CDIO as a Foundation for Program Accreditation/Certification in Portugal

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ABSTRACT

This document describes two initiatives for accreditation/certification of first and second cycle Bologna programs in Portugal. One initiative was started by the National Agency for Program Evaluation and Accreditation and is mandatory for all Bologna programs. The other initiative was launched by the Portuguese Professional Engineering Association and aims to certify, at the European level, Bologna second cycle engineering programs with the EUR-ACE quality seal. Both initiatives are essentially evidence-based and stress the importance of having an operating quality assurance system to support and monitor program execution. The Instituto Superior de Engenharia do Porto (ISEP) experience with the CDIO and EUR-ACE frameworks is described and strong points highlighted in this article. In the end, the authors propose that combining CDIO and EUR-ACE may bring added value, because CDIO is more oriented to program operation and EUR-ACE more oriented to program management. The authors also propose the CDIO Syllabus as the link between CDIO and EUR-ACE.

Keywords: Accreditation, CDIO, Certification, Engineering, EUR-ACE, Quality Assurance

INTRODUCTION

In 2009, the Portuguese universities and polytechnics were confronted with two initiatives for accreditation and/or certification of first and second cycle Bologna programs (European Higher Education Area, 2007). The accreditation initiative was started by the National Agency for Program Evaluation and Accreditation (A3ES, 2009) and is mandatory for all Bologna programs. The results from this accreditation process will be announced before the end of 2011 and accreditations will have to be renewed each five years, at most. If a study cycle is not accredited, it will not be eligible for public funding.

The other initiative was launched by the Portuguese Professional Engineering Association (OE) (Ordem dos Engenheiros, 2010) and aims to certify sets of Bologna first and second cycle engineering programs with the European Accredited Engineering (EUR-ACE) Quality Seal (2008). The principal aim of the European
Accredited Engineering Program (EUR-ACE) is to develop a framework for the accreditation of engineering degree programs in the European Higher Education Area (EUR-ACE, 2008), as embodied in the EUR-ACE Certification Framework (EUR-ACE, 2009).

In 2006, Informatics Engineering was the first ISEP department to adopt the Conceive-Design-Implement-Operate (CDIO) approach (Crawley et al., 2007) as the teaching and learning framework. As a result, Informatics Engineering reformulated its Bologna first and second cycle study plans based on the CDIO approach and the Association for Computing Machinery (ACM) Curricula Recommendations (2001). In 2008, after the Instituto Superior de Engenharia do Porto (ISEP) formally joined CDIO, the dean decided that the Conceive-Design-Implement-Operate (CDIO) approach should be the foundation for program accreditation and/or certification. Since then, all departments in ISEP have been adopting, to various extents, the standards and practices of CDIO (http://www.cdio.org).

This article’s Context section describes how CDIO is currently put into practice in all engineering cycles of ISEP. The following section explains the frameworks of A3ES accreditation and EUR-ACE certification activities. The next section addresses the benefits and limitations of adopting CDIO as an educational context for engineering education at ISEP and how that may help to get successful accreditation and/or certification results. The Conclusion section synthesizes what has been achieved and summarizes the most important findings and ideas.

**CONTEXT**

Instituto Superior de Engenharia do Porto (ISEP) is one of the five largest engineering schools in Portugal, with almost 6500 students, 420 faculty and 130 staff. It is located at Porto and in 2009-2010 lectured 10 first cycle and 10 second cycle Bologna programs. In late 2008, ISEP proposed a new Systems Engineering first cycle Bologna program that included most of CDIO program standards and practices. The program, designed by a team of ISEP CDIO adopters and the top management staff of the biggest Portuguese entrepreneurial association (Associação Empresarial de Portugal), was finally approved in May 2009 and has started in September 2010. Of the 22 engineering programs in the list below the three programs marked with an asterisk (*) were designed in accordance with CDIO standards and practices, while the others have been adapting their structure and operation to the CDIO approach.

**First Cycle Bologna (3 Year BSc)**

- Civil Engineering
- Computer Engineering and Medical Instrumentation
- Electrical Engineering - Power Systems
- Computer and Electrotechnical Engineering
- Metrology and Instrumentation Engineering
- Geoenvironmental and Geotechnical Engineering
- Informatics Engineering (*)
- Mechanical Engineering
- Mechanical Automotive Engineering
- Chemical Engineering
- Systems Engineering (*) - started in 2010-2011
- Chemical and Biological Industry Quality Engineering

**Second Cycle Bologna (2 year MSc)**

- Computer and Medical Instrumentation
- Mechanical Constructions
- Metrology and Instrumentation
- Electrical Engineering - Power Systems
- Computer and Electrotechnical Engineering
- Geoenvironmental and Geotechnical Engineering
- Informatics Engineering (*)
- Chemical Engineering
- Operations and Process Management
- Construction Technology and Management
- Sustainable Energies - started in 2010-2011

Figure 1 shows CDIO inspired and/or compliant courses for first cycle programs in
www.igi-global.com/chapter/pedagogy-curriculum-architecture-engineering/68731?camid=4v1a

Technology Adoption in Engineering Design for Distance Education
Amanullah M.T.O., Jaideep Chandran and Alex Stojcevski (2014). International Journal of Quality Assurance in Engineering and Technology Education (pp. 54-64).
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