

FOREWORD

INTERNATIONAL DIMENSION IN ENGINEERING EDUCATION

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1. *The origin of the University in Europe*

The development of the University in Europe (east and west) from its origins to the present day, played a crucial role against a backdrop of changing conditions, ideas and values. The modernization, differentiation and expansion of higher education led to the triumph of modern science, changing the relations between universities and national states, teachers and students, their ambitions and political activities. Special attention was focused on the fundamental advances in «learning» – the content of what was taught at the universities.

1.1 *The University was not only born in Europe, it was born to be European*

Starting from the origins of University, young people belonging to the most important European families, performed mobilities to the major Higher Education Institutions in Europe (*peregrinatio academica*) and this constituted the basis of the wish to learn from prestigious teachers.

During Middle ages, the Benedictine Monasteries became centres for the diffusion of *Christianity* in the «Old World», but were also *excellent examples of civil living* and made a decisive contribution to the *moral and cultural rebirth* of the continent after the barbarian invasions. As true communities, the monasteries were like miniature societies, in which time was spent not just on spiritual and meditative activities, but also cultural, administrative and productive work. Within their walls, on the one hand, there was *prayer and study*, the pursuit of culture and knowledge and the collection and organisation of manuscripts and documents.

Great innovation was introduced by the Benedictine Monasticism in the Middle Ages with the training of Novices. Novices were not admitted to vows until they had successfully completed the prescribed period of training and proving, called the novitiate. This can be considered as forerunner of the European mobility of knowledge. The figure of *St.*

Benedict came to represent an element of unification in a Europe that had always struggled to build a sense of civil, cultural and spiritual identity. His message, which was spread by the many Benedictine communities from the VII century onwards, sustained the «old continent» during the darkest periods in history, and offered a decisive contribution to the construction of modern society.

In later times, mobility has characterized both University teachers and students. From one side, teachers moved to the most prestigious Universities where they could obtain higher wages, on the other hand students moved to the most accredited Universities where prestigious teachers worked.

2. Mobility within University Co-operation Programmes

2.1 Erasmus Programme

From the late 80s, the EU policy recognized the fundamental importance of the integration of cultures through the mobility of students and teachers. The most important mobility programme for Higher Education is Erasmus.

Erasmus is the EU's flagship education and training programme, enabling two hundred thousand students to study and work abroad each year, as well as supporting co-operation actions between higher education institutions across Europe. It caters not only for students, but also for professors and business staff who want to teach abroad and for university staff who want to be trained abroad.

The Programme is named after the humanist and theologian Desiderius Erasmus of Rotterdam (1465-1536) whose travels for work and study took in the era's great centres of learning, including Paris, Leuven and Cambridge. Like the man, the Erasmus programme places great importance on mobility and furthering career prospects through learning. By leaving his fortune to the University of Basel, he became a pioneer of the mobility grants which now bear his name.

Studies show that a period spent abroad not only enriches students' lives in the academic field but also in the acquisition of intercultural skills and self-reliance. Staff exchanges have similar beneficial effects, both for the people participating and for the home and host institutions. In addition to mobility actions, the Programme supports higher education institutions to work together through intensive programmes, networks and multilateral projects. Few, if any, programmes launched by the European Union have had a similar Europe-wide reach. Around 90% of European universities take part in Erasmus and 1.9 million students have participated since it started in 1987. The annual budget is in excess of €

400million, more than 3,100 higher education institutions in 31 countries participate, and even more are waiting to join.

Erasmus has become a driver in the modernisation of higher education in Europe and inspired the establishment of the Bologna Process. The general aim of the Programme is to create a European Higher Education Area and foster innovation throughout Europe. Erasmus became part of the EU's Lifelong Learning Programme in 2007 and expanded to cover new areas such as student placements in enterprises (transferred from the Leonardo da Vinci programme), university staff training and teaching for enterprise staff. The Programme seeks to expand its mobility actions even further in coming years, with the target of 3 million Erasmus students by 2012.

Actions include support:

For students mobility (SM):

- studying abroad
- working abroad
- linguistic preparation

For university/higher education institute teaching staff mobility (TS):

- teaching abroad
- receiving training abroad

For universities/ higher education institutes:

- intensive programmes (IP)
- academic and structural networks (TN)
- multilateral projects (MP)
- Curriculum Development (CD)

For enterprises:

- student placements
- teaching abroad
- university cooperation

Higher education institutions which want to participate in Erasmus actions must have an Erasmus University Charter. The Charter aims to guarantee a high level of quality in mobility and cooperation by setting out fundamental principles for all Erasmus actions that participating institutes must follow.

The European Commission is responsible for the Erasmus programme's overall implementation and its Directorate-General for Education and Culture coordinates its different actions. So called «decentralised actions» regarding individual mobility are run by national agencies in the 31 participating countries. Centralised actions such as networks, multilateral projects and the award of the Erasmus University Charter are managed by the Executive Agency for Education, Audiovisual and Culture based in Brussels.

2.2 TEMPUS Programme

The Tempus Programme (Trans-European Mobility Scheme for University Studies) supports the modernisation of higher education and creates an area of co-operation in countries surrounding the EU. Established in 1990 after the fall of the Berlin Wall, the scheme now covers 27 countries in the Western Balkans, Eastern Europe and Central Asia, North Africa and the Middle East (going beyond the «iron curtain».

TEMPUS Joint European Projects (JEP) aim at increasing cooperation and network-building between actors in higher education in EU Member States and partner countries, and help the higher education sector propagate its knowledge outside academic institutions. Projects can support universities in applying the principles of the «Bologna Process», for example by implementing the new two-level education system, and the European Credit Transfer System. *JEPs for Curriculum Development* help to create new or update existing courses and enhance the skills of teaching staff; develop updated modern teaching and learning materials; provide material aid in purchasing computers and other teaching material.

3. Mobility in a Global context

Mobility constitutes a primary element in the internationalization of Engineering Education and Erasmus represented one of the main factors of the Bologna process.

At the moment in Europe there are different societies for Engineering Education aiming at the *development* and the *improvement* of the Engineering Education in Europe such as SEFI, IGIP, CESAER.

A future step of this internationalization process is represented by IFEES (the International Federation of Engineering Education Societies) founded in Rio de Janeiro in 2006 aiming at establishing effective engineering education processes of high quality around the world to assure a global supply of well-prepared engineering graduates. IFEES will strengthen member organizations and their capacity to support faculty and students. It will attract corporate participation, helping to connect engineering graduates with international corporations that have a pressing need for well-trained engineers who can work in a global environment. IFEES will also enhance the ability of engineering faculty, students and practitioners to understand the varied cultures of the world and work effectively in them.

INTRODUCTION

DEVELOPMENT OF ENVIRONMENTAL AND RESOURCES ENGINEERING CURRICULUM 2005-2008: PRESENTATION OF THE RESULTS

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The TEMPUS DEREK Development of Environmental and Resources Engineering Curriculum was a three-year TEMPUS JEP (Joint European Project) whose Grantholder was the University of Florence, Italy and whose Grant Co-ordinator was the University Ss. Cyril and Methodius in Skopje, FYR of Macedonia.

The specific objectives obtained by the project were the development of a new, up-to-date, three-year undergraduate curriculum in Environmental and Resources Engineering at the University Ss. Cyril and Methodius in Skopje, based on the European Credit Transfer System and in accordance with the Bologna Declaration, aimed to establish the European Higher Education Area and the fulfilment of the conditions necessary for offering a joint degree title in Environmental and Resources Engineering implemented jointly on the basis of an agreement between the University Ss. Cyril and Methodius in Skopje and the University of Florence.

The project has led to the development of a new Environmental and Resources Engineering Curriculum focused on the achievement of the six main goals of the Bologna Declaration, as a contribution to the realization of the European Higher Education Area (EHEA). In order to fulfil the Bologna Declaration goals, in addition to the new curriculum, the following DEREK outcomes were achieved: the co-operation among the DEREK Consortium Libraries, the design and elaboration of a new Environmental and Resources Engineering Curriculum based on the European Credit Transfer System (ECTS), the acquirement for the beneficiary University of the basic equipment for the development of the curriculum, the development and implementation of online learning courses, the work on the sustainability of the new curriculum. The

project activities were managed, monitored, controlled and disseminated in accordance with the rules of the TEMPUS programme.

This publication represents the concluding part of the project, a book in which all project actions and outcomes are explained and the approach of the different partners towards the achievement of the different goals is described.

The volume is divided into two main parts: the first part describes the European Consortium approach (including papers from all representatives of Consortium Member institutions in the European Union and the project external experts) and the second part describes the approach from the different faculty representatives of the Ss. Cyril and Methodius University in Skopje and the South East University of Tetovo. This book describes some specific project activities, the methodology, the instruments and the process to the Curriculum Development and it is targeted to act as an updated, coherent and concrete set of instruments for the achievement of similar project objectives.

Through the co-operation of all project consortium members (four Universities in the European Union, two in the partner Country represented by different involved Faculties and two external experts) the project contributed to the establishment of methods for strengthening the regional scientific cooperation and network-building between actors in higher education in EU Member States and partner countries, and helped the higher education sector to propagate its knowledge outside academic institutions.

The DEREC JEP helped the Ss. Cyril and Methodius University in Skopje in applying the principles of the «Bologna Process» by implementing the new two-level education system, and the European Credit Transfer System. Particularly, DEREC created a new course in Environmental and Resources Engineering and enhanced the skills of the partner country University teaching staff; developed updated modern teaching and learning materials and provided material aid in purchasing computers, fields and laboratory equipment.

Great enthusiasm was expressed by the European Commission on the Project activities. Particularly it was «highly appreciated that the accreditation process has been completed». It was also noted «the progress on the delivery of a joint degree with the University of Florence» and congratulations were expressed for «extensive cooperation between the two universities which has been fundamental for these developments». Comments from the European Commission on the Project reports were discussed and shared with all Project Partners on the occasion of the Quality Control Meetings of the Project held at the Ruhr University Bochum in November 2006, at the Aristotle University Thessaloniki in September 2007 and at the Vienna University of Technology in July 2008.

The new course followed all accreditation procedures and in September 2008 was opened to students. At the moment, different students are

enrolled at the Environmental and Resources Engineering degree course at the Ss. Cyril and Methodius University in Skopje. Enrolled students will spend part of their final year at the University of Florence and at the end of the course will be awarded with a degree in Environmental and Resources Engineering which is fully legally equivalent to the degree in Environmental, Resources and Territory Engineering awarded by the University of Florence on the basis of the existing bilateral agreement between the two institutions.

The activities of the DEREK project will be additionally developed in a new project to be launched in the frame of the TEMPUS IV second call of proposal which will be centered on the students mobility (allowing sustainability and exploitation of results to the DEREK project) and will include possible spin offs on a possible second level of the DEREK course and on Higher Education and Research.

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