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HELLENIC REPUBLIC

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HELLENIC QUALITY ASSURANCE AGENCY

FOR HIGHER EDUCATION

EXTERNAL EVALUATION REPORT

DEPARTMENT OF PHYSICS

UNIVERSITY OF IOANNINA

JULY 2010

External Evaluation Committee

The Committee responsible for the External Evaluation of the Department of Physics of the University of Ioannina consisted of the following four (4) expert evaluators, drawn from the Registry constituted by the HQAA in accordance with Law 3374/2005:

1. Prof. Costas Kounnas, École Normale Supérieure, CNRS, France
2. Prof. Panos Razis, University of Cyprus, Cyprus (Coordinator)
3. Prof. Charalambos Tsertos, University of Cyprus, Cyprus
4. Prof. Emmanuel Tsesmelis, European Laboratory for Particle Physics, Switzerland and University of Oxford, United Kingdom

The structure of the “Format” proposed for the External Evaluation Report is dictated by the requirements of Law 3374/2005 and corresponds generally to the structure of the Internal Evaluation Report submitted by the Department.

The length of text in each box is free. Moreover, the various questions may not be answered separately; they only provide a general idea about specific matters that should be addressed by the Committee when formulating its comments.

Introduction

- The External Evaluation Committee (hereafter referred to as the “Committee”) visited the Department of Physics (hereafter referred to as the “Department”) of the University of Ioannina between the 28th and the 30th of June 2010.
- On the morning of the 28th of June, the Committee had an extensive presentation of the University by its Rector, Prof. I. Gerothanasis, in the presence of the Head of the Department of Physics, Prof. T. Bakas, and the Chairman of the Internal Evaluation Committee, Assoc. Professor I. Rizos. The presentation provided an extensive overview of the University, with a detailed quantitative analysis of the University structure and all its activities. A series of questions were asked by the members of the Committee for further clarification of the elements of the review.
- After the Rector’s presentation the Committee visited the following Laboratories, where the faculty members in charge provided a short tour of the corresponding infrastructure and research instrumentation and gave a brief presentation of the scientific activities of the members of the group, followed by a discussion with the Committee:
 - Materials Science Physics Laboratory (Prof. T. Bakas, Assist. Prof. A. Douvalis).
 - Condensed Matter Physics and Material Science Laboratory (Assoc. Prof. G. Evaggelakis).
 - Laboratory of Atomic and Molecular Physics (Prof. K. Kosmides, Assoc. Prof. A. Lyras, Assist. Prof. S. Koen, Assist. Prof. E. Benis and collaborators).
- The Committee also had the chance to make a short tour of the student dormitories, the athletic stadium on the campus and to lunch at the dining facilities for the students and faculty. The Committee also made an extensive tour of the Library of the University, visiting the collection of the books in the Natural Sciences. In the Library the Committee had the opportunity to discuss with a few of the undergraduate students of the Department preparing for their final degree examinations (*ptychiakes*).
- On the morning of the 29th of June the Committee attended a formal presentation of the Department by its Chairman, Prof. T. Bakas. The presentation was very thorough and analytical and gave the opportunity to the members of the Committee to ask many questions on the structure of the Department, the undergraduate and graduate physics curricula, the educational processes and the students’ performance, the student support system, the technical personnel organizing the laboratories and the global scientific outcome of the Department as a whole. The discussion was very fruitful for clarifying many topics related to the educational system, the curriculum objectives, the thematic areas and number of lessons provided by the various Department Sections, as well as for providing a better understanding of the considerable information provided on the studies offered and research performed at the Department.

- Subsequently, the Committee had a meeting with a large group of graduate (approximately 35) students and a small number of undergraduate students (given the fact that the academic year was over and they are not so much involved in research as are the graduate students).

Many questions were raised by the students, mostly concerning their support needs for pursuing their graduate studies, their worries for research funding and career development. The students also provided valuable comments on the quality of teaching and their living conditions on the campus and in the city in general.

- The Committee then met collectively with the faculty members of the Theoretical Physics Section where their research activities have been presented in more detail in the areas of high energy physics and cosmology, theoretical nuclear physics and astrophysics and neutrino interactions. There was no faculty presence from the area of theoretical solid state and condensed matter physics. Presentations were made by Prof. K. Tamvakis, Assoc. Prof. I. Rizos and Assoc. Prof. T. Kosmas in the presence of Professors K. Vayonakis, E. Manesis, G. Leontaris and Assoc. Professors L. Perivolaropoulos, P. Kanti, A. Dedes.
- The Committee then visited Assoc. Prof. A. Bartzokas from the area of Meteorology, where he presented to the Committee the activities of his group related to the installed weather monitoring stations and weather forecast via a dedicated computer cluster as well as his colleagues' activities on environmental problems (measurements of noise, air quality, air pollutants and modelling).
- The Committee thereafter visited the Nuclear Physics Laboratory where Prof. A. Pakou gave a short presentation on the current research activities of the group (Assist. Prof. X. Aslanoglou, Assist. Prof. C. Ioannides, Assist. Prof. N. Nicolis, Lecturer N. Patronis) on their experiments running at large European facilities (CERN, Legnaro, Catania) as well as at the National Nuclear Research Centre Demokritos and in the local laboratory in Ioannina in which applied research is carried out (XRF applications and environmental radioactivity monitoring).
- On the 30th of June the Committee visited some of the classrooms and the large amphitheatre of the Department, as well as several teaching laboratories (mechanics, electromagnetism, waves and optics, semiconductors, telecommunications and electronics), where discussions were held briefly with some of the members of the faculty in charge and the technical personnel providing assistance with the corresponding experiments.
- The Committee also visited the Physics Exhibition Laboratory, an innovative and very well organised laboratory under Prof. Manesis dedicated to the promotion of the didactics in physics via demonstrations of some of the most important experiments and ideas in physics. This Laboratory plays a fundamental role in the promotion of physics among the young secondary school students who visit it and helps to formulate ideas about their future studies and professions.
- On the 30th of June, the Committee also visited the secretarial staff of the Department at the University Administration Building and some of the members of the technical staff. With the secretarial staff the Committee obtained information regarding their qualifications, experience, daily duties, knowledge of foreign languages, level of computer knowledge etc.
- The Committee then met with Prof. C. Allysandrakis in his office. He did not present to the Committee the activities of his group (Astronomy), stating that the universities are constantly evaluated through the years by the performance of their faculty

members operating in the international scientific environment. After exchanging some views regarding the necessity of a formal evaluation of a university by external evaluation committees, in particular in order to formulate suggestions for resolving chronic problems of higher education and research, the Committee continued with its visits of other laboratories.

- The Committee visited two laboratories housing two 400 MHz NMR spectrometers and one more advanced state of the art 500 MHz spectrometer. Like most of the other advanced equipment bought by the Department, these systems are shared and utilized in research by all members of the faculty who might need them for some analysis.
- Another laboratory visited was the High Energy Physics Laboratory, where the Committee attended a presentation by Assoc. Prof. I. Evaggelou on the contributions of the experimental group for the CMS Experiment, currently running at the Large Hadron Collider (LHC) of the European Laboratory for Particle Physics (CERN), and by Assist. Prof. I. Papadopoulos on the setting-up of a high performance computer cluster in the framework of creating at the University of Ioannina a data analysis centre (Tier2 node) within the international Grid Initiative project. At the time, Assoc. Prof. N. Manthos was doing shifts of the experiment at CERN, while Assoc. Prof. P. Kokkas was giving a physics presentation to CMS remotely over the teleconference system. During the visit in the High Energy Physics Laboratory of the Department the Committee also had the chance to discuss briefly with Prof. C. Foudas over Skype.
- The Committee then visited an advanced physics semiconductor laboratory where Assist. Prof. E. Evaggelou presented briefly the importance of this area's research projects to the development of electronics and its many applications.
- The Committee also visited the Soft Matter Physics Laboratory of Prof. G. Floudas, where his group presented their research with liquid crystals, an optical microscope and other high technology instrumentation.
- The Committee also visited the Surface Laboratory of Assoc. Prof. M. Kamaratos, performing research on the surfaces of materials with Auger Spectroscopy, Ar bombardment under high vacuum, and on the study of the chemical properties, lattice parameters and other properties of the surfaces.
- The Committee also visited the office for student placement and professional orientation and discussed the services offered to the student body.
- During the 3 days visit to the Department, some discussions were also held with various members of the Department at the individual level.
- For the evaluation of the Department of the University of Ioannina, the members of the Committee received and took into consideration the information contained in the following documents:
 1. The Internal Evaluation Report, including the tables and annexes concerning the personnel and curriculum and an analytical departmental publications list for the period 2004-2008.
 2. An analytical excel file containing the publications record and citation index of each member of the Department.
 3. The PowerPoint presentations by the Rector of the University and by the Chair of the Department.
 4. A report of the proposed "Network of Research Supporting Laboratories".
 5. The undergraduate and graduate prospectus including a summary of the course

- syllabus, available online at the Department web-site (www.physics.uoi.gr).
6. Statistics concerning student performance and their evaluation reports of the courses and educational processes offered by the Department.
 7. Graphs concerning the age distribution of the faculty staff and the annual budget of the Department detailing the funding sources.
 8. A summary table and graphs containing the number and the budget allocated for research programmes per year and per department, as provided by the University Research Committee for the years 2000-2007.
 9. Brief scientific and technical reports provided by the various teaching and research laboratories.
 10. Additional promotion material provided by the library and the office for student placement and professional orientation.
 11. Advertising material concerning the Erasmus international exchange student network.

General comments for the methodology followed in the evaluation process:

In order to proceed with the evaluation of the Department, the Committee members received and considered the material described above. Subsequently, there were presentations of the activities of the Department which included several speakers:

1. The Rector gave a general qualitative and quantitative overview, including the educational, research, economic and administrative elements characterising the University.
2. The Chairman of the Department presented its activities, including a number of statistical elements concerning educational and research numbers, budgeting, student performance statistics, age distributions, planning elements etc.
3. Faculty members in charge or representatives presented the educational and research activities of each scientific sector of the Department.
4. A presentation was made of the activities of the technical and administrative personnel.
5. A discussion was made with student representatives (graduate and undergraduate), on aspects related to the educational processes at the University/Department, the student support system, the student performance and related problems.
6. A presentation was made on the outreach activities and knowledge transfer from the Department to industry and the local society in general.
7. Finally, closed sessions took place by the Committee members to consider and check all the information collected, to evaluate the Department and to write the External Evaluation Report.

A. Curriculum and Teaching

A1.1 Curriculum: Undergraduate level

APPROACH

The undergraduate physics curriculum is primarily structured in accordance to other physics curricula adopted by well established universities in Europe and the USA, although there are a significantly higher number of courses introduced into the curriculum.

More specifically, the undergraduate physics curriculum consists of:

1. 27 core level courses (introductory and main physics courses, some fundamental mathematics courses, 1 general chemistry course, 2 computer laboratory courses, 7 physics laboratory courses and one mandatory course in Environmental Physics or Introduction to Astrophysics).
2. 13 out of 70 offered elective courses in two of the following areas:
 - Theoretical Physics,
 - Experimental and Applied Physics,
 - Didactic of Physics,
 - Environmental Physics, Physics of the Atmosphere and Space Physics,
 - New Technologies.

In addition, at most two more courses can be taken from other departments of the University.

3. A Diploma Thesis is offered in all the above 5 areas.
4. Finally, one foreign language course (English or French or German) is required.

The minimum number of didactic units to obtain the final undergraduate degree (*ptychion*) is 171, corresponding to 248 ECTS units.

The Committee considers that the undergraduate programme is well established and structured and fulfils all the international standards for a general degree in physics. All courses are within the European standards of the ECTS credit transfer system. In addition, the programme provides the opportunity to the students to proceed and specialize in at least two of the 5 physics areas mentioned above, something considered very valuable for a student continuing with graduate studies and/or pursuing research in physics. The Committee acknowledges the possibility offered through the programme to specialize in the area of Didactic of Physics, which is particularly important since a large number (or the majority) of the students after their Bachelor "*Ptychion*" become physics teachers at the secondary level.

The Committee finds the 2 mandatory computer courses as well as the 7 autonomous laboratory courses contained in the curriculum to be very useful for the student to acquire and develop important technical skills. The Committee also stresses the importance of the Diploma Thesis (2 semesters) which helps the students to develop and enhance their own initiatives.

The number of 70 elective courses out of which the student has to select 13 is very high. Moreover, there is an absence of 1-2 courses in Mathematical Methods of Physics to be taught by members of the Department for providing experience to the students with the application of mathematics to real physical systems observed in Nature.

APPLICATION AND RESULTS

The structure of the physics curriculum is well developed and balanced among the various physics disciplines. Due to the large number of electives it functionally resembles the programmes taught by established American universities, which contain a higher percentage of elective courses (liberal arts approach), rather than that of the English universities that prefer to adopt a curriculum without many electives.

Although the Committee would prefer a natural order for a student to attend the courses of the physics programme, the Committee appreciates, however, that the prerequisites cannot be strictly enforced, due to the varying rate of progress of each student. Therefore, the Committee recommends that the Department encourages the students to advance in their courses once they have been exposed to the prerequisites, even if they did not successfully pass the previous courses containing these prerequisites.

As far as the infrastructure for the undergraduate teaching laboratories is concerned, the Committee feels that the infrastructure is very well organized, preserved in very good condition and located in adequate space. The Committee underlines that measures should be taken for its continuous refurbishing and maintenance of the teaching laboratories in order to preserve their present excellent state and to further expand to provide more possibilities and to upgrade the experimental set-ups. However, there is a serious lack of a sufficient number of specialized technicians. The present situation, with only 3-4 technicians covering the needs of so many student groups in several educational laboratories, is not satisfactory.

Therefore, a major priority should be taken in the recruitment of additional specialized technical personnel, together with a solution of providing stipends/fellowships to graduate students through teaching assistantships in order to help run the experimental exercises.

Moreover, there is a significant lack of other official research facilities in the area of Ioannina outside the University. Therefore, the physics educational programme is not sufficiently reinforced by practical and technological examples taken from modern research other than that performed in the Department. A strong collaboration with high-calibre research centres should thus be sought, from which also the faculty of the Department will benefit greatly. A possible solution to this problem would be to develop a synergy with the existing Medical School of the University, for instance in the area of medical physics.

IMPROVEMENT

The Committee considers that priority should be given to recruiting new specialized technical personnel to guarantee the quality and continuous functioning of the experimental courses due to large number of students sharing the same experimental set-ups. A further solution can be provided regarding this issue by granting teaching assistantships to young graduate students (preferentially PhD students) who also provide invaluable contributions to the faculty members in their research programmes.

The constant maintenance and upgrade of the infrastructure of the teaching laboratories should not be neglected, including the hardware equipment, software, computing systems and networking. The recruitment of a specialized technician is necessary.

Concerning the curriculum, the Committee members feel that the educational programme offered by the Department is successful. However, the Committee strongly urges the Department to drastically reduce the number of elective courses, by combining different thematic subjects from similar areas, in order to give the possibility to students to acquire a more focused approach in the main directions in physics. Normally, a broad specialization is achieved at the graduate degree level.

With respect to the mathematics content, the Committee notes the orientation of the Mathematics courses towards physics applications, which could be further strengthened by adopting material from mathematical method of physics books. The existing theoretical and experimental courses in Modern Physics will help in this direction.

A. Curriculum and Teaching

A1.2 Curriculum: Master and Doctoral level

APPROACH

The University of Ioannina has several graduate programmes in Physics. The programmes have recently been adapted according to the European standards of Bachelor, Master and Doctorate degrees. All courses have also been recently credited according to the ECTS system.

There are 5 postgraduate Master study programmes (*Μεταπτυχιακά Προγράμματα Σπουδών ΠΜΣ*): Physics, Photonics and Materials Science (22 courses); Atmospheric Sciences and the Environment (9 courses); Modern Electronic Technologies (13 courses); Telecommunications Applications (25 courses); New Technologies and Research in Didactic of Physics (10 courses). Each programme has a duration of two semesters for lectures and one semester for the Master thesis (except for the latter programme which has two semesters for the thesis). There are no national scholarships available to support students studying under these Masters programmes.

The Master programmes are planned according to the research interests of the individual laboratories as well as the didactic orientation of the Department. They are of very good quality and are comparable to the level of Masters programmes offered by other universities in the world.

Some of the topics are of applied nature, and thus serve the needs of the general society by providing technological knowledge and methods for solving several current problems of interest.

The content of all the Master programmes are continuously reviewed by the Coordinating Committee (*Συντονιστική Επιτροπή*) and is accordingly modified to fulfill the needs. The Master students are naturally entering into it through the undergraduate programme and are examined with oral and written exams. The final grade is composed of examinations based on the lectures (60%) and on the Master thesis (40%). The Master programmes have a high success rate, with about 110 of the inscribed 170 students receiving their degree.

The four graduate programmes of the Department offer doctoral programmes. The selection of students is performed by a tripartite committee of the Department and the final examination is done by the seven-member examination committee after a public presentation. The award of the PhD is done in the presence of the Rector of the University (or his delegate). More than 30 PhDs have been awarded in the period 2004-2008, which is considered to be very good by international standards for such a university size. There are no national scholarships available to support students studying under these doctoral programmes.

The Department has a well established teaching evaluation procedure including a specialized questionnaire and a feedback mechanism to further improve teaching issues.

APPLICATION AND RESULTS

The Committee discussed the graduate programmes (Master and PhD) with members of the faculty and with about 35 enrolled graduate students. All of them were happy and satisfied with the quality and structure of the programme and with the quality of the staff. The students emphasized that the programme is very good and very intense and requires many hours of study.

It became evident that financial support for Master and PhD students is totally absent and both faculty and students emphasized the need for a national scholarship system. Due to this absence of financial support, the students are obliged to take on outside work, effectively becoming part-time students and thus lengthening the duration of their studies. Furthermore, it seems that Master students automatically lose their privileges for subsidized hostel accommodation on the grounds of the University. National scholarships for graduate students are a very common practice in major Universities around the world. For the University of Ioannina this will have the additional effect of attracting a larger number of excellent graduate students to geographically remote universities like at Ioannina.

IMPROVEMENT

A major problem in the graduate programmes is the lack of national scholarships to support the students while attending the programmes offered by the Department. A structured national scholarship programme should be realized and offered over the long term.

The implementation of remunerated teaching and/or research assistantships would serve the dual purpose of providing financial support to graduate students during their studies and of providing expert scientific assistance for the presently under-staffed laboratories that in some cases lack the required technical support. Both the graduate students and responsables of the laboratories strongly support this proposal.

Another measure that will improve the situation would be to establish start-up funds for new faculty members in experimental physics. Such funds are available to new faculty at major universities in the US and Europe. The Department cannot hope to fulfill all its promise if it continues to be handicapped by the lack of start-up funds.

A2.1 Teaching Undergraduate

APPROACH

The teaching methodology adopted by the Department is the same as that established in any international university through-out the world. It is based on a series of lectures, supported by electronic means and complemented by problem solving sessions and exercises. In the case of introductory general physics laboratory courses, all students in a session, after a brief lecturing on behalf of the tutor, perform simultaneously the same practical exercises, something that from a pedagogical point of view presents an advantage, although from the financial point of view increases the cost of acquiring the necessary infrastructure (requires multiple experiment stations).

The educational material of the courses is posted on the web pages of the Department and is suitably accessed by the students and faculty members via a security code.

All courses offered by the Department and the University are well supported in general, as far as the bibliography is concerned, by suitable conventional educational material (books and scientific magazines) as well as electronic material provided through the participation of the University in the Hellenic Academic Libraries (HEALink) network.

Most of the textbooks existing in the international bibliography, in their translated versions, are used in the courses offered by the Department and can be found also in the Library, whereas many theoretical and laboratory course textbooks have been produced by the members of the faculty.

The teaching staff-student ratio is approximately 1:25, something that needs further improvement, since it is low in comparison to what is accepted internationally. With respect to the guidance of students by the faculty members, each student has an advisor during his/her studies, although this important feature is not used much by the students.

The equipment utilized in the undergraduate laboratory courses is adequate and in very good condition. Every effort should be made so that sufficient funds are secured for the corresponding maintenance of this equipment. For the more advanced equipment some further upgrade will help introduce additional features for new experimental exercises. Considering the large number of student sessions in the laboratories more technical assistance is needed, either by hiring a few more technicians, or, more importantly, by providing a sufficient number of teaching assistantships to students doing their graduate studies. Currently, there are only 4-5 people working as technical staff in the Department despite the large number of laboratories operating in the Department.

With respect to the students evaluation, the Department should make every effort so that a combination of continuous assessment, including midterms, problem solving questions, oral and written examinations and practical exercises (in laboratory courses) is reinforced.

IMPLEMENTATION

The academic staff of the Department is currently composed of 51 faculty members; i.e., 12 Professors, 17 Associate Professors, 14 Assistant Professors and 8 Lecturers. There is also a number of academic staff being hired and a number of “*emeriti*” professors. The Department has 5 laboratory technicians, 5 secretaries located in the various departmental sections, as well as 5 secretaries located in the University Administration Building.

With the exception of the number of technicians, which is limited and apparently inadequate to serve the needs, the Department staff is sufficient to realize its educational programme, both at the undergraduate and graduate levels. Despite the fact that each laboratory course has to be subdivided into several groups (of about 30 students each) to cover the large number of the students attending, the overall performance, infrastructure, room-space availability and accompanying teaching material are in good standing. The support of the teaching sessions via electronic means seems to be also adequate.

The textbooks and additional notes provided for each course as well as the laboratory notes represent good introductory material to successfully overcome the difficulties of the required subject topics. In addition, the easy access to the central Library, also remotely accessible via internet connection, allows the students to utilize the international bibliography and progress in recent scientific developments.

A positive aspect of the undergraduate programme that should be underlined is the possibility offered to the students to participate in the European exchange programme Erasmus, allowing them to gain experience within the European Area of Higher Education.

The Department has introduced, for the first time within the University, the electronic collection of data for the evaluation of the teaching personnel, which enables the academic staff to draw useful conclusions about their overall performance and to improve the course syllabus and the feasibility of the physics programme to achieve its goals.

RESULTS

Overall, the teaching performance and methodology as practiced by the Department are considered to be efficient.

Although the intake of the Department is approximately 150 students per year, only around 100 enrol in the undergraduate programme (about 35% of incoming students become inactive), out of which about 50 graduate per year. The average graduate grade is 6.3 out of 10. The first phenomenon is highly connected to the nature of the entrance criteria imposed by the national examinations system, which obliges the students to sometimes select a field outside their main preferences. The second phenomenon is due to the quality of the enrolled students and the financial constraints, considering the fact that Ioannina is a geographically remote university, far away from the birthplace of most students, which strongly favours Athens and Thessaloniki.

The average duration of undergraduate studies is a little bit below 6 years. Only a few (3-5%) of the enrolled students succeed to graduate within 4 years. Also, only a small number of the graduating students continue with graduate studies at the University of Ioannina or elsewhere.

There seem to be no discrepancies in the success/failure percentage rate in the various courses, whether introductory or advanced. Many differences in the duration for the completion of studies and the grade of the degrees are mainly justified for social reasons.

IMPROVEMENTS

The faculty members are giving appropriate weight to the promotion of physics to the local society and in particular to the younger generation. One excellent measure they use is to regularly receive groups of secondary school students at the Physics Exhibition Laboratory and demonstrate to them various physics experiments and ideas that played a significant role in the history of physics. These didactic experiments, should be also offered (besides the students of the Department), on a regular basis, to the secondary school physics teachers so as to promote the correct pedagogical methodology of physics teaching. The Committee was surprised to learn that the corresponding physics didactic specialization, provided by the Department, is not yet recognized by the Hellenic Republic as fulfilling the criteria of “pedagogical training” required to teach physics at the high school level. Every effort should be taken at the legislative level to change this.

The Committee encourages the Department members and the University at large to take more actions towards advertising the Department’s educational programmes more strongly to the secondary school student communities across Greece for their very good quality and specialization features.

The Committee also believes that the number of students enrolled in the Department has to be reduced to the level of about 120 students in order to maintain the good quality of the programme. Like all other universities in Greece every effort should be made to complement the existing national entrance examination system with the proper measures to attract only students wanting to study the particular fields.

A2.2 Teaching Master and Doctoral studies

APPROACH

The Department of Physics offers organized and structured graduate studies within a wide-ranging field of physics domains. The graduate programmes consist of lectures and a research thesis leading to the award of a Masters and PhD degree.

The graduate programme “New Technologies and Research in the Didactic of Physics” is unique at Greek higher education establishments and is in operation since 2002.

The selection of students follows agreed procedures that include written examinations, an interview and the consideration of the candidate’s *curriculum vitae* and letters of recommendation. Acceptance of the candidate students is done after approval of the General Assembly of the Department.

Following the completion of the lecture series, the students select the research supervisor and are integrated within a research group. The topic of the PhD thesis is submitted to the Coordinating Committee of Graduate Studies (ΣΕΜΣ). The student can be integrated in the research earlier, should he/she wish. The Doctoral programme is closer to the American one, by including courses and a thesis. The graduate students mature naturally in the research group of a professor, where they also try to make their own original contributions.

The Department offers weekly seminars given by distinguished speakers supporting the graduate programmes.

Graduate students enjoy similar arrangements as undergraduate students concerning accommodation, meals and medical care.

All costs for research carried out by graduate students are borne by the Department and the laboratory infrastructure is made available to the research students. The Network of Inter-departmental Laboratories is also made available to the graduate students and entrance is free of charge.

IMPLEMENTATION

For each course there are examinations, which are written and/or oral, as is described in the bulletin for graduate studies. The bulletin describes rules to be followed and the content of the course. Most of the material is available on the Internet. The courses also include problem sets and term papers. They are finally crowned by the Masters and PhD thesis, the latter of which contains original work. This system presents the advantage of a closer collaboration between the student and the supervising professor.

For the doctoral programme there is a committee consisting of 3 faculty members who follow closely the progress of the candidate and the selection of the topic for the thesis. After the completion of the work for the doctoral thesis, the students present their research in an open seminar, in front of a seven-member committee, which subsequently examines them orally on the methodology and outcome of the research. Even if not a formal

requirement, doctoral theses should lead to a publication in an international refereed journal.

RESULTS

The students who complete the graduate programmes are of high quality. This is supported by the reputation of their corresponding supervising professors. An indicator of the good graduate work is the high quality of students the programmes attract and excellent positions they secure after graduation. The graduates achieved permanent positions at universities, research centres and the private sector in Greece and abroad. The Department graduated already 30 PhDs and 110 MSc. during the previous five years.

IMPROVEMENT

As presented above, it is necessary to secure scholarships for all graduate students, Masters and PhD level. This can be realized through the implementation of teaching and/or research scholarships and through the submission of applications for the Herakleitos and Thales programmes, within the framework of prefecture of Elias funding programmes.

The Greek authorities should recognize the certificate awarded at the end of the successful Didactic of Physics Master graduate programme for teaching in Greek secondary schools.

The Committee recommends that the graduate experimental laboratories require the additional support of technical personnel.

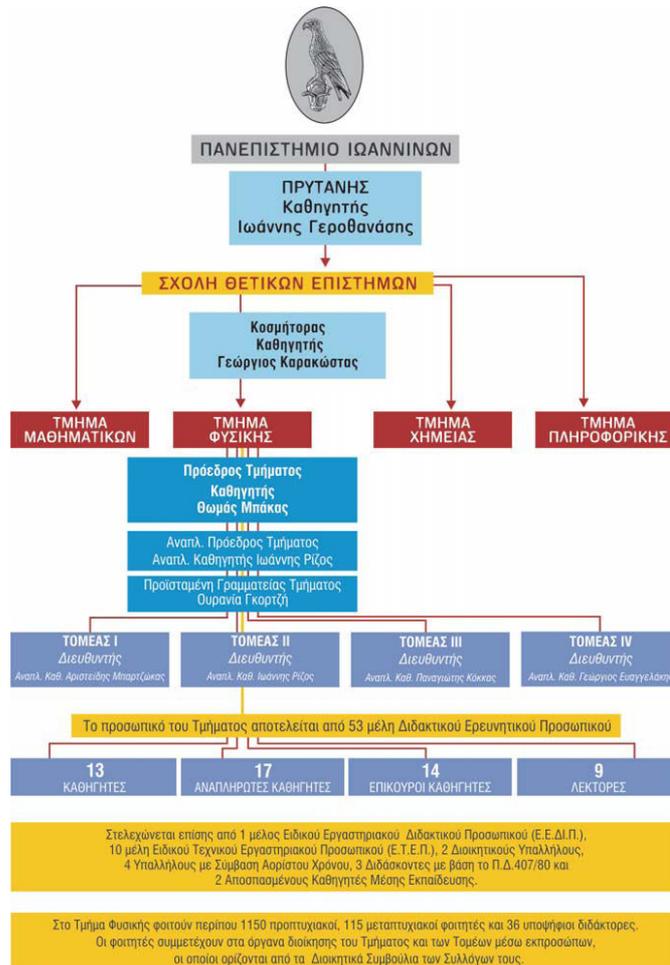
B. Research

APPROACH

The Department strives for excellence in research, by concentrating in a few selected and state of the art themes within 4 general Sections:

1. Astrophysics (7 staff members in the Astronomy Laboratory (3) and the Meteorology Laboratory (4)).
2. Theoretical Physics, including Particle Physics and Cosmology, Nuclear Physics and Condensed Matter Physics (14 staff members).
3. Experimental Atomic and Molecular Physics, Experimental Nuclear Physics and Experimental High Energy Physics (17 staff members in the Atomic and Molecular Laboratory (7), Nuclear Physics Laboratory (5) and the High Energy Physics Laboratory (5)).
4. Experimental Solid State Physics and Surface and Material Physics (13 members in the Material Physics Laboratory (2), Surface Physics Laboratory (3), Condensed Matter Physics Laboratory (3) and the Electronics Laboratory (5)).

The structure of research is shown below:

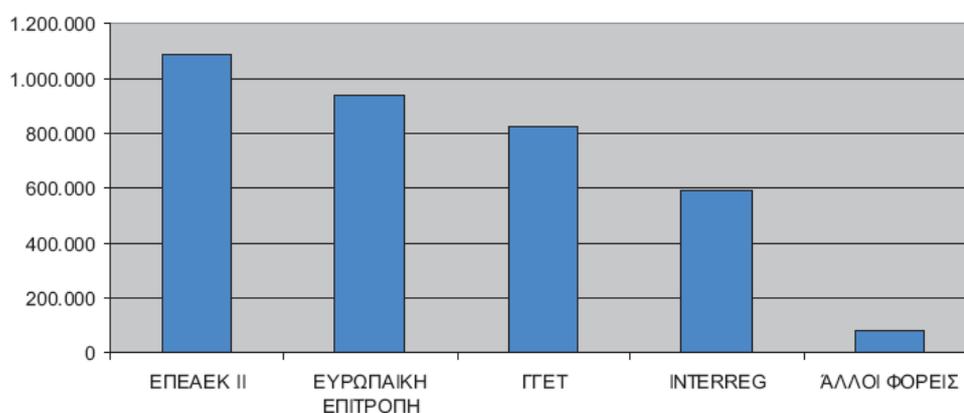


The Department promotes research by hiring the best Greek scientists available world-wide. They frequently come from the best Universities and Institutions.

The high level of research is indicated by the large number of publications in internationally-recognized peer-reviewed journals, the number of citations of the members of the Department and the ability of the Department to attract competitive grants from European research programmes.

In certain Sections, such as Theoretical Physics, the Department strives to concentrate on a few specific well-defined research topics and avoid dispersion in areas where they do not have the critical mass, for example theoretical solid state physics.

In the past five years the Department has succeeded in securing research funds from competitive external grants. The following graph shows that the vast majority of their budget comes from competitive grants, out of which 2/3 are international.



The research is supported by 112 Masters students and 35 doctoral students who also carry a large fraction of the research. The number of postdoctoral fellows is minimal and depends on the success of grants from the European Commission. The number of graduate students is excellent despite the lack of national financial support. On the other hand, the low number of postdoctoral fellows is a deep concern.

The Committee considers that the number of technical personnel in the laboratories is clearly inadequate and must be addressed. This could be done either by the appointment of the necessary technical personnel or with the implementation of the teaching and/or research assistantships of graduate students.

IMPLEMENTATION

From preliminary data available to the Committee the following numbers are obtained:

1. The members of the Department published 500 articles in refereed journals in the last 5 years, corresponding to 2.0 articles per year and per faculty member, which is considered to be very good. About 25% of the publications have an impact factor of >4.
2. The number of citations per year for the total number of publications of the Department approaches 1000. The total number of citations is more than 11 000 for the previous 5 years, which corresponds to 46 citations per member and per year.

3. These figures place the Department among the most frequently cited physics departments in Greece.

A more complete and comparative bibliometric picture will emerge when ADIP makes its review of the other physics departments in Greece.

Research projects and research collaborations:

Astrogeophysics

Meteorology and climatology
 Physics of the atmospheric environment
 Plasma physics of the Sun and the interplanetary medium
 Radiogalaxies
 Solar and space physics

Theoretical Physics

Condensed matter physics
 Elementary particle physics
 Gravity and general relativity theory
 Nuclear physics, nuclear reactions, nuclear energy
 Plasma physics
 Cosmology

Atomic and Molecular Physics, Nuclear Physics and High Energy Physics

Experimental atomic and molecular laser spectroscopy
 Experimental high energy physics
 Experimental optoelectronics
 Experimental molecular physics
 Heavy-ion reaction mechanisms
 Nuclear physics

Solid State, Material and Surface Physics

Condensed matter physics – simulation techniques, electronic structure, gamma ray spectroscopy
 Electronics and microelectronics
 Experimental solid state physics
 Experimental physics of solid surfaces
 Mossbauer spectroscopy and magnetism
 Physical systems simulation theory and techniques
 Semiconductor physics
 Surface physics
 Telecommunications and applications

There are significant research collaborations of members of the Department with research scientists of universities and research institutes in Greece and abroad.

RESULTS

The Committee commends the fact that the Department is trying to hire the best available scientists and to recruit only if they meet a certain high standard. The Committee recommends a continuing increase in the hiring of scientists from outside of the University of Ioannina.

The result is therefore a highly visible research in a few selected areas, like theoretical particle physics and cosmology, experimental high energy physics, the group of polymer physics, state-of-the-art laser physics, Mössbauer spectroscopy, all of which have succeeded to obtain international recognition.

The Committee noted an excellent performance of the Theoretical Particle Physics and Cosmology group, in scientific production, international collaborations and active participation in European research programmes. In these domains the scientific activities of this group meet those of well known institutions at the international level.

The research quality of the Department is recognized by the international scientific community. This is reflected in the award of 9 postdoctoral fellow positions funded by the European Union Marie Curie or other research training programmes during the last five years (K. Zuleta, N. Chatillon, J. C. Bueno Sanchez, T. Dent, Lubos Jankovic, C.J. Lolis (twice), L. Tayebi, and A. Ibenskas, 2004-2009).

IMPROVEMENT

- It should be noted that this research effort is undertaken with the absence of another, dedicated Research Centre in the Epirus region. This leads to the need for strengthening the Department's scientific and research base and the transfer of knowledge and technology to regional industry, particularly to energy and environment issues, and is also the policy of the University authorities.
- The Department should take the opportunity with the next new appointments to consolidate the research effort of the Department and to re-organize its experimental Sections to reflect a more coherent and focused research programme avoiding the present situation where these Sections appear as a collection of under-staffed individual experimental Laboratories. Deliberations with the University authorities resulted in the following agreed proposal for recruitment and large capital equipment investments for research.
- Recruitment policy - the creation of the seven new scientific staff positions during the next five years with the aim of strengthening the research activities of the Department. The Committee considers that the strengthening of staff in the following areas:

(I) The structure of the Astrogeophysics Section would remain as it is and would be reinforced with the addition of an expert technical support staff to provide assistance in the Meteorological Laboratory.

(II) Theoretical Physics – This Section should continue to be composed of all theoretical physics of the Department - Particle Physics, Gravitation and Cosmology, modern theoretical Nuclear Physics and Condensed Matter Physics. In view of the two imminent departures (retirements) from the Particle Physics, Gravitational and Cosmology group, the two new appointments must be made to replace the two departures. These appointments (with two young physicists) should serve the areas of modern quantum gravity (string theory and related topics), cosmology and astroparticle physics, thus creating a modern and coherent effort covering as much as possible the areas of theoretical particle physics and cosmology. An extra position in phenomenology would be useful to support the experimental particle physics programme. An extra appointment should also be made in the near future to reinforce the Theoretical Condensed Matter group.

The Committee believes that the two remaining sections should be reorganized as follows :

(III) Experimental Solid State/Condensed Matter Physics Section - This Section would include the current laboratories of Atomic and Molecular Physics and the laboratories of the Solid State, Material and Surface Physics. The Committee believes that a new appointment is necessary for a further reinforcement of the Section.

(IV) The Experimental Nuclear and High Energy Particle Physics Section - This would be composed of the current Nuclear Physics Laboratory and High Energy Physics Laboratory and would also include the current Electronics Laboratory. This Section would need to be strengthened with one new appointment of a physicist in experimental particle physics.

In addition to carrying out research on electronics equipment and methods, the inclusion of the Electronics Laboratory would also provide support in the research of front-line electronics development required for modern high-energy physics experiments and with the possibility to strengthen international collaboration in electronics through joint efforts with the many other electronics laboratories participating in the high-energy physics experiment international collaborations, such as at CERN. This Section could be further strengthened in the future with the inclusion of a medical physics component of research, which would interact closely with the Medical School of the University.

The physics didactic activities of the Department should be supported by staff drawn from all Sections. A new scientific appointment in this area would further strengthen this effort and the appointee would be placed in the Section of his/her research specialty. The physics didactic activity should be reinforced with the addition of an expert technical support staff to provide assistance in new technologies and in the Physics Exhibition Laboratory in order to improve its already high quality of service.

- Capital equipment investments – Deliberations with the University authorities resulted in the following agreed proposal for large capital equipment investments for research. New modern equipment for carrying out frontier research should be purchased and should serve as common facilities to be used across Departments of the University as part of the Network of Research Supporting Laboratories. The Laboratory Units and Centres that are qualified to be part of the Network include: Nuclear Magnetic Resonance Centre, Scanning Electron Microscopy, Confocal Laser Scanning Microscopy, Power X-ray Diffraction, Single-Crystal X-ray Diffraction, X-ray Fluorescence Spectroscopy, Mass Spectrometry, Archaeometry, Central Laser Facility, Magnetic Measurements, Thermal Analysis, Cancer Biobank Centre, and the Centre for Scientific Simulations.

- Collaborations - The Committee also notes that the Department needs to intensify their collaborations with teams in other Greek Universities and research institutes. The Committee corroborates this statement and strongly recommends more efforts in this direction, which is an endemic weakness of all Universities in Greece.

C. All Other Services

APPROACH

- There is a real effort to modernize the administrative services. The administrative services seem quite effective, adequate and recently modernized (student web subscription, grading by professors on the web and recently also management of electronic book distribution). The personnel seemed content with the arrangements.
- The technical support (5 persons) for teaching and supervising at the laboratories is overstrained and evidently insufficient to cover the needs of the curriculum. The existing personnel are currently filling the gaps with a lot of self-sacrifice and extra non-remunerated hours, but obviously this is not something that can last for the long term. One of the 2 technicians that support the laboratories will retire soon.
- Secretarial support is provided by a central Departmental Secretariat (5 Secretaries) and by four Secretariats serving each of the Sections (total of 5 Secretaries). The Secretariat of the Department is open daily from 08:00-14:00. The services offered by the Secretariat are considered to be excellent and to be the best Department Secretariat of all the University as shown by a recent survey. Amongst its responsibilities, the Secretariat handles student registrations, examinations and the distribution of the education material. However, some of this secretarial staff do not have the proper studies (secretarial studies, accounting) and certificates (foreign language, computer certificates) and did not go through the necessary training.
- The Department runs the very effective Physics Exhibition Laboratory. This laboratory provides exhibitions mostly to secondary school students and is considered to be a very original and important service for science communication and outreach in the wider Epirus region. To our knowledge this is a unique undertaking in Greece.
- The University has an office for student placement and professional orientation staffed by two professional career advisers which has been reduced from a peak of 6 at the beginning. The office offers help to all students of the University for furthering their education and also provides advice for career options and placements. This service is run very effectively and is considered to be a very vital service of the University.
- Moreover, the Department is served by the well-equipped and well-organized central library, which includes modern electronic facilities. Other student facilities include the modern sports centre and housing facilities.

IMPLEMENTATION

- The administrative infrastructure is well organized. The Department Secretariat is located in the University Administration Building, some distance from the buildings

of the Department. Information exchange with students is ensured via electronic means.

- The Library is very pleasant, spacious and sufficiently modern. The Department has WIFI internet access throughout. Information exchange with the students is done electronically.
- The Teaching Exhibition Laboratory is currently under the responsibility of a Professor of Physics. The incumbent will be retiring soon and the succession plan should be agreed with a smooth handover with a new responsible.
- The office for student placement and professional orientation reports hierarchically to the Deputy Rector and is staffed by 2 professionals. The office handles thousands of cases every year.

RESULTS

The Department appreciates the administration and is aware of the clear inadequacy of the number of the technical personnel.

IMPROVEMENTS

- A clear priority of the Department is the recruitment of new technical personnel.
- The Secretariat of the Department should be relocated to the buildings of the Department, close to the Section Secretariats where space has already been allocated. This would facilitate the communication and links within the Department, including with the students, staff and Secretariats of the Sections, resulting in an improved service. Moreover, this scheme would facilitate secretaries being able to cover for each other in case of absences and reduced workloads in certain activities during given periods. The University and the Department authorities agree on such a scheme.

The relocation of the Secretariat of the Department will liberate space in the University Administration Building, which could be taken by an improved office for student placement and professional orientation. This is a central University service and should be located in a central location. After a lengthy discussion, the University authorities agree on such a scheme and will implement this in the near future.

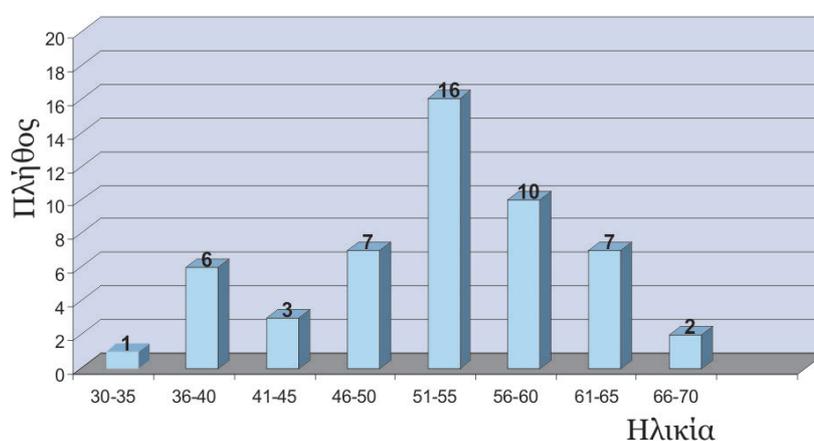
- The advertisements of the secretarial staff positions should contain, according to the duties of these positions, the necessary minimum qualification degrees (secretarial studies, accounting) and required certificates (foreign language, computer knowledge). Also, all secretarial personnel should undergo thorough professional training on a regular basis.
- The Physics Exhibition Laboratory should continue to be supported and visits from the general public should be encouraged in addition to those of secondary school students.

- The Department should acquire external funding from specialized National and/or International sources in order to develop a plan for the formal establishment and constant upgrade and maintenance of the High Performance Computing Cluster, currently at the High Energy Physics Laboratory, which should develop into a Centre (Tier2) with large processing power and storage capabilities and high level instrumentation. Such a Tier2 centre is absolutely necessary and will be of invaluable help for most of the research projects performed in the Department with intensive calculation or large database needs.

D. Strategic planning, perspectives for improvement and potential inhibiting factors

- Short, medium and long-term goals.

1. The curriculum is well organized structurally. However, the Committee considers that the number of elective undergraduate courses (70) is too high and notes that efforts are made to drastically reduce their number by combining similar thematic topics. A similar situation exists at the graduate level, particularly with the programme Electronics and Telecommunications (25), where the Committee recommends a drastic reduction of the number of courses by combining thematic topics to bring the number to the similar level as the other programmes.
2. The Administration staff have the electronic tools to adequately handle the services offered in support of the students and the staff. This includes the services for student registration, recording of examination marks and the general student records. However, the staff need to have the proper qualification degrees (for example secretarial studies, foreign language certificates etc.) and to go through continuous training.
3. In order to facilitate communication and links between the general Department Secretariat and the Secretariats of the Sections, students and staff, the Committee recommends that the former is relocated to the building of the Department from its current location in the University Administration Building.
4. The number of technical personnel (5) is clearly inadequate to cover the total needs of the Department and especially those of the laboratories taking into account the large number of students attending the laboratory sessions. It must be organized in a better way in the future with, for example, the introduction of a teaching and/or research assistantship programme for graduate students.
5. Considerable efforts of science communication and outreach with local schools are well established through the Physics Exhibition Laboratory. A careful planning of the outreach and a better link with the local schools and the wider community of the region has to become more prominent in the aims of the Department.
6. The age graph below shows that the first generation that has established the Department four decades ago will be at the age of retirement in 10-15 year's time. More than half of the staff of the laboratory is currently above 50. The Department will be coming in the next 10 years to a crossroad and this is an opportunity for the Department to consider its future in detail.



- It is important that the Department maintains its continuous efforts to produce world-class research. This would require the gradual renewal of the research staff and the research laboratories, including the state-of-the-art research infrastructure and facilities. The creation of the Network of Research Supporting Laboratories to serve across the University would also facilitate this effort.
- The Committee's proposed restructuring of the research groups detailed in Section 2.2 would improve the coherence and focus of research in the Department and the interactions with other international centres of research. In particular, with the proposed restructuring of the Department, the Electronics and Telecommunications activities should be maintained in the Department as it constitutes a very important support activity for the Department.
- Synergies and links with the Medical School of the University need to be strengthened in the areas of radiation physics and medical physics.
- The Meteorological Laboratory should expand its links with external agencies in the field, and especially with the National Meteorological Service (EMY) and the Athens Observatory, which would be very useful for the regional community.
- The degree of the graduate didactic programme should be automatically recognized by the National authorities to meet the criteria for secondary education teaching certificate equivalent in the country.
- Like in most other universities in Greece there continues to be a relatively high percentage of students (20-30%) admitted to the Department through the national examination system without the students necessarily wanting to become physicists. This problem holds for almost all scientific fields and has to be seriously addressed by the State, in close collaboration with the universities.
- A system of fellowships and teaching and/or research assistantships should be devised for the graduate students, so that more of them become involved in research, assisting the established scientific groups in their teaching (problem solving sessions, experimental exercises) and in their pursuit for quality research.

One way to achieve this is either through allocating a part of the significant amount of the student support funds as stipends for these students (a healthier system and attitude of work in return for payment). Another way is to require from all the middle or high financial class students to pay a minimum amount of money for their food. An example, easily provided by a graduate student attending the Department is the following:

$$3500 \text{ students} \times 2 \text{ euro/day} \times 20 \text{ days/month} \times 9 \text{ months/year} = 1.260.000 \text{ euro}$$

This fund, collected by having each student subsidize their food with 360 euro per academic year will allow the establishment of approximately 100 graduate student assistantships at the level of 1000 euro per month for the whole year (12 months).

Finally, two comments of general nature that seem to hold for all Greek universities:

1. The universities are restrained by the law, which does not permit them to distribute some allocated funds and positions according to their needs. They do not have sufficient self-governance to redirect funds and positions according to their strategic planning. Each university should be given a budget and be allowed to set its priorities.
2. More effort should be made by the relevant State authorities to ensure the continuity and non-interruption of the functioning of the University throughout the academic year. This seems to be a general problem in Greece.

E. Conclusions:

Conclusions of the External Evaluation Committee and recommendations:

The Department has clearly developed to a high level in research and meets international standards.

- In its short history, practically most of its members have remained active.
- Its graduates have obtained positions in several established universities and institutes world-wide, with some of them returning to the University of Ioannina to take up staff positions.
- The Committee noted the absence of other research institutes in the area and also the lack of collaboration between the physics research groups and other groups of the University, for example the Medical School.
- The deficiencies in undergraduate and graduate studies are attributed more to the general institutional structure of the Greek universities and the peculiarities of the admission system.

The Committee strongly believes in the necessity to implement an efficient system of scholarships for all graduate students, at the Masters and at the PhD level. This can be realized through the implementation of teaching and/or research scholarships and through the submission of applications for European and/or National research funding.

The Committee recommends that the graduate experimental laboratories require the additional support of technical personnel. Graduate students with an appropriate teaching and/or research assistantships would successfully support the undergraduate laboratories and help in the realization of the teaching undergraduate programmes.

A plan for recruitment of new, young faculty members should be followed by the Department. The plan should guarantee the continuity of a well functioning educational programme, taking into account the retirements of a large number of faculty members and the dynamic scientific developments of our times.

In view of the upcoming retirements in the Theoretical Physics Section, special attention must be given to the hiring of two faculty member able to serve the areas of quantum gravity, cosmology and astroparticle physics – creating a modern and coherent effort covering as much as possible the areas of theoretical particle and astroparticle physics. Also, new appointments should be made for a particle theory phenomenologist, a theoretical condensed matter physicist, as well appointments in the Experimental Solid State/Condensed Matter Physics Section, the Experimental Nuclear and High Energy Physics Section, and in the Physics Exhibition Laboratory to reinforce these areas. The total number of positions recommended by the Committee is 7.

The Committee believes that the Department should organize an efficient recruitment policy reinforcing its scientific and technical personnel along the lines of the proposed recruitment policy by the Committee.

The number of undergraduate students entering at the first year in the Department is more than 210. 35% of those do not attend the courses offered by the Department and they cannot be considered as “active” students. The Committee believes that the number of students entering in the Department has to be drastically reduced to approximately 120 students per year in order to achieve a much better educational functionality, a more efficient student care in accommodation and restaurant facilities.

The Members of the Committee

Name and Surname

Signature

Prof. Costas Kounnas

Prof. Panos Razis

Prof. Charalambos Tsertos

Prof. Emmanuel Tsesmelis