A trans-European, multi-departmental course on network and e-business centred computing

G. Hassapis†, S. Tzortzidou†, V. Alexandrov‡ & C.D. Kloos*

Aristotle University of Thessaloniki, Thessaloniki, Greece†
University of Reading, Whiteknights Reading, England, United Kingdom‡
Universidad Carlos III de Madrid, Madrid, Spain*

ABSTRACT: A Master of Science (MSc) course on Network and E-business Centred Computing is presented in this paper. This course is organised and run by three different universities located in three different European countries. Students attend lectures and carry out laboratory and dissertation work in all of the three European Universities by travelling and staying in each country for specific time durations. The course accepts applications from students from all over the world; many students coming from countries other than the countries of the European Union are supported by grants provided by the Erasmus Mundus funding scheme of the European Union. Specifically in this paper the aims, the syllabus and the experience gained from such an educational experiment will be presented.

INTRODUCTION

In many countries around the world higher education faces the challenges of globalisation and, in particular, the need to adapt to the demands of the knowledge society and to enhance the attractiveness and its visibility worldwide. As one can read in the various publicly available documents, in Europe these challenges are taken quite seriously and many efforts are made to stimulate the process of convergence of degree structures across Europe [1]. These themes are central to current national reform processes in higher education taking place in Member States. Furthermore, Europe is interested in promoting an intercultural dialogue with the rest of the world. For this reason, a number of programmes are funded towards this end. Among these there is the Erasmus Mundus programme, which, according to the published objectives, tries to promote international cooperation, as well as staff and student mobility in the field of higher education [2][3]. It is believed that this cooperation and mobility will enhance the quality of European higher education, as well as the dialogue and understanding between people coming from different cultures. In addition, this programme contributes to the development of human resources and the international cooperation capacity of higher education institutions in third countries by increasing mobility between the European Union and these countries.

The Erasmus Mundus programme provides support to:

- higher education institutions that wish to implement joint programmes at postgraduate level or to set-up inter-institutional cooperation partnerships between universities from Europe and targeted third countries;
- individual students, researchers and university staff who wish to spend a study/research/teaching period in the context of one of the above-mentioned joint programmes or cooperation partnerships;
- any organisation active in the field of higher education that wishes to develop projects aimed at enhancing the attractiveness, profile, visibility and image of European higher education worldwide.

In an effort to satisfy these objectives three European universities, namely the University of Reading in the UK, the Universidad Carlos III de Madrid in Spain and the Aristotle University of Thessaloniki (AUTH) in Greece have joined forces and developed a joint postgraduate programme in the field of Informatics. Specifically, the School of Electrical and Computer Engineering at the Faculty of Engineering in AUTH, the Department of Computer Science of the University of Reading and the Department of Telematics Engineering of the University Carlos III of Madrid designed and organised a joint course of postgraduate studies titled *Erasmus Mundus MSc in Network and e-Business Centred Computing*, which was approved and funded by the Erasmus Mundus initiative of the European Union [4]. In the following sections, first the aims and the organisation of the course will be presented and, next, the way the students are selected, the content of the modules and the method of their delivery will be explained. Finally, the degree to which the aims both of the course and the Erasmus Mundus programme have been satisfied is assessed.

THE AIMS OF THE COURSE

The course was designed with the following aims in mind:

- To prepare future professionals for the digital economy to be capable of understanding the technical underpinnings and business opportunities of the new economy.
- To provide in-depth study and training encompassing state-of-the-art principles and techniques of the e-business route. This is provided through having a set of in-depth specialist modules.
- To provide students with research and development skills through a substantial six-month research and development project undertaken in one of the participating institutions.
- To provide the students with an opportunity to study in a multi-cultural environment sharing knowledge with other students from different backgrounds.

COURSE DESCRIPTION

The course is organised in modules. Each participating University has the responsibility of organising and teaching a group of modules having the same overall credit units. The modules are taught over a nine-month period at the three Universities that participate in the course. The first trimester the students move to Reading to attend the modules offered by the University of Reading; the second trimester they move to Thessaloniki to attend the modules offered by AUTH and the third trimester they move to Madrid to attend the modules offered by the Carlos III University. Each student has the obligation of carrying out a dissertation thesis over a six-month period in any of the Universities participating in the course.

COURSE ADMINISTRATION

A Multilateral Agreement signed by the three Universities commits them to apply uniform teaching and examination standards, which must be in compliance with the legislature of the country of each University. An agreed student selection policy is applied. A joint degree signed by the Rectors of the three Universities is awarded to the students. This degree is equivalent to the MSc degrees awarded by the Universities of each country. Students from countries other than EU countries receive a scholarship by the Erasmus Mundus initiative covering their maintenance and study expenses. The programme has entered into its fourth year of running, and the students from the first two intakes have already graduated. Students from Argentina, Bangladesh, Brazil, Canada, China, Ecuador, Ethiopia, F.Y.R.O.M. (Former Yugoslav Republic of Macedonia), Goa, Guatemala, India, Indonesia, Lagos, Mexico, Nigeria, Honduras, Pakistan, Russia, Serbia, Taiwan, Ukraine, the USA and Vietnam have been accepted in the course over its four years of running. The course is administered by three bodies. The hierarchical dependencies of these bodies are shown in Figure 1.
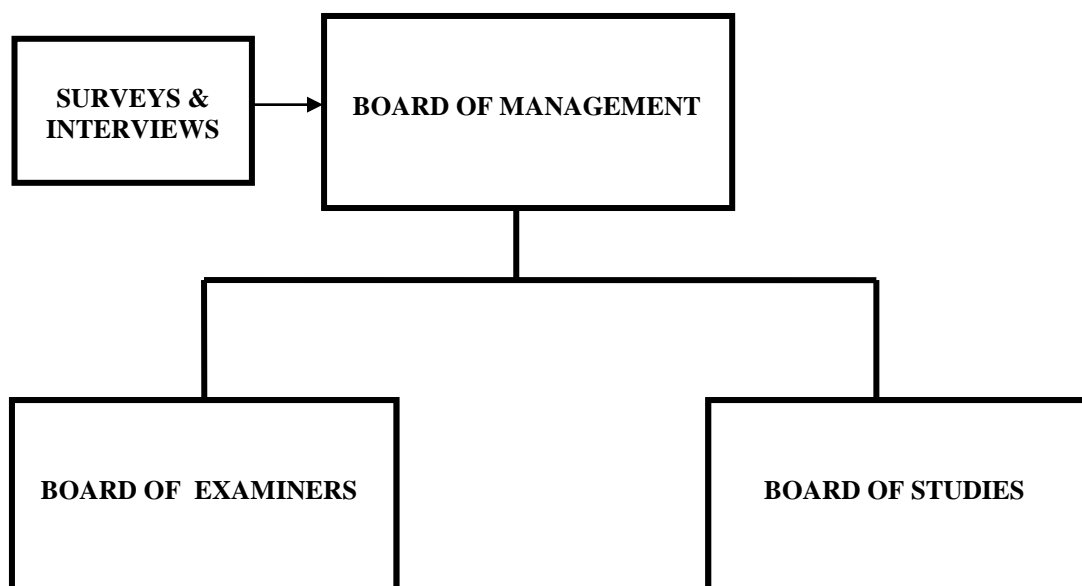

Figure 1: Management organisation.

The overall responsibility and decision-taking body is the Board of Management with representatives from each institution. The Board of Examiners has the responsibility of monitoring and implementing the agreed QA procedures of the course. It includes the representatives of the Board of Management and at least two lecturers from each partner teaching modules on the MSc and two External Examiners. The Board of Studies meets regularly to review and develop the joint curriculum. The Course is managed on a day-by-day basis by four staff members at the coordinator site and two members of staff at each of the partner sites. Additional monitoring takes place through regular surveys and

interviews of the students and lecturers of the programme collecting the students' and lecturers' opinions on the programme, accommodation, language provision, etc. Also, there is day-to-day contact with the student representative of the course. All this information is supplied on a regular basis to the Board of Management and the other joint bodies.

COURSE CONTENT

The course consists of 12 in-depth specialist modules in the chosen e-business area, followed, as explained above, by a substantial six-month research and development project undertaken in one of the participating institutions. Four modules are taught at each one of the first three trimesters of the course. The modules of each trimester are delivered at a different University but with the same pedagogical approaches. Core modules, related to the general computer science background, are taught during the first semester at the University of Reading. Specialist modules are taught at the other two sites. The purpose of the specialist modules taught at the Aristotle University is mainly to make students aware of some very recent developments that can be utilised in building the e-business environment of the future. Such environments could have advanced gesture and human mood recognition interfaces, possess intelligence in their communication with the client and provide answers to context based searches. The modules taught at the Carlos III University focus on providing a hands-on experience of the state-of-the-art tools and techniques used to build the e-business organisations. A list of the taught modules is given in Table 1.

Table 1: List of the taught modules during each trimester.

> Course content
>
> Term 1: University of Reading (UoR)
>
> - SEMC01: Advanced Operating Systems & Programming in Unix
> - SEMC02: Network Computing
> - SEMC03: Computer Architectures
> - SEMC06: Transferable Skills
>
> Term 2: Aristotle University of Thessaloniki (AUTH)
>
> - SEMC51: Human-Computer Interaction
> - SEMC52: Computational Intelligence and e-Business
> - SEMC53: Databases and Knowledge Mining
> - SEMC54: Introduction to e-Business
>
> Term 3: University Carlos III Madrid (UC3M)
>
> - SEMC61: Network Infrastructure
> - SEMC63: B2B Technologies
> - SEMC64: B2C Technologies
> - SEMC65: Network Security and Electronic Payment

PEDAGOGICAL AND COURSE DELIVERY ISSUES

Several studies offer evidence that collaborative teaching facilitates higher-level cognitive and social interaction, which leads to a deeper understanding of the taught subjects [5][6]. Such a teaching approach presents to the class the goals of the lectures, receives feedback from the class on the level of understanding, includes practical examples which demonstrate the application of the theory and involves the students in collaborative project work. In this MSc course, the collaborative teaching approach has been adopted for every delivered module and applied in the same way by all the three participating Universities. So, each module is characterised by the goals that it is going to serve and make these goals known to students.

First of all, every module is delivered over a specific period of time during which no other module is taught. Depending on the module, its delivery duration may vary from one to two weeks. The module teaching involves three parts every day. The first part is an interactive lecture delivery usually taking two hours. From the interactions of the student with the lecturer a series of exercises is planned for the next two hours with the assistance of computer facilities. By the end of the day, a two or more hours tutorial is organised, which can be attended voluntarily by the students who wish to have some assistance in understanding the material taught in that part of the day. Also, a small assignment is given to each student when almost half of the module content has been taught and the student is expected to present his or her solution by the end of the module delivery. This assignment is not related by any means to the dissertation project that the student has to carry out within a period of six months and after all the modules of the course have been completed.

COMMON TEACHING AND LEARNING ENVIRONMENT

All the lecture notes, tutorial notes and other relevant information for all the partners are kept on BlackBoard, an asynchronous e-learning management environment, at the University of Reading, with all teaching staff and students having access to the corresponding modules [7]. In addition, there is an Information module keeping all current information for students and staff such as handbooks, regulations, timetables, etc. There is also an Administrative module for Management of the MSc, which keeps all the documents and minutes of the meetings so that the course can be managed efficiently by the partners on a day-by-day basis. BlackBoard seems to be a good cooperation mechanism while running distributed courses. Through this mechanism educational material is delivered to the students, lecturers communicate with the students asynchronously, assign work, receive submitted coursework and announce the grades of the assignments.

Common examination criteria and procedures, as agreed in our Multilateral Agreement of Collaboration, are followed by all the three partners. The exam papers are submitted in advance and checked by the External Examiners in order to ensure the same high standard across the Consortium.

STUDENT PERFORMANCE

As a representative sample of the monitored academic performance of the students, the grades of the class of the academic year 2008-2009 of the modules taught in Greece are shown in Figure 2.
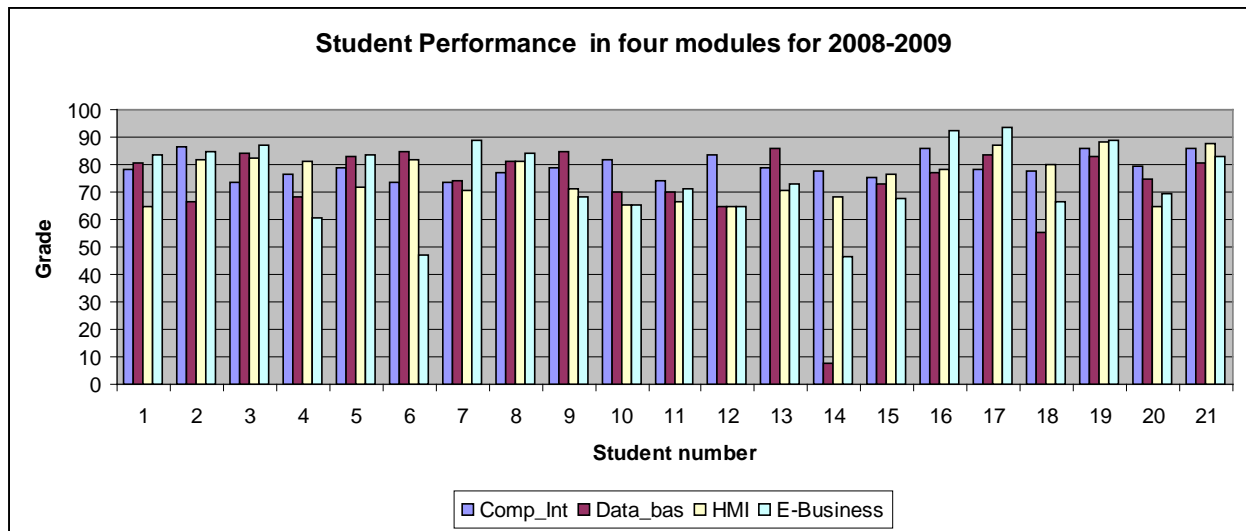

Figure 2: Students' performance.

As one can observe, the students have obtained quite high grades. These grades are the results of weighed marks taken at exams, assignment and lab work. In Table 2 some indices are given, such as the average mark in each module, the median and the minimum mark. One can observe that the average mark is well above the pass level of 50 and half of the students have achieved higher grades than the average grade. In two of the modules, no-one has failed whereas in the other, only two persons failed.

Work is assessed as follows. Grades greater than or equal to 70 correspond to work of distinction standard. Grades between 60 and 69 correspond to work of merit standard and grades between 50 and 59 correspond to work of a good standard. The failing categories are between 40 and 49 for work below threshold standard, and below 40 is unsatisfactory work. It is believed that this is a very good overall performance for a very intensive course, considering the language and cultural difficulties and adaptation problems that most of the students face by moving to three different countries. Hence, the students have to cope with three different cultures within the short period of nine months.

Table 2: Performance indices.

Module	Average Grade	Median Grade	Minimum grade
Computational Intelligence	79,07429	78,35	73,35
Knowledge Mining	73	76,9	7,5
Human-Computer Interaction	75,42857	76,5	65
Introduction to e-Business Technologies	74,75524	73,18	46,68

ASSESSMENT

The Universities in the consortium have established a true working relationship and, it is believed, they have implemented and run the Erasmus Mundus course very efficiently. The Board of Management, the Board of Studies, and the Board of Examiners have been established. Up to now, three cohorts of students have graduated. The rate of student failure was very low. One or two students from every cohort did not manage to obtain the degree. The performances of the students during the other two years, for which data were not given for reasons of space, are very similar to the one shown in the previous section. In addition, using BlackBoard as a communication medium in a distributed setting has helped a lot to streamline, and speed up the administration and communication between the partners, as well as the communication with the students in a distributed multi-site setting. The problem that took most of the time was that of visas.

Student adaptation to the social life was another problem that was encountered. So, some of the students seemed to have problems in finding places to go in the city, mixing with local people and entertaining themselves. Sometimes the reason was the language barrier. For easier adaptation, the partners agreed to run induction courses upon the students' arrival at every country and give introductory language courses in Greek and Spanish. The first week of the stay, especially in Greece, students are taught how to cope with the needs of everyday life, such as ordering in a restaurant, shopping and the like by escorting them to these places and teaching them on the spot the Greek language basics required for coping with these situations. Then, they can take the regular Greek language course along with their studies. Every year the course accepts between a minimum of 250 applications and a maximum of 500 applications.

REFERENCES

1. European Commission – Education and Training, 8 December 2009, http://ec.europa.eu/education/index_en.htm
2. Erasmus Mundus – Scholarships and Academic Cooperation, 8 December 2009, http://ec.europa.eu/education /external-relation-programmes/doc72_en.htm
3. European Commission, Erasmus Mundus Programme Guide 2005–2009, 4 December 2009.
4. Erasmus Mundus M.Sc. in Network and e-Business Centred Computing, 8 December 2009, http://www.reading.ac. uk/sse/pg-taught/sse-pgtadvancedEuropeanErasumsMundusMSc.aspx
5. Hakkarainen, K., Epistemology of Inquiry and Computer-Supported Collaborative Learning. PhD thesis, University of Toronto, Canada (1998).
6. Scardamalia, M. and Bereiter, C., *Adaptation and Understanding: A Case for New Cultures of Schooling*. In: Vosniadou, S., De Corte, E., Glaser, R. and Mandl, H. (Eds), International Perspectives on the Psychological Foundations of Technology-Based Learning Environments. Mahwah, NJ: Lawrence Erlbaum, 149–163 (1996).
7. Bb Blackboard, 9 December 2009, http://www.blackboard.com