Chemistry, the main research topics include: catalytic hydrogenation and hydroformylation of fatty acid methyl esters; benzene and poly-butadiene-1,4 hydrogenation; synthesis and characterization of model homo- and co-

polymers with novel architectures (miktoarm stars, nonlinear block, dendritic); study of dilute solution and solid state properties; micellization of well defined copolypeptides; polymer brushes; nano-objects via block copolymers; micro- and nano-lithography studies of polymeric materials; protein microarrays in lithography; alcoholic fermentation and assessment of antioxidant activity in wine; NMR analysis of grape derived products; and classification of alcoholic beverages. In the Laboratory of Food Chemistry, the main research topics include: mycotoxins (analytical methods for identification, effect of inhibitors); *Listeria monocytogenes* lipids (role of stress conditions, modification of membrane lipids); food constituents determination; analysis of lipids in foods and natural products; identification of toxic metals in foods, safety and quality. In the Laboratory of Biochemistry, the main focus is on lipids, and the research topics include: lipid chemistry; identification of lipids in foods and natural products; trans-fatty acids; valproic acid; endocannabinoid compounds; lipids in cell signalling and metabolic pathways; endogenous and exogenous factors in obesity.

Section III: In the Laboratory of Inorganic Chemistry, the primary research topics include: homogeneous catalysis (olefins, alkynes, phosphites, metal complexes), heterogeneous catalysis; photocatalysis; photovoltaic solar cells; biomimetics (metal-based drugs, metal complexes for PAF and thrombin); computational studies of inorganic compounds via DFT based calculations; inorganic mechanism reactions (kinetic theories and applications to geochemical and biological systems; photochemical reactions); inorganic and molecular materials (polynuclear metal complexes; transition metal complexes; metal organic frameworks); inorganic chemical technology (mineral resources; fertilizers; biocatalysts). In the Laboratory of Environmental Chemistry, the main research directions include: chemistry of aquatic systems; speciation studies in natural systems; modification and removal of metals in biogeochemical cycles; management of aquatic and marine ecosystems.

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

The department used the common international standards for assessing the published results of research (i.e., number of publications and citations; H index (ISI Web of Science); impact factor of journals); most significant advances, recognition of faculty via domestic and international awards. The department should be commended for the exceptionally detailed presentations of all aforementioned data for sections, laboratories, and all individual faculty members. In particular, the presentation of Professor Calokerinos on the internal assessment of the department as well as the laboratory presentations of Professor Koupparis, Professor Kokotos, Professor Pitsikalis, and Professor Mitsopoulou were outstanding in both technical content and delivery.

IMPLEMENTATION

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

The Department has first rate laboratory facilities for research and teaching, has ample space to accommodate the current and future research and teaching needs, has established successful domestic and international research collaborations, and actively promotes research collaboration with other research institutes in related fields. The Department promotes the submission of applications to national and internationally funded projects by the academic staff.

The external evaluation committee had a fruitful and constructive discussion with the young staff members. Our impression was that they have a clear view for the future development of the Department of Chemistry of NKUA. The young staff members have contributed significantly to the improvement of the research infrastructure and the achievements of the department and have rejuvenated its educational curriculum. Importantly they show research independence and strong collaboration among them. Specific recommendations for this group are pointed out in section F.

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

The department has established very spacious and excellent experimental laboratory facilities for both teaching and research purposes. Current and future research infrastructure **urgent needs are for (a) a state of the art X-ray diffractometer, (b) high field NMR, (c) a magnetometer, and (d) electron paramagnetic resonance, EPR, spectrometer. Furthermore, there is a need for proper maintenance and technical personnel support of the existing experimental facilities.**

Scientific publications

According to the Internal Assessment Report and the presentations, during the period 1990-2011 there is a total of about 2350 papers in peer reviewed academic journals. For the period of 2001-2005, there were about 120 publications per year, while for the periods of 2006-2008, and 2009-2011, there has been an increase of publications per year to about 150 and 155, respectively. According to ISI Web of Science (as of June 15, 2012; All databases), the Professors of the department had an average H-Index of 17.0, the Associate Professors had an average H-Index of 10.5, the Assistant Professors had an average H-Index of 12.4, and the Lecturers had an average H-index of 8.8.

- *Research projects*

According to the funding record presented during the visit for the period 2005-May, 2012, we can observe that the total departmental funding has ranged from about 1.1M Euros in 2010 to 2M Euros. More specifically, the total funding was approximately 2M, 1.43M, 1.93M, 1.89M, 1.12M, 1.1M, 1.86M Euros for 2005, 2006, 2007, 2008, 2009, 2010, and 2011, respectively, with 0.38M in 2012 (up to May). For a yearly average of total funding at 1.62M Euros and an average faculty size of 65, the average annual funding raised per faculty member for the aforementioned period is about 25,000 Euros. This may be regarded as low and represents an area for potential improvement. To enhance the level of funding so as to reach an adequate and stable level, requires (a) regular calls for proposals by the Ministry of Education and the General Secretariat of Research and Technology followed by submission of proposals, (b) submission of proposals to all appropriate calls for proposals of the European Union, and (c) proper success rates in the (a) and (b).

The recognition of three faculty members (Iatrou, Thomaidis, Skoullou) with the recent Aristeia awards/proposals, and the multiple funded proposals for the Herakleitos II and Thalys programs represent very positive signs for scientific recognition and will improve the funding of the department significantly.

- *Research collaborations*

The department has established numerous research collaborations with domestic and international academic and research institutions. The internal evaluation report and the presentations given during the visit provide an extensive list of collaborating institutions.

RESULTS

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

The overall departmental objective of excellence in research is attained. Strengths are reflected in the Analytical Chemistry (average H-Index=15.7), Industrial Chemistry (average H-Index=14.5), and Organic Chemistry (average H-Index=13.9). Improvements can be achieved in Physical Chemistry (average H-index=11.5), and Inorganic Chemistry and Technology (average H-Index=10.2). Major improvements are needed in the Biochemistry (average H-Index=9.8) and Food Chemistry (average H-Index=8.5). The heavy research focus of the Environmental Chemistry Laboratory on the oceanography front (Prof. D. Nikolelis and environmental analysis) is noted, although it may not be aligned with the research directions and objectives of a typical chemistry department.

- *Scientific publications*

(see comments in the IMPLEMENTATION section)

- *Research projects*

(see comments in the IMPLEMENTATION section)

- *Research collaborations*

(see comments in the IMPLEMENTATION section)

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

There are several patents resulting from the research work. **An improvement could take place by establishing a patent office and a technology transfer office with the proper support. Their presence could benefit the results of research work.**

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

There are faculty members with recognition reflected in awards and publications in high visibility journals. The three recently awarded Aristeia proposals represent a strong indication of the external recognition.

This is an area that could be improved further with the potential addition of international level recognition and awards.

IMPROVEMENT

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

The department should be commended for the identification and very detailed presentation of all positive and negative points, as well as for the well thought planned actions for improvement short-term and long-term.

Suggestions for improving the research activities within the department are:

- **better maintenance and utilization of space allotted for research efforts**
- **adequate funding for maintenance and acquisition of instructional equipment in the classrooms and for research**
- **proper maintenance and operation of building facilities**
- **introduce a glass-shop facility**
- **introduce a mechanical-shop facility**
- **adequate funding for maintenance and technical personnel support for state of the art instruments**
- **attract high quality faculty members and secure start-up funding support**

- Initiatives in this direction undertaken by the Department

Some of the aforementioned improvements rely primarily upon the support by the Ministry of Education, the regional sector, as well as funding from the European Union.

D. All Other Services

APPROACH

- Quality and effectiveness of services provided by the Department.

Administrative and technical personnel are generally happy working within the Department. The technical personnel are of high caliber and most of them hold MS and PhD degrees. This assures high quality service to the teaching and research laboratories. **During our meeting, the non-permanent personnel (contractual employees) raised several concerns about the overall uncertainty of their employment under the new law. This unhappiness has nothing to do with the department, but it originates with forces residing in the ministry of education and the current structure of the law regarding higher education..**

Faculty and staff have access to scientific journals through a central library. This is a well-equipped and modern library with a reasonable collection of books and journals. A very positive recent development is the availability of remote access to on-line journals through VPN service to both faculty and students. However, **access to journals is interrupted for long time when the subscription is not paid by NKUA on time. Such interruptions are disruptive to research and should be avoided.**

The Department has a strong presence in the Internet and provides a wide range of information through its web pages to students and the community. Knowledge of computers and informatics is emphasized, and the department should be congratulated for introducing informatics as a core, no-credit bearing course. The e-class system is working well and provides easy access to course information and communication between students and faculty. The Department should be applauded on introducing electronic evaluation of courses. Currently, students evaluate a limited number of courses; further expansion of this evaluation process to all courses, including laboratory courses, should be pursued.

Access to high performance computing is limited and will benefit from major upgrades.

Support staff is unevenly distributed among the laboratories. We recommend that the needs of each laboratory should be reevaluated, and staff support and duties should be aligned with such needs in a more centralized manner.

Through its environmental chemistry laboratory, the Department is responsible for handling hazardous waste throughout the School of Sciences. This is great service to the School and is commendable.

The Kylikeion is located in an internal corridor of the building, which is problematic. Finding another location for the Kylikeion with access to the exterior would help create a meeting place for students and avoid smoking in the building.

IMPLEMENTATION

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

Admissions and administration of students are coordinated through a very capable and friendly student services administrative staff. Student services are quite efficient and

provide high-end services to students. The student services office is well organized with distributed responsibilities that allow the secretariat to stay open throughout the calendar year. The department should be commented on this student-friendly approach. The administrative staff should be given opportunities for additional training and professional development.

RESULTS

- Adequateness and functionality of administrative and other services.

There is a general feeling that there is an overinflated bureaucracy that slows down the research operation in particular. Ordering of chemicals and supplies takes much more paperwork than necessary and many operations are handled through paper exchange, many times by the faculty themselves. This is an unacceptable situation that slows down the research operation. **We realize that the department does not initiate many of these bureaucratic requirements, but NKUA and the Greek Ministry of Education should evaluate its current practices and continue to make changes that reduce and eliminate unnecessary, cumbersome bureaucratic steps that stifle progress, creativity and productivity.**

IMPROVEMENTS

- Proposed initiatives aiming at improvement.

The Department is located in relatively new facilities. The teaching laboratories are large and have plenty space to train the students. The quality of construction is not as high with hoods that are small and have glass fronts. The air circulation in the teaching laboratories is not balanced which makes the hoods suboptimal. The department also described issues related to placement of water pipes in close proximity to open wiring, which potentially can lead to electrical shorts. We recommend a regular evaluation of teaching laboratory infrastructure and hood suction capacity. **Safety of the laboratories should be emphasized and smoking should be prohibited including hallways, consistent with common practices in chemical facilities throughout the world.**

A general concern raised by the postgraduate students is the lack of funding. Many students end up self-financing their studies including travel expenses to and from work and sometimes their travel to conferences.

There are very few ERASMUS students visiting the department. A possible explanation, in addition to language difficulties, is the limited availability of university housing for students. The department should consider offering more courses in English at the postgraduate level to attract more researchers through the available mobility programs.

Collaboration with social, cultural and production organizations

The Department operates a robust seminar series with internal and external seminar speakers. Students should take advantage of this opportunity to augment their learning by attending seminars.

The Department is active in the organization of international conferences that attract quality researchers.

The Department has a range of collaborative activities with social, cultural and production organizations. Among others, it reaches high school students through career days, faculty give public lectures, organizes chemistry poster days, and participated in the International

Year of Chemistry. Such activities are very positive and should be continued. Further, there exists a relationship with the Association of Greek Chemists, EEX, with extended service to the EEX provided by faculty of the department. The department should continue to cultivate this interaction for the benefit of the profession and the students.

Several laboratories are providing services beyond the Department through chemical and food analysis. A direct benefit of these services is support of the infrastructure of the department and training of students in modern techniques and ISO certification regulations.

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

As observed at other university chemistry departments in Greece, the inhibiting factors at the state level are (a) the lack of frequent funding cycles, positions, and support from the ministry of

education; (b) the almost non-existing funding and support from the General Secretariat of Research and Technology; (c) the lack of fellowships and/or teaching assistantships for the master's and doctoral programs; and (d) the increased competitive level for external funding.

The potential inhibiting factors at the institutional level in the chemistry department of the University of Athens are:

- (a) the lack of any crystallographic facility;
- (b) the lack of proper maintenance and technical personnel support of the experimental facilities;
- (c) unnecessary and convoluted bureaucratic procedures;
- (d) lack of flexibility for creative solutions (e.g., new inter-departmental initiatives);
- (e) lack of proper and timely actions to address vital safety concerns (e.g., non-existing safety exits in sections A and C of the building);
- (f) lack of reliable experimental hoods (e.g. in the laboratory of Organic Chemistry).

The potential inhibiting factors at the departmental level are:

- (a) the weaknesses identified in the Biochemistry Laboratory and the Food Chemistry

Laboratory;

- (b) the lack of a shared instrumental facility to facilitate the transparent use of equipment;
- (c) The number of undergraduate students when it exceeds the departmental capacity of 100, (a number determined by the ministry of education.)
- (d) the perceived departmental image favoring inbreeding (albeit wrongly).

Specific suggestions to address the aforementioned inhibiting factors are:

1. It is imperative that a state of the art diffractometer with a Charge Coupled Device (CCD) or at least an area detector technology be acquired. The need for modern X-ray instrumentation in a good chemistry department that is also available to interdepartmental use cannot be overemphasized.
2. Encourage a shift in the teaching and research directions to chemical biology, catalysis and materials chemistry.
3. Introduce transparent metrics, based on documented departmental excellence, for the distribution of funds at the institutional and state level.
4. Institute fellowships and teaching assistantships at the master's and doctoral levels. Initiate and sustain regular cycles of funding mechanisms from the Ministry of Education and the General Secretariat of Research and Technology.
5. Establish and coordinate intra- and inter-departmental research proposals for competitive external funding opportunities so as to promote the creation of internationally recognized centers of excellence.

F. Final Conclusions and recommendations of the EEC

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*

- In spite of the present adversity in funding by the state, the chemistry department of the University of Athens has established a quality research and teaching program generating high quality graduates.

It is recommended that pre-requisite courses need be implemented in anticipation that this will improve the overall performance of the undergraduate students.

- Most faculty members have active research programs. The senior faculty maintain a respectable international research program; it is also gratifying to observe that most of the younger faculty members appear to lead vibrant research initiatives.
- Most faculty members pursue creative and modern teaching initiatives as is apparent in

the revised curricula.

- The best Ph.D. graduates are sought after for postdoctoral positions nationally and abroad, and some of them follow academic careers at domestic universities.
- The existing building facilities, experimental laboratories space for teaching and research, the classrooms, and the office space are very appropriate. However, there exist serious safety concerns that require immediate action by the institution.
- While the existing experimental infrastructure appears generally satisfactory in most areas of chemistry, there is a real need for common major instruments that presently are unavailable.

Specifically there is a need for a state of the art X-Ray diffractometer, a higher field NMR spectrometer, a state of the art Magnetometer and an Electron Paramagnetic Resonance spectrometer. Provisions for appropriate technical support, possibly through reallocation of existing staff, must be made.

The external evaluation committee has the following recommendations:

- **The research directions of modern chemistry departments currently are heavily influenced by chemical biology and materials chemistry. In the chemistry department of the University of Athens the existing modest efforts in these directions must be enhanced.**

There exist faculty members with training and interests in materials chemistry. They are in laboratories that may not be appropriate for their scientific expertise. These faculty members could be the nucleus of a new laboratory.

The lack of a chemical biology laboratory is apparent. Such a laboratory may be generated by changes within a pre-existing biochemistry lab. The present biochemistry laboratory is weak and with forthcoming retirements could be on the verge of collapse. **It would be imperative for the department to hire young biochemists, and potentially reassign some faculty members with bio-inorganic, bio-organic, and bio-analytical research and teaching interests in the laboratory of biochemistry. Any departing faculty members should be replaced by faculty with interests and training as stated above.**

- **Pursue and expand intra- and inter-departmental collaborative research efforts (e.g., Biology, Medicine, Materials) that follow the new directions.**

- Administrative and technical support in research is needed [Reduced Bureaucracy would further improve the research environment].
- Adequate funding and better distribution of internal funds - competitive grants to younger scientists - start-up grants would benefit the department.
- Central, departmental administrative support for the management of research projects is required.
- Enhance motives for mobility - Extraversion of under- and post-graduate students, not only for outgoing students, but also better administrative support for incoming students and researchers [for instance there is not an organized structure for incoming student residence].

- Re-evaluation of the undergraduate curriculum should be performed (with the view to substantially reduce the number of undergraduate courses, by combining and updating).
- Prerequisite modules are needed at the undergraduate program.
- Reconsideration of existing master courses and introduction of new ones according to contemporary scientific trends and applications.
- Increase the number of hoods (keep vacuum lines and distillation apparatus in the hoods) and upgrade.
- Chemicals store rooms that meet modern safety standards.
- A change in the attitude for the role and contribution of postgraduate students and exceptional undergraduate students. They should help substantially in teaching activities and laboratory activities with prompt and consistent reimbursement.

Departmental infrastructures for "large and medium scale" facilities instead of laboratory fragmentation and development of a departmental culture in administration. Common room (for instrumental analysis) with trained personnel, each one dedicated and responsible for each instrument and common room for reagents and consumables. It is imperative that a glass blowing facility, an electronics shop and a machine shop are available to the chemistry department.

- *the Department's readiness and capability to change/improve*

The external evaluation committee attests that the members of the Department of Chemistry are aware of the current and future needs and have themselves proposed many of the aforementioned suggestions for improvement as evidenced in the internal evaluation report and during the site visit.

- *the Department's quality assurance*

The department's quality assurance depends on the continued excellence of the senior faculty and to a greater extent to the growth, recognition, and success of the younger faculty. The vibrant younger researchers represent the future of the department.

The Members of the Committee

- | Name and Surname | Signature |
|---------------------------------------|-----------|
| 1. Professor Dimitris Coucouvanis | _____ |
| 2. Professor Dimitris S. Argyropoulos | _____ |
| 3. Professor Leonidas Bachas | _____ |
| 4. Professor Christodoulos A. Floudas | _____ |
| 5. Professor Athanassios Giannis | _____ |