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ΑΝΩΤΑΤΗΣ ΕΚΠΑΙΔΕΥΣΗΣ

HELLENIC REPUBLIC

H.Q.A.A.

HELLENIC QUALITY ASSURANCE AGENCY
FOR HIGHER EDUCATION

EXTERNAL EVALUATION REPORT

COMPUTER SCIENCE DEPARTMENT

UNIVERSITY OF CRETE

December 2011

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External Evaluation Committee

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

1. Professor George Karypis   (President)

   University of Minnesota, USA

2. Dr Theodoros N. Arvanitis

   University of Birmingham, UK

3. Dr Nikolaos Boulgouris

   Brunel University, UK.

4. Professor Maria Petrou

   Center for Research and Technology Hellas, Greece

5. Professor Nikolaos D. Sidiropoulos

   University of Minnesota, USA

Introduction

I. The External Evaluation Procedure

- *Dates and brief account of the site visit.*
- *Whom did the Committee meet ?*
- *List of Reports, documents, other data examined by the Committee.*
- *Groups of teaching and administrative staff and students interviewed*
- *Facilities visited by the External Evaluation Committee.*

The External Evaluation Committee (EEC), consisting of Professors Karypis, Arvanitis, Boulgouris, Petrou and Sidiropoulos, arrived to Heraklion on Monday, November 28th, 2011 and was met at the airport by two members of the Department who took them to their hotel. The same evening, the EEC met the Chairman of the Department, Professor Panos Trahanias, and the Vice-Rector for Human Resources of the University of Crete, Professor Kostas Tzanakis. Some initial discussions took place for more than 2 hours and the agenda of the visit on the following day was finalized.

The EEC visited the Department on November 29th and 30th, 2011. On the first day, the EEC attended presentations by Professor Trahanias, on the general structure of the Department and the undergraduate program of studies, by Professor Bilas, on the postgraduate programs, as well as presentations by Professors Hristofidis and Nikolaou on the Greco-French and the Erasmus-Mundus programs of graduate studies, respectively. The Department made also available to the EEC samples of coursework, lecture notes, evaluation forms, and exam papers.

The EEC met with several students of the Department by visiting a 1st year laboratory, and a 3rd year lecture course, as well as the offices of postgraduate students, where several MSc and PhD students were working. The EEC met with more than 20 students in each occasion, randomly selected, all of which were very willing to talk to its members and express their views. The students' committee representatives had been invited by the Department to talk to the EEC and initially they had declined to participate in the process. Unfortunately, due to the initial reluctance by the students' representatives to meet with the EEC and the EEC's unscheduled visits to meet students in laboratories and classrooms, the students' representatives had left by the time the EEC attempted to reach them.

The EEC also met with three members of the Department that offer technical support for the teaching laboratories, and with three out of the five members of the Secretariat. Finally, the EEC spoke to six members of staff at the Associate and Assistant professor level, individually. During those meetings, the EEC members discussed matters related to career development and the overall working environment in the Department. Afterwards, the EEC had a group discussion with the senior faculty. The visit was completed at 7:30pm.

On the second day, the EEC visited the new building to which the Department is scheduled to move by the summer of 2012, and the Institute of Computer Science (ICS) at the Foundation for Research & Technology Hellas (FORTH), that houses research facilities utilized by the faculty and their graduate students. On the same day, the Department made available to the EEC all documentation requested, namely detailed information on the research grants held by members of the Department, the information package offered to persons with special needs, details on the bilateral agreements with foreign universities, and copies of presentations made on the research activities. The visit on the second day was concluded by the EEC conferring briefly between themselves and finally giving to the Department Chairman an oral preliminary feedback.

The EEC considers that the information it gathered and the material that was made available for their perusal allowed them to form a solid view of the strengths and weaknesses of the Department. However, the EEC felt that the central University administration should have been more involved during this assessment effort, by meeting with the EEC and articulating how the Department fits within the mission and strategic plan/vision of the University of Crete.

The EEC was impressed by the team spirit it detected among academic members of the Department, support personnel and students, who although randomly picked, had only praises about their teachers and the administrative/support staff.

II. The Internal Evaluation Procedure

Please comment on:

- *Appropriateness of sources and documentation used*
- *Quality and completeness of evidence reviewed and provided*
- *To what extent have the objectives of the internal evaluation process been met by the Department?*

The EEC felt that the internal evaluation process has overall met its objectives. To a large extent the internal evaluation process was based up on reliable data and sources. However, the EEC felt that the Department had in certain areas of the report overemphasized unofficial third-party rankings.

A.1. Curriculum of Undergraduate Program

APPROACH

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

The overall aim of the undergraduate curriculum is to provide a comprehensive program in computer science, which includes a balanced combination of theoretical foundations and scientific methodology for the development of software-intensive systems (including elements of engineering hardware) that meet socio-technical needs.

The stated specific objectives of the Department's undergraduate curriculum are:

1. Teaching delivery, based on high quality benchmarks and driven by international standards.
2. Curriculum content that follows the modern scientific and technological perspective of computer science, systems engineering and telecommunications.
3. A pragmatic and applied approach in instruction, including intensive laboratory-based teaching. This approach encourages creative and research-inspired understanding of science and technology.
4. A balanced combination of depth and breadth of scientific knowledge in the field.

The achievement of these objectives is realized by: a) a well-structured set of core courses covering the fundamental knowledge in computer science and associated engineering disciplines, b) the availability of advanced elective courses, inspiring students with specialized knowledge in cutting edge technology, and c) the provision of enhanced academic experience, which is research-led.

- *How were the objectives decided? Which factors were taken into account? Were they set against appropriate standards? Did the unit consult other stakeholders?*
- *Is the curriculum consistent with the objectives of the Curriculum and the requirements of the society?*

The goals and specific objectives of the curriculum have been derived based on the following three elements:

1. The current European and American University curricula profiles in the field of "Computer Science and Engineering".
2. The needs of the market (both local and international) for the employability and progression of a typical scientist/engineer, resulting from the above mentioned perspective in the field of computer science.
3. The appropriate experience required for progression in research-led career in the fields of computer science and technology.

The undergraduate program follows, in principle, the guidelines of various international Computer Science and Engineering scientific associations; learned societies and professional bodies (e.g. IET, IEEE, ACM, etc.). The content of the core undergraduate courses and the enhancements provided from the course electives satisfies international benchmarks of academic training in the field, while it is well informed of current advances both in research and technology innovation. The Department has consulted local and international stakeholders including academic collaborators, industrial partners and alumni in the process of setting and revising the goals and specific learnable objectives of the curriculum. In addition to the above mentioned stakeholders, the Department has made an effort to

consider the regular feedback of students on the content of the course, while created a comfortable atmosphere for faculty and students to exchange ideas on curriculum needs and potential revisions.

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

Overall, the learnable objectives of the curriculum fulfill the overall requirements of science and technology education for the Greek society, while they are consistent with social and market-driven needs at a national and international level.

- *Has the unit set a procedure for the revision of the curriculum?*

There is a clear process of regular evaluation and revision of the curriculum through the Undergraduate Studies Committee that provides appropriate recommendations to the General Assembly of the Department. The Department has implemented a substantial revision and enhancement of their curriculum through an EU/National Funded Program (ΕΠΕΑΕΚ «ΣΠΟΥΔΗ –Ενίσχυση Σπουδών Πληροφορικής») during the period 2003-2008. The curriculum was enhanced with 19 new courses that cover the scientific and technological advances in the field and took into consideration the socio-technical needs of the modern society.

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

The overall implementation of the curriculum is effective in meeting the goals and specific objectives aforementioned. There is a clear structure of 25 core courses in computer science and associated science & engineering disciplines, two elective courses outside the main discipline and seven elective courses on more specialized discipline-related subjects. There is a good number of appropriate pre-requisite courses to determine progression.

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

The curriculum conforms with international standards for this area of academic study (see comments above) and is compatible with the basic prerequisites of the recommendations of the Bologna Accord, while it clearly implements the ECTS scheme for credit transfer.

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

The curriculum is well defined and articulated in the Study Guide of the Department. Each course is clearly defined in terms of overall aim and learnable objectives, coverage of knowledge domain, teaching and delivery approach, examination method and feedback.

- *Is the curriculum coherent and functional?*

The undergraduate curriculum is coherent and functional for the needs of a typical "Computer Science and Engineering" degree. Not only it adheres to international recommendations and professional benchmarks, but it provides a comparable and competitive set of skills to graduates as those from equivalent European- and North America-based universities.

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

The course outlines clearly identify the context and constraints of each course. In our opinion, there is an appropriate planning both in knowledge content, practical laboratory experience, problem-solving and other relevant skills, while the time constraints for each course have been carefully considered.

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

The profile of staff is appropriate for the delivery of a professionally recognized course, while the current human resources clearly cover the requirements for implementation and delivery of the curriculum.

RESULTS
- *How well is the implementation achieving the Department's predefined goals and objectives?*
- *If not, why is it so? How is this problem dealt with?*

The curriculum is well-implemented and allows the graduates of the Department to either pursue graduate studies or to enter the workforce. This is corroborated by the post-graduation employment paths of the Department's alumni.

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

The Department has a good understanding of its teaching achievements, quality of the overall degree provided and has a good knowledge of potential risks and constraining factors for the future.

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

Currently the curriculum is up to date. The Department has shown competence in past revision of their curriculum structure and context, and we feel that there is a well-established

pipeline, through the Undergraduate Study Committee, for curriculum evaluation, revision and enhancement.

- *Which improvements does the Department plan to introduce?*

Though the Department does not have any immediate plans to improve its curriculum, it is regularly following current advances in the field and the members of the faculty try to infuse their courses with the latest scientific/research advances, while considering socio-economic factors and constraints.

A.2. Curriculum of Graduate and Doctoral Program

APPROACH

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

The overall goal and specific objectives of the undergraduate program are also extended in the MSc and PhD studies. We are including both these levels together, here, as elements of the curriculum are shared by both their MSc and PhD graduate programs.

In addition to providing a deeper understanding of the Computer Science discipline, the MSc and PhD programs are designed to also achieve two additional research-related objectives:

1. To provide high-quality research training through specialization in cutting-edge and emerging areas of computer science and associated engineering disciplines.
2. To create an inspiring research environment in collaboration with ICS at FORTH.

- *How were the objectives decided? Which factors were taken into account? Were they set against appropriate standards? Did the unit consult other stakeholders?*
- *Is the curriculum consistent with the objectives of the Curriculum and the requirements of the society?*
- *How was the curriculum decided? Were all constituents of the Department, including students and other stakeholders, consulted ?*

The graduate program is research intensive and tailored to the Department's research areas. The areas of teaching in the MSc program augment those of the undergraduate program, and the MSc program follows a similar strand-based approach that parallels the Department's research areas.

- *Has the unit set a procedure for the revision of the curriculum?*

The Department uses set procedures through the Postgraduate Study Committee and the General Assembly for curriculum updates and revisions. Enhancements of the MSc courses have happened as part of the ΕΠΕΑΕΚ project «ΣΠΟΥΔΗ –Ενίσχυση Σπουδών Πληροφορικής», during the period 2003-2008.

IMPLEMENTATION

- *How effectively is the Department's goal implemented by the curriculum?*
- *How does the curriculum compare with appropriate, universally accepted standards for the specific area of study?*
- *Is the structure of the curriculum rational and clearly articulated?*
- *Is the curriculum coherent and functional?*
- *Is the material for each course appropriate and the time offered sufficient?*
- *Does the Department have the necessary resources and appropriately qualified and trained staff to implement the curriculum?*

For the MSc training program, we observed a similar approach and efficiency in implementation. However, there is a high number of elective courses (65 courses in total) which exceeds the typical number of electives for similar type of international graduate programs. Nevertheless, the teaching capacity in terms of personnel and associated skills is available.

The PhD training is of high standard and relates to the research quality outputs of the Department. The requirement that a student must have an MSc degree prior to entering the PhD program, although highly desirable in terms of research quality and outputs, leads to a program whose duration is long, especially when compared to international standards. The Department is aware of this issue and there is ongoing discussion on potential alternate approaches.

RESULTS

- *How well is the implementation achieving the Department's predefined goals and objectives?*
- *If not, why is it so? How is this problem dealt with?*

The Department has been very successful in achieving its overall objective of producing high caliber MSc and PhD students. This is evident by the large size of their graduate program (especially in the MSc program) and the successful post-graduation career paths of their graduates. In addition, the Department has implemented very interesting EU (Greek-French Program) and international exchange schemes (ERASMUS-MUNDUS) for MSc and PhD studies.

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

The Department is aware that its success stems from the facts that it relies on a high-quality and intensive curriculum and integrates the coursework with cutting edge research from an early stage. The Department is also aware of potential risks (e.g., continue to attract and retain highly qualified faculty and bright and motivated students) and constraining factors for the future (e.g., economic uncertainty).

IMPROVEMENT

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

The Department is regularly following current advances in the field and its faculty try to inform and update the content of the graduate courses according to the scientific/research advances in the field and the employability needs of their graduates.

In addition, the Department is cognizant of the fact that its Doctoral program is considerably longer than comparable programs in Europe and North America, which might hinder its ability to attract students.

- *Which improvements does the Department plan to introduce?*

The Department is considering the issue of the long duration of its PhD program and its close integration to the MSc program in terms of timing constraints. There are ongoing discussions on how to create and implement a more flexible approach to improve on these timing issues.

B. Teaching

APPROACH:

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

The Department's policy with regard to teaching approach is based on the combination of applied and technical education with research and creative thinking. The followed teaching methodology relies on standard teaching instruments for knowledge transfer and assessment.

- *Teaching methods used*

The Department has deployed a variety of teaching, learning, and assessment methods, including lectures, tutorials, lab sessions, coursework, an optional off-site project, and a compulsory final year project. These teaching strategies are internationally considered very suitable for a computer science department.

- *Teaching staff/ student ratio*

The Department has 950 enrolled undergraduate students and about 25 academic staff. However, roughly half of the enrolled undergraduate students are beyond the normal duration of studies (4 years). If one considers the 493 undergraduate students within the normal period of study, plus the 189 post-graduate students, the student/staff ratio is about 27 students per member of academic staff. This student staff ratio is considered good by international standards.

- *Teacher/student collaboration*

In order to form an opinion about the teaching practices followed and the way these are experienced by the students, the EEC visited the labs during lab sessions and attended part of a lecture. The EEC spoke to academic staff, teaching assistants, and a large number of students in order to record their views and discuss issues associated with their teaching experience.
The students are satisfied with the quality of teaching as well as with the effort made by the lecturers. It is reassuring that lecturers are believed to like their job and to be enthusiastic about their teaching. In other relevant comments, students mentioned that they normally have their e-mails replied by academic staff within the same day, while many students explained that they felt perfectly comfortable to call their lecturers on a number of occasions. The above constitute evidence that teacher/student collaboration is particularly good and conducive to a high-quality teaching and learning experience for the students.

- *Adequacy of means and resources*

The means and resources deployed within the teaching process are sufficient. The unavailability of well-organized library that remains open until late is a problem for most of the students while the condition of some of the classrooms and labs is not very good, as the EEC has seen during the visit. It is expected, however, that these problems will diminish within the foreseeable future (summer 2012) when the Department will migrate to the new and considerably more spacious building.

- *Use of information technologies*

Information technologies, such as PCs, laptops, and data projectors, are routinely used for the delivery of lectures and for conducting work in the labs. Each course has its own web-page and mailing list, with which information about the course as well as teaching material can be disseminated to the students. In some courses, lectures are recorded using a tablet PC or a video-camera. Furthermore, coursework reports are submitted electronically, which simplifies the submission process for the students, allows the easier detection of plagiarism incidents and, therefore, acts as plagiarism deterrent.

- *Examination system*

The examination system is based on a final exam preceded by tests taking place during the term. The final mark is a weighted sum of the exam marks and the coursework mark achieved by the students through their coursework. This format largely contributes to keeping the students focused, while it spreads the accumulation of marks throughout the semester, effectively eliminating the possibility of a student being severely disadvantaged in case they were unfortunate enough to be ill on the day of an exam. Furthermore, repeat examinations take place in September for students who have failed on their previous attempt.

IMPLEMENTATION
- *Quality of teaching procedures*

The quality of teaching procedures is high. In some cases, a course is taught on both fall and spring semester in order to make sure that classes are of small size. Overall, the students were satisfied with the way the courses were taught. However, one of their concerns was that, in some cases, there appears to be a lack of uniformity on how the material of the same course is delivered (e.g., focus, difficulty, coursework, exams, etc.) across different semesters. Another issue that may warrant some attention arises from the EEC's observation that there are instances of sequentially-dependent assignments, i.e., a situation in which the next deliverable of a coursework depended on the solution of the previous coursework. This practice should better be avoided in order to allow more flexibility for the students.

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

Teaching materials and resources are of high-quality and fit for purpose. The labs are well-equipped with computers, monitors, network equipment, electronic design boards, and FPGA boards. These facilitate the efficient delivery of lectures/tutorials, enable applied work during lab sessions, and promote the comprehension of the taught material by the students.

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

The EEC has seen evidence of high-quality lecture presentations, challenging student assignments, mid-term and final exams. The end-of-term evaluation form includes provisions for the students to comment on the quality of the course material. The undergraduate and graduate studies committees can recommend changes based on these comments and the latest advances in the field.

- *Linking of research with teaching*

There is a strong link between teaching and research at all levels of studies. At the undergraduate level, the students are given the opportunity at their later years of their studies to participate in the Department's research projects. At the MSc level, teaching and individual projects are research intensive. During these projects the students are heavily involved in the research activities of their selected laboratory.

- *Mobility of academic staff and students*

The Department has an excellent track record of collaborations with highly-regarded international institutions. Such collaborations are those with the Joseph Fourier university (Grenoble I) and the Paris – Sud university, with which the department has a joint graduate program. Furthermore, the Department participates in an ERASMUS Mundus program with the Stuttgart and Tilburg universities in the area of "Service Engineering". Finally, through the ERASMUS and SOCRATES programs, the Department has an ongoing collaboration with 34 European Universities in 16 European countries. The above activities provide clear evidence of student mobility, with a significant number of students participating in the above programs and a number of staff visiting international institutions.

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

The Department uses a standard teaching evaluation form within which it aims to collect the opinions of the students with regard to teaching matters relevant to the students' experience in attending Departmental courses. The form requests information about the student, the course, the infrastructure, the lecturer, and the teaching assistants. Although the form appears to be suitable, the student participation rate in filling out the review forms is very low. The Department needs to take actions to encourage the students to participate in this evaluation process. One way of doing that is to better communicate the changes that the Department undertook in response to prior students' evaluations.

RESULTS
- *Efficacy of teaching.*

Considering:
a) the overall satisfaction of the students in relation to the knowledge they acquire,
b) the enthusiasm and dedication of the academic and technical staff in the teaching process, and
c) the fact that the Department's graduates are sought after at an international level,
the conclusion that can safely be reached is that teaching objectives are largely met. However, there is evidence of low lecture attendance and strategies should be devised in order to promote attendance and consolidate its benefits.

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

There are discrepancies in the success/failure rates among the different courses, primarily at

the undergraduate level. Courses early on in the undergraduate degree program have higher failure rates than the rest. In addition, courses that have a strong mathematical, theoretical, or hardware component have also a higher failure rate. These trends may be attributed to the fact that the first and second year students are not prepared for the rigors of University academic life and the poor preparation on core subjects at the high-school level. However, the Department needs to strive to ensure uniformity in the complexity of the courses. One way this can be achieved is to enforce standards in the format of the final exam questions.

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

Students graduating in exactly four years are in the minority (less than 4% of the admitted students) while the number of admitted students graduating by the end of the 6th year of their studies is between 39%—49% (for students admitted between 2002 and 2005). A significant number of students take more than six years to graduate. For example, for the class of 2002—2003 for which sufficient statistics are available, there were 21 and 6 students that graduated in seven and eight years, respectively (corresponding to 15% and 4% of the admitted students). This is of concern since it represents an increase of more than 50% over the four-year minimum. These statistics are aligned with the situation in other Greek universities. However, they are not justifiable if seen from an international point of view.

There is limited variation in the final average mark of graduates with the majority of them achieving a mark between 6.0-7.0, while only a very small number of students achieve a mark higher than 8.5. Such limited variation is expected, due to averaging. However, the average mark is somewhat low. This may be attributed to the overall difficulty of the courses and the high standard that the Department is striving to achieve. Some students raised this issue (i.e., the courses at the Department are harder than those at other CS departments) and suggested that there has to be a mechanism to normalize the grades across the Greek CS departments. The EEC believes that this is something that needs to be done at the national level and the Department should not lower its high standards.

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

The Department has an understanding of issues of this sort and is trying to resolve them through discussion and actions taken at the Study Committees and the General Department Assembly.

IMPROVEMENT
- *Does the Department propose methods and ways for improvement?*
- *What initiatives does it take in this direction?*

The Department does not appear to have a specific plan to further improve the effectiveness of its teaching. However, the EEC believes that the collaborative atmosphere between staff and students as well as the good collegiate relationships between staff has set the basis for the identification of problems and for taking steps to rectify them.

C. Research

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

APPROACH

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

The Department considers research to be a critical part of its mission and, through its integration with graduate education, an integral part to its overall educational mission as well. The Department's overall research objective is to focus on leading edge research in various areas related to both core Computer Science as well as current and emerging areas of interdisciplinary informatics research.

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

It was not evident to the EEC if the Department has set internal standards to formally or informally assess the quality of its research.

IMPLEMENTATION

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

The research within the Department is organized around nine thrusts, each structured in the form of a research laboratory. Each laboratory contains 1-4 faculty members and each faculty member is primarily associated with one of these laboratories. However, the boundaries between these laboratories are not rigid and there is a substantial amount of cross-laboratory collaborations among the faculty members. These research laboratories serve as the fundamental mechanism by which the Department promotes and supports its research activities. Each laboratory contains a mixture of senior and junior faculty members, with the senior faculty acting as mentors to the junior ones on issues related to graduate student advising, research funding, and proposal writing. Each laboratory also serves as the host for the MSc and PhD graduate students advised by the faculty members and working on research projects related to the laboratory's research thrust.

The research in the Department benefits substantially by its association with ICS at FORTH. ICS provides to the Department access to high-quality research facilities.

The Department has a policy to support and foster the research of junior faculty. This includes preferential teaching assignments geared towards graduate classes in the faculty's research area and through the ICS, seed funding for hiring graduate research assistants.

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

The Department's current physical infrastructure is by far inadequate to support its extensive and active research program. If the Department did not have access to the infrastructure provided by ICS, its research program would have been substantially hindered. Moreover, its ability to recruit outstanding faculty members and graduate students will have also suffered.

- *Scientific publications.*

The Department promotes the broad and timely dissemination of the scientific results of the

research performed by its faculty members and their advisees. To that extend it strongly encourages the publication of the results in high-quality journals and selective peer-reviewed conferences, symposia, and workshops.

- *Research projects.*

The Department encourages its faculty members to both initiate and participate in various research projects. It expects its faculty to actively seek external research funding from national and international sources in order to support their research. The Department supports these research projects through three mechanisms. First it provides the physical infrastructure through the affiliation of its faculty members with ICS. Second, by recruiting faculty members with proven, high-quality, and internationally recognized research track record. Third though the recruitment and training of high quality graduate students.

- *Research collaborations.*

The Department believes that research collaborations are essential for state-of-the-art research in Computer Science. These research collaborations need to be performed at multiple levels: both within and across disciplines as well as within and across countries. To that extend it fosters collaborations among its faculty members, across disciplines, across Greek universities, and across universities abroad. The Department employs various mechanisms for fostering these collaborations including exchanges of faculty members and researchers with other national and international universities and research institutions, participation in joint degree programs, creation of inter-disciplinary graduate degree programs, and participation in international joint degree/graduate student training programs.

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

The Department has been very successful in achieving its overall research objectives. Its research program is broad, substantial, and of high quality. Nearly all the faculty are research active, participating in projects, advising graduate students, and publishing in journals and conferences. This sustained research activity has made the Department one of the best Computer Science departments in Greece with a strong international reputation of research excellence and an asset to Greece.

- *Scientific publications.*

The Department has been very successful in disseminating the results of its research to the leading journals and conferences in the field. For the three years spanning 2008—2010, the Department's faculty, graduate students, and affiliated researchers have published 105 journal papers, 259 conference papers, and 57 other publications. The majority of these publications have been in high-quality journals published by the key Computer Science professional societies (ACM & IEEE) and in some of the most selective and top peer-reviewed conferences of the discipline.

- *Research projects.*

The Department has been very successful in attracting funded research projects from both national and international sources. Since 2008, the Department has secured 46 individual research projects. The research funds from these projects has been around €4.5M/year out of which more than 92% of the funds came from the European Union. This level of funding translates to €180K/faculty, which is comparable to the funding levels of leading Universities in Europe and North America. These projects are well-distributed among the Department's laboratories and the Department's faculty members. Moreover, since the median and average annual amounts across the 46 projects is very similar (€85K and €98K, respectively), the above figures are not skewed by the presence of few large research projects.

- *Research collaborations.*

The Department has established strong research collaborations with faculty members from other Departments within the University of Crete, other universities in Greece, universities and research centers in Europe, North America, and Asia, and researchers from other institutes at FORTH. According to the Departments own survey, each of the Department's faculty have on the average 15 collaborators across the above institutions. In addition, the Department as a whole or its various research laboratories and faculty are very active in a number of intra-European research groups such the European Research Consortium of Informatics and Mathematics (ERCIM), the network of excellence in systems security (SysSec), the network of excellence on high-performance & embedded architecture & compilation (HiPEAC), and the European Research Center on Computer Architecture (EuReCCA).

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

The Department's research is heavily focused towards systems work and as a result there is a strong component in developing working prototypes/demos for evaluation and validation purposes. To that end, the Department has been very successful in delivering and disseminating its research products and outcomes in the form of working systems that can be either deployed directly or are very close to being deployable in functional forms and commercial settings. The research on robotics, computer vision, distributed computing, signal processing, networking, computer architecture, VLSI, and human computer interaction are just some examples of this work. For instance, the Department's robotics/vision and HCI groups have deployed their results in various museums nationwide, where they are used for both demonstration purposes and also for enhancing the user's experience as he/she visits the sites. In addition, there is broad effort by the various laboratories and faculty to distribute their research in the form of software and hardware artifacts. This is very important and significantly enhances both the visibility of the department as well as the applied impact of the research. Finally, the Department's faculty have been involved in international standardization efforts and were instrumental in the development of the CIDOC Conceptual Reference Model (ISO/DIS 21127) for semantic interoperability of museum, archive, and library information.

In terms of securing and protecting its intellectual property the Department though ICS has filed for 15 patents. Three of these have been granted and the remaining are pending. These patents and patent applications cover various areas including digital circuits, signal processing, networking, parallel computing, and information systems. However, there seems

to be no consistent approach regarding intellectual property and its protection.

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

The Department's high-quality research is well-regarded both within Greece as well as internationally. This is evident by a number of different and important factors. First, the scientific publications produced by the Department's faculty are highly cited. According to the Department's own assessment, the Department's average h-index is 17 (Google Scholar), which given the age and rank of its faculty members is comparable with other strong national and international CS departments. In addition, since 2008, seven of the conference papers co-authored by the faculty members and their students have received best paper awards. Second, many of its faculty members have received various prestigious awards including the Marie Curie excellent teams award, the Marie Curie fellowship awards, the IBM invention achievement award, the IBM outstanding innovation award, the IBM outstanding innovation award, the IBM faculty award, and the Chevalier de l'Orde de Palmes Academiques award. Third, the faculty members serve in various journal editorial boards, participate in the organization of research conferences as chairs, co-chairs, and program committee members, and belong in the field's professional societies. Fourth, its graduate students have continued their PhD studies at top universities in Europe and US; and a large number of its PhD graduates have positions at Universities and research centers.

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

The Department has identified a number of directions along which is planning to further improve its research activities. These directions include: expand its PhD graduate program; further strengthen its existing research thrusts and expand on the emerging areas of cloud computing, green computing, and cognitive systems; expand collaboration with other universities and industry; and continue to increase its externally funded research projects.

- *Initiatives in this direction undertaken by the Department.*

Thus far, the Department has focused on pursuing its vision on how to improve its research via targeted faculty recruitment in the identified research areas.

D. All Other Services

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

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

The Department takes seriously its teaching commitments. The students were very happy with the way the courses are delivered and the access they have to their teachers.

The Department also takes special care of junior members of staff, facilitating their career progression.

The Department has had a policy to simplify its procedures for a long time.

The Department does not appear to have a specific policy to increase the presence of students on campus.

IMPLEMENTATION
- *Organization and infrastructure of the Department's administration (e.g. secretariat of the Department).*
- *Form and function of academic services and infrastructure for students (e.g. library, PCs and free internet access, student counseling, athletic- cultural activity etc.).*

The long-standing policy of the Department to simplify its administrative procedures has born its results. The Secretariat is fully web-based, with the students expressing particular satisfaction with the way they are treated by its members and the ease by which they can deal with it.

The Department suffers from poor premises, and out of date equipment, none of which is its fault. A large number of the classrooms are housed in prefab structures. The library, due to lack of personnel, is open only during Monday-Friday and only until 3:30pm, even during the period of exams! There are hardly any reading rooms, and no recreational facilities. The toilets were clean, but rather in poor state of repair. There is no Dormitory for students to live and there is no accommodation office to help students find accommodation. There are no recreational facilities on campus.

On the plus side, there is a university office for persons with special needs, which offers counseling to students and information to lecturers to detect signs of panic and deal with people with dyslexia and hearing problems. Due to the age of the buildings, there does not seem to be easy access to persons with mobility problems.

The Department assigns to each new student a personal tutor/advisor, to whom the student may turn for advice at any stage of the duration of their studies. However, it appears that hardly any of the undergraduate students make use of this facility.

RESULTS

- *Are administrative and other services adequate and functional?*
- *How does the Department view the particular results.*

The administrative services seem to be excellent. The Department even supplies the email facility to its students long after their graduation. This is an excellent policy, which allows it to keep contact with its alumni.

The Department is aware of the problems that arise from the inadequacy of its buildings and facilities, but feels it is beyond its control to do anything about them.

IMPROVEMENTS

- *Has the Department identified ways and methods to improve the services provided?*
- *Initiatives undertaken in this direction.*

The Department believes that a lot of the problems identified above will be solved when they move to their new premises in a few months' time. The new premises are near the University athletic complex and the Student Center. There are also several spaces reserved for recreational activities. There is a large room reserved for a reading room, although the funds to furnish it have not been identified yet. The main university library is also nearby. Unfortunately, there is no provision for a dormitory on campus yet, although the new building is far from the city and there is plenty of space to have one built.

Collaboration with social, cultural and production organizations

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

The Department has strong links with local institutions, contributing significantly to the cultural and social activity of the local community. For example, the Department, in association with ICS, has a robotic exhibit at the local technological museum, it holds open days for school children to come and visit their research labs, while members of the Department give public talks and write articles for the local press. In addition, as the Department is at the forefront of information and communication technologies, over the years it has been providing extensive and essential services to the local authorities, the local community, and the nation as a whole.

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

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

Please, comment on the Department's:

- *Potential inhibiting factors at State, Institutional and Departmental level, and proposals on ways to overcome them.*
- *Short-, medium- and long-term goals.*
- *Plan and actions for improvement by the Department/Academic Unit*
- *Long-term actions proposed by the Department.*

The Computer Science Department was founded in the early '80s, at a time when there was only one other Department with a similar focus in Greece. Thanks to the vision and know-how of its founders, the innovative and youthful spirit of University of Crete, and a fortuitous state of affairs, the Department started with a clean slate, attracting high-caliber Greek scientists from abroad to fill early faculty positions. The founders understood the need to cut through the restraints of public bureaucracy and founded the Department together with the Institute for Computer Science (ICS) at (soon-to-become) FORTH.

The Department has already accomplished a lot in its almost 30-years of operation – its reputation both within Greece and abroad is something to be rightfully proud about.

The **strategic strengths** of the Department include:

- The quality of its faculty. The vast majority of faculty members (23/25) obtained their PhD from other Institutions, mostly abroad, and many from top schools in the US, Canada, and Europe. Most of the faculty are research-active, with sustained publications, research funding, and student production. The faculty is characterized by an opportunity-seeking mentality that parallels that of high quality schools in Europe and North America.
- There is team spirit between faculty and students (this was evident during the course of the external evaluation site visit), and strong ties with local, regional, and national government and European RTD funding mechanisms.
- Its undergraduate program is solid and well-aligned with international curricula and accreditation standards (e.g., ACM, IEEE). The implementation of course prerequisites almost 30 years ago was something very unusual by Greek standards at the time, and it continues to be. The EEC believes that the imposition of prerequisites is very beneficial, primarily for the students, and should serve as a good example for other departments in Greece.
- Its research and technological development program is vibrant, and well-aligned with the European RTD enterprise.
- The Department will soon have ample space (11000m² in the brand-new building scheduled to open in the summer of 2012), plus access to state-of-art research labs at ICS/FORTH.
- There is strong potential for synergies with the Medical school, Biology, Mathematics/Applied Mathematics, and of course ICS as well as other FORTH Institutes.

The Department has to cope with a number of **inhibiting factors**, including:

- Difficulty in *attracting top talent* in its roll of incoming freshmen, due to the later

opening of many other CS-related Departments in Greece (which dilutes the pool of talented CS students), together with the relatively high cost of living in and traveling to Crete, and the worsening economic climate leading to the current economic crisis. These factors make other Departments in mainland Greece more appealing from a financial point of view. The existing centrally-administered national admissions system further compounds this problem because it isolates prospective students from the Department, which has no control of its incoming class size or qualifications.

- The _unpredictability_ of its operational environment, including innovation- stifling regulation and ever-changing rules by the ministry of education and the government at large. This has always been a problem in Greece, but the situation has worsened in recent years, with completely unreasonable delays in research procurement, review, selection, contract negotiations, all the way to dissemination of funding installments often delayed by years. This already demoralizing situation has been seriously aggravated by the current crisis, and now threatens the Department (and the country at large) with a serious brain drain. Faculty and graduate student _attrition_ is now a very serious concern.

- Closely related is the difficulty of attracting prominent Greek scientists from abroad to return to Greece. It is hard enough to convince people to return in this economic climate; but even those that choose to make the leap of faith are uncertain of when their appointment will come through (if at all), given the back-and-forth promises and delays on the ministry and Government side.

- The diminishing operational budget of the Department (now at about half of what it used to be a few years ago).

The Department has successfully navigated past hurdles by building upon its strengths and the influence exerted by its leadership to bypass administrative and bureaucratic hurdles, often demonstrating out-of-the-box thinking. This will continue to serve the Department well, however the EEC believes that the Department should be planning for the next stage forward in a more disciplined and visible manner.

The Department's internal evaluation report did not spell out a strategic plan and vision for the Department. The Department Chair included a slide on future priorities and directions in his presentation, and the EEC was told that the Department does hold occasional faculty retreats, and that the last one happened two years ago. The EEC's sense is that the faculty does engage in informal discussions regarding the short- and mid-term future, but there is no mechanism in place to produce a written but living document that responds to threats and charts out priorities in a coherent and well-defined manner.

The EEC understands the difficulty of planning and strategizing in the midst of the worst economic and institutional crisis that has hit the country and now Europe at large in several generations. However this is also what makes strategic planning even more important now than ever before.

F. Final Conclusions and recommendations of the EEC

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

Overall, the EEC was impressed by the quality of students, staff, teaching, and research. There is an atmosphere of mutual respect between students and staff, a sense of pride by both in being members of the Department, and their strong desire to excel in their mission. This coupled with the strong team spirit that permeates the Department raises the EEC's confidence that the Department will continue on its path of excellence. The following includes a number of recommendations that the EEC felt that can help the Department in this direction.

Recommendations for Curriculum

To the Department

- The Department follows a well thought-out model with a significant taught coursework component, and well thought-out milestones, checks, and balances – including preliminary written and oral exams for the Ph.D. program, for example. This is commendable. An area for possible improvement is to consider consolidating the combined MSc+PhD program, which currently requires a minimum of 7+ years for its completion. This is more than what is typical abroad (4-6 years).

Recommendations for Teaching

To the Department

- Teaching evaluation is not performed as consistently as it could have been performed. As a result students are somewhat indifferent about the process. It would have been very good if an effort was made to bring to the awareness of students and staff the significance of teaching evaluation as a vehicle for delivering change and improving teaching practice. This would involve the encouragement of the students to complete the anonymous teaching evaluation forms as well as a more visible process in which the students' feedback is analyzed and taken into account within Departmental procedures. Furthermore, the EEC heard some student complaints about the commitment and the interest that teaching assistants take in their teaching. Although the evaluation of teaching assistants is explicitly tabulated on the teaching evaluation form, the disengagement of students and staff from the teaching evaluation process prevents the accurate reflection of the efforts and efficacy of TAs as well as the undertaking of specific measures in order to deal with relevant identified issues.

- A way to further improve the efficacy of teaching could possibly be the introduction of a peer review process in which a lecture of each academic staff is observed by a colleague (typically a more experienced colleague), who could point out possible improvements in the lecturing style of the observed member of staff.

- A formal process could be introduced for the co-ordination of coursework submission deadlines. This would prevent the occurrence of situations in which two or more deadlines or important events (e.g., mid-term exams) take place within the same week. If having one deadline/event per-week proves to be difficult, an effort could be made to avoid having important dates on consecutive days.

- There is evidence, outlined previously in this report, of some lack of uniformity in the preparation of marking schemes and a lack of a clearly defined path for fair moderation of examination/coursework scripts. A process could be introduced that

assures consistency of the format/style of the exam papers and uniformity of assessment. A further process could be introduced for the moderation of exam scripts.

Recommendations for Research

To the Department

- The Department has a vibrant program that is well-aligned with the European RTD enterprise and includes a significant applied component that is primed for transition to start-ups and industry. One area for improvement is to target the few very prestigious basic research opportunities in Europe: the Starting/Advanced Investigator Grant from the European Research Council, and the FET program. These will certainly enhance the prestige of the Department. The senior faculty can also consider ways of being more proactive in nominating and promoting their colleagues for society-level awards (e.g., best paper awards, IEEE/ACM fellows, other society awards, nomination to technical and/or conference committees, etc.).

- Whereas top undergraduates are often hand-picked and given opportunities to engage in research, the EEC felt that the Department should try to provide some "walk in" exposure opportunities to all undergraduates, not only to the best. This will be a lot easier when the Department moves to its brand new building, which will allow better consolidation of teaching and research under one roof.

To the University

- FORTH/ICS has played a crucial role in the Department's research development to date, providing ample leverage in terms of research infrastructure and a conducive research environment. University researchers in Greece are seriously hindered by campus closings and a bureaucratic public sector that stifles research, innovation and entrepreneurship. For this reason, it is important for the University to nurture the link to FORTH/ICS.

- The University needs to develop an Intellectual Property (IP) management policy (e.g., how the inventions generated by its research activities will be protected, exploited, and leveraged through copyrights, trademarks, patents, etc.)

Recommendations for Other Services

To the Department

- The Department has an excellent relationship with its alumni, some of whom have obtained well-paid jobs abroad. It is recommended that the Department makes a greater use of them, through some Alumni society, and asks for their help to set up a donations fund for furnishing, for example, the new building's reading room, and/or updating its equipment, or even paying for a Dormitory if the raised funds are substantial. In this way, both the students' presence on campus will be increased, but also the ability of the Department to attract students from mainland Greece will improve, as a major obstacle concerning accommodation will be removed.

- The Department may arrange an annual career fair, where potential employers for all levels of graduates (first degree, MSc, or PhD) will be invited to present their vacancies and make informal contacts with potential new recruits.

To the University

- The University may set up an accommodations office, where local landlords will be able to post flats/rooms that are on offer for students to rent, while the office will act as an impartial broker that will help students from other parts of Greece to arrange affordable accommodation of an acceptable quality through a trusted intermediary.

- It is worth for the University to consider making available to the students an electronic voting system, where all students may be able to vote in order to make timely decisions about departmental issues. Such systems nowadays exist for voting anonymously and securely even for national elections.

Recommendations for Strategic Planning

To the Department

The EEC strongly encourages the Department to institute appropriate procedures to formulate and periodically update a strategic plan that includes *tangible and measurable mid-term goals* and an *ambitious but realistic long-term vision*.

These should follow the competition in Greece, but more importantly they should identify peer institutions abroad, and pin-down a group of higher-up departments towards which the Department aspires to move. Specific areas for improvement can then be identified by comparing the Department's profile in terms of established academic metrics to those higher-up. The strategic plan should also assess and put in context emerging trends in the field at the international level.

Additional steps that can be taken to strengthen the Department's quality, as well as its accountability and visibility, include:

- Instituting an annual reporting process that starts from individual faculty annual activity reports, followed by Department-level analysis, summarization and reporting, and culminates with feedback to all faculty members. This is a long-standing tradition in North America and the UK, which promotes transparency, meritocracy, and healthy competition.
- Instituting a regular faculty retreat, ideally on a yearly basis.
- Establishing a formal mentoring program, including written yearly feedback to junior faculty regarding their progress.

The Members of the Committee

     Name and Surname   Signature

1. _____

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