

EXTENDED UNIVERSITY PROGRAMS: DEPARTMENT OF MEDICAL SYSTEMS TECHNOLOGY

Vassilis Zacharopoulos¹, George M. Papadourakis¹, Chara Athanasaki-Michailidou¹

Abstract *The Greek Ministry of Education and Religious Affairs decided in 1997 to begin a pilot project entitled "Extended University Programs". The new programs were designed to respond to the demands of the Greek economy and society and promote: a) Flexibility - complementarity - life-long education and training, b) Gradual establishment of free access to Universities and Technological Educational Institutions, c) High quality and low operational cost, and d) Links with the labor market. At the Technological Educational Institute of Crete the Department of Medical Systems Technology was established at the School of Applied Technology under the Extended University Program. In this paper the philosophical issues of the Extended University programs will be outlined and in particular the scope and aims of the Department of Medical Systems Technology will be described. Within the three years of operation of the Department comparisons will be made with the traditional Departments. Furthermore, statistical data of the new students will be analyzed and reflections on their future and further development of the department will be outlined.*

INTRODUCTION

The continuous upgrading of the Hellenic educational system is one of the higher aims of the Hellenic government within the European developing policy of the country. This is due to the following reasons:

- In modern days, the development of a country is based mainly on its human resources.
- The relative low educational attainment of the active population (ages 25-64), having as a result the social demand for higher education.

In 1994, according to 1996 OECD indicators [1], the percentage of active population in Hellas having higher education degrees was 18%, which is low compared to countries such as Canada (46%), USA (32%), Belgium (22%), Denmark (20%), Germany (23%), Ireland (19%), Netherlands (21%), United Kingdom (21%), Finland (20%) and Sweden (26%). The only developed countries having lower percentage numbers are: France (18%), Spain (15%), Portugal (10%) and Italy (8%).

Recently, the number of students in higher education has risen and the demand for higher education has been increased rapidly. However, due to the educational entrance system in the Hellenic Universities, through competitive examinations, has as a result the distribution of successful

candidates to Departments not related necessary with their desires. The end result is that a great number of University students do not have the desire to finish their studies. In 1995, 46% of the University students in Hellas are considered inactive [2]. According to Hellenic laws a student cannot be expelled from the University no matter how many courses has failed. The only way for a student to leave the University is by resignation.

Another major problem relates to the great number of Hellenic students enrolling at foreign Universities because, either they have failed during the entrance exams or they didn't enter at a department of their choice. The number of Hellenic students enrolled at foreign Universities in 1995 was over 30000 at a cost for the Hellenic economy of approximately 200 million dollars per year.

The development and application of an educational system capable of solving the above mentioned problems while maintaining the quality of University education is a great challenge to the Hellenic Ministry of Education. The new educational system should be flexible enough in order to reflect simultaneously the students' desires for education as well as the continuing changing needs of the work market to specialized human resources.

The introduction of a new program of studies at the Hellenic Universities possessing the above characteristics was designed by the Hellenic Ministry of Education and was named Extended University Programs. They were implemented in the form of pilot projects.

In this paper the philosophical issues of the Extended University programs will be outlined and in particular the scope and aims of the Department of Medical Systems Technology will be described. Within the two years of operation of the Department comparisons will be made with the traditional Departments. Furthermore, statistical data of the new students will be analyzed and reflections on their future and further development of the department will be outlined.

EXTENDED UNIVERSITY PROGRAMS

The *Extended University Programs* is a project financed by the Operational Program for Education and Initial Training (EPEAEK). EPEAEK is co-financed by National funds as well as by the European Community. The project was implemented as a pilot one and started in 1998. The program was designed to respond to the demands of the Hellenic economy and society and promote:

¹ Technological Educational Institute of Crete School of Applied Technology P.O. Box 140, Stavromenos 715 00 Heraklion, Crete, Greece
papadour@cs.teiher.gr

- Flexibility - complementarity - life long education and training.
- Gradual establishment of free access to Universities and Technological Educational Institutes (TEIs).
- High quality and low operational cost.
- Links with the labor market

The Extended University Programs reinforce the flexibility of the Universities and TEIs to cover the demands for higher education by increasing the available positions. It is estimated that in next 35 years the number of yearly available positions for higher education in Hellas will be 75000-80000 and it will cover entirely the demand of the Hellenic society. Furthermore, the Extended University Programs will reinforce the educational choices in higher education by developing new study areas as they emerge from the evolution of technology and the social – economic priorities of the country.

In the first place, priority was given to fields of study which were in line with the basic goals of the second community support framework, such as:

- Economy – Management – Production
- Sciences
- Sciences of material
- Environmental Sciences
- Management of Information Systems
- Energy
- Humanities
- Social Sciences

The Extended University Programs operate in parallel with the traditional programs of the Universities and TEIs of Hellas. They were formed as inter-departmental or inter-institutional study programs within existing traditional departments, thus achieving high quality and low operational costs.

The Extended University Programs grant a first degree equivalent to those of existing programs of study. However, it is different from the traditional programs since the Extended University Programs are also open for enrollment to students of all ages who wish to compliment their skills and knowledge, in application of the life-long learning principle, by attending one or more single courses. To increase flexibility a credit system was introduced.

The Extended University Programs are organized in a trimester system (3 four-month period per year) thus extending the operational period over the summer months June and July. Each trimester consists of 12 weeks of study and at most a student can attend three courses per trimester resulting at a maximum of nine courses per year. A typical Extended University Program consists of 40 courses, thus a student can be awarded a degree in approximately five years of study.

MEDICAL SYSTEMS TECHNOLOGY PROGRAM

There is a world wide increasing demand for technology scientists specialized in biomedical technology from hospitals, industry, research institutes and other organizations. This demand is higher in Hellas since the existing programs don't cover sufficiently this area especially at undergraduate level. Therefore, it is not uncommon to find unskilled personnel placed in biomedical technology positions having as a result the communication and collaboration with doctors to become difficult and problematic.

The Department of Medical Systems Technology was formed as an Extended University Program and offers a new curriculum in the field of Biomedical Technology. The Department offers two specializations: a) Medical Instrumentation and b) Medical Informatics and Telemedicine. The medical instrumentation specialty focuses mainly on the right selection, function design and maintenance of the modern medical equipment. The medical informatics and telemedicine specialty focuses on the development of the information systems used in medical diagnosis as well as the reception, processing, storage and transmission of medical images covering a broad range of medical demands.

The department's goal is to provide its students with the necessary and in accordance with international standards theoretical and technical knowledge and expertise so that, the department graduates will be able to work in all biomedical technology related areas as scientists, engineers or technical staff in the hospitals, the industry, the research centers and other organizations in the government as well as the private sector, participating actively in the design and the production of medical systems contributing thus in the advancement of biomedical technology.

The duration of studies in this program is 5 years. It is realized in 15 trimesters. The program of studies is presented in Table I. The first 2 trimesters include general education courses. In the following 7 trimesters, the department offers courses in the fields of mechanical, computer, electrical and electronic engineering. The 10th and 11th trimester include specialty foundation courses in Biomedical Technology while in the last year, actually from the 12th trimester, the student chooses between the following two specialization areas: a) Medical Instrumentation and b) Medical Informatics and Telemedicine. In addition, the department students obtain a two-month long infield practical training during the 9th trimester and a four-month long infield practical training the 13th trimesters whereas; they complete a degree thesis throughout the 15th trimester.

TABLE I
PROGRAM OF STUDIES

| Year | Spring Trimester | Summer Trimester | Winter Trimester |
|-----------------|---|---|--|
| 1 st | 1T Mathematics I Material Technology Physics I Introduction to Biomedical Technology | 2T English I Mathematics II Physics II Introduction to Informatics - Operating Systems | 3T English II Electrotechnology Introduction to Electronics Computer Programming |
| | 4T English III Digital Electronics Analog Electronics Technical Drawing | 5T Technical English I Microcomputers Power Electronics & Electrical Motion Sensors & Computer Peripherals | 6T Technical English II Data Bases Automated Control Systems Introduction to Telecommunications |
| 3 rd | 7T Computer Networks Introduction to Anatomy - Histology Technical Mechanics - Machinework Processing | 8T Introduction to Biology - Physiology Hospital Management - Ethics Topics Bioengineering - Fluid Mechanics | 9T A Medical Informatics I Medical Optics - Bioelectricity 9T B Practical Training I (2 months) |
| | 10T Bio-signal Reception & Processing Medical Systems Instrumentation I Hospital Facilitation | 11T Physics & Instrumentation of Medical Imaging Digital Communication Networks Quality Control & Maintenance of Biomedical Equipment | 12T A Biochemistry - Biomaterials Medical Systems Instrumentation II Medical Instrumentation Applications 12T B Medical Informatics II Telemedicine Medical Image Processing |
| 5 th | 13T A Practical Training II (4 months) | 14T Dynamics & Kinetics of Limbs - Artificial Parts Medical Systems Instrumentation III Rehabilitation Engineering | 15T Robotics in Medicine Artificial Organs Engineering Degree Thesis |
| | 13T B Practical Training II (4 months) | 14T Artificial Intelligence in Medicine Biological Systems Simulation Biostatistics | 15T Robotics in Medicine Applications of Medical Informatics Degree Thesis |

REALIZATION OF THE DEPARTMENT AND STUDENT STATISTICS

The program is realized at the TEI of Crete campus in Heraklion, Crete, Greece. TEI of Crete professors, belonging to the School of Applied Technology, mainly teach the courses. External lectures belonging to national research centers and medical staff from the two local hospitals are invited to teach specialization courses.

The first students were enrolled in Spring 1998 and 72 candidates were selected among 428 applicants based on academic and social criteria set by the Hellenic Ministry of Education for several student categories. Applications belonging to the following student categories were evaluated:

- Regular students having high school diploma and have taken part in national University entrance examinations.
- Foreign University students wishing to transfer from the foreign University to the Extended University Program.
- Hellenic University and TEI students wishing to transfer from their Department to the Extended University Program.
- Graduates of Universities and TEIs.
- Older (over 25) students.

Table 2 shows the number of applications per category along with the admitted and registered number for each category for the three years of the operation of the Extended University Program. Although the Hellenic Ministry of Education set the entrance guidelines, the students were

evaluated and admitted by the Department’s personnel, unlike the traditional entrance of students to Universities and TEIs by participating in national examinations evaluated and admitted by the Ministry of Education.

Concerning the VI) category students, there was a special entrance application procedure in winter 1999, and 24 candidates were selected among 31 applicants. The candidates attended trimesters 12-15. The first 15 graduates were awarded a certificate of attendance in Summer 2000.

After completing two years of studies in the Department, less than 50% of the initially registered students remain active. Table 3 indicates the actual number and percentages of the active, inactive (they have postponed their studies) and withdrawn students. Transfer students from

foreign Universities (70%) followed closely by transfer students from Hellenic Universities (67%) have the highest success rate. The regular students (56%) have a relative high success rate while graduates from other Hellenic University and TEIs (19%) and older students (25%) have very low continuation percentages. We believe that the cause for such continuation levels can be accounted to the fact that most students belonging to these categories already have a full-time or part-time employment and they couldn’t devote enough time to their studies in order to pass the courses. Another percentage of these categories found jobs after they enrolled and for the same reasons mentioned above couldn’t keep up with their studies as well.

TABLE II
NUMBER OF APPLICANTS AND SELECTED STUDENTS FOR THE THREE YEARS OPERATION OF THE DEPARTMENT.

| Academic Year | 1998-1999 | | 1999-2000 | | 2000-2001 | |
|---------------|--------------|------------|--------------|------------|--------------|------------|
| CATEGORY | Applications | Selections | Applications | Selections | Applications | Selections |
| É | 281 | 36 | 225 | 37 | 226 | 34 |
| ÉÉ | 17 | 10 | 6 | 6 | 7 | 7 |
| ÉÉÉ | 5 | 3 | 10 | 10 | 20 | 12 |
| IV | 24 | 11 | 8 | 7 | 9 | 9 |
| V | 101 | 12 | 72 | 12 | 54 | 10 |
| TOTAL | 428 | 72 | 321 | 72 | 316 | 72 |

TABLE III
ACTUAL NUMBER AND PERCENTAGES OF ACTIVE, INACTIVE AND WITHDRAWN STUDENTS.

| CATEGORY | Student's | Active | Inactive | Withdrawn |
|--------------|-----------|-----------|----------|-----------|
| É | 36 | 20 | 3 | 13 |
| ÉÉ | 10 | 7 | 1 | 2 |
| ÉÉÉ | 3 | 2 | - | 1 |
| IV | 11 | 2 | 3 | 6 |
| V | 12 | 3 | - | 9 |
| TOTAL | 72 | 34 | 7 | 31 |

| CATEGORY | Active | Inactive | Withdrawn |
|----------------------|------------|------------|------------|
| É | 56% | 8% | 36% |
| ÉÉ | 70% | 10% | 20% |
| ÉÉÉ | 67% | 0% | 33% |
| IV | 18% | 27% | 55% |
| V | 25% | 0% | 75% |
| TOTAL Overall | 47% | 10% | 43% |

CONCLUSIONS

The philosophical issues of the “Extended University Program”, a new Educational approach in Greece was outlined, and in particular the scope and aims of the Department of Medical Systems Technology were described. The realization of the department was presented and statistical data of the new students were analyzed.

The part-time students concept is new in Greece and while there is desire for further educational enhancement

from older people they do not fully acknowledge the time required to devote to their studies having as a result high withdraw rates. In the near future regular programs at the Hellenic Universities and TEI’s will cover the demands for higher education and the future of the Extended University Programs will relay heavily on older students and part-time students. The criteria of selecting such students should be investigated in order to assure that the most suitable and likely to succeed candidates are selected.

REFERENCES

- [1] OECD Education at a glance –OECD indicators, 2 Vols, 1995, 1996.
- [2] “Extended University Programs”, Operational Program for Education and Initial Training, Technical Action Report, Hellenic Ministry of Education, Athens, Greece, 1997
- [3] “Medical System Technology”, Proposal to Hellenic Ministry of Education, Technological Educational Institute of Crete, Heraklion, Crete, Greece, 1997.