

# HARMONISATION OF CURRICULA FOR POWER ELECTRICAL ENGINEERING

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**Abstract**  $\frac{3}{4}$  Eleven years after political changes in Central and Eastern Europe took place, the harmonization of the educational systems in CEE countries with EU standards is still a current issue. Even though university curricula and study programmes in these countries have undergone changes (e.g. the introduction of credit systems like ECTS) and as a result have approached EU standards, compatibility of entire curricula in CEEC and EU universities is still lacking. Hence, it is in the interest of the Czech Republic, especially in view of its pre-accession status, to ensure a European dimension in university education through the continuous development of curricula compatibility. It is the aim of this proposed PROG to support curricula compatibility in electrical power engineering in a tri-university partnership. In view of the rapid normalization and development of uniform technical regulations, it is necessary to train future professionals using standard principles and uniform content in university education so as to ensure compatibility of professional know-how eventually all over Europe.

**Index Terms**  $\frac{3}{4}$  EU Standards, Power Electrical Engineering, Study Program.

## INTRODUCTION

The aim of this proposed PROG is to harmonize teaching in electrical power engineering within a tri-university partnership (i.e. at the three proposed universities: University of West Bohemia (UWB), Czech Republic; Fachhochschule Regensburg (FHR), Germany; Technical University Kosice (TUK), Slovakia) during the first phase of this initiative. In order to introduce and sustain a competitive uniform degree programme, it is crucial to start out on a smaller scale; after the credibility and visibility of this degree programme have been established, it is expected that an expanded European dimension in terms of new partnerships will be sustainable.

## PURPOSE, OBJECTIVES AND PROJECT OUTCOMES

In addition, uniform teaching in the field of electrical power engineering is especially necessary, in view of the rapid globalization and the monopolization of products and

equipment in the field of power engineering. The first set of courses (one re-designed and one newly) will be introduced after the first IC funding period, and all courses will have been introduced after the third funding period. The PROG is aimed at students who seek a sound theoretical and practical foundation in electrical power engineering. The courses combine the materials already in existence, teaching experience and research in electrical power engineering at each partner institution for solving environmental engineering problems.

In view of the European dimension, the objective of this tri-university partnership is to provide uniform educational standards in electrical power engineering that will ensure the competitiveness and flexible mobility of the human resources of the CEE partner countries across Europe. The PROG coordinator, the University of West Bohemia in Pilsen (UWB), has already initiated such uniform educational standards after having obtained accreditation for the issue of the EUR Ing. degree. It is the PROG coordinator's objective to not only maintain this level of initiative, but also to develop it further by combining forces with EU university partners so as to exploit the available experience and know-how.

The proposed courses will be recognized as integral parts of the graduate study programmes of all the three institutions concerned. The following already existing courses will be harmonized (i.e. re-designed) according to standard principles and uniform content so as to ensure compatibility of study programmes at each partner university:

### UWB

- 1) Transient phenomena in electrical networks  
Mathematical computation of unstable states of the synchronous machine under symmetric and non-symmetric transient phenomena. Stability of synchronous machines in power systems. Transient phenomena symmetric, non-symmetric, subtransient electromagnetic, and electromechanic.
- 2) Power stations Basis of power conversion. Heat process in power stations. Increasing efficiency in heat processes. Starting up and operation of thermal power stations. Electrical equipment of thermal power stations. Electrical schemes, self-power consumption of electrical equipment. Operation and equipment of power stations.

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- 3) Transmission and power distribution (Electrical networks) Theory of transmission and distribution of electrical energy of stable states on different voltage levels in normal and failure processes. Equivalent schemes, computation solution procedures in balanced/unbalanced systems.

N.B.: (the course contents are applicable to all institutions offering these courses, see below)

### FHR

- 1) Power engineering equipment and control systems 1 (Electrical networks in unstable states)
- 2) Power engineering equipment and control systems 2 (Power stations)
- 3) Electrical networks/EMC (Electrical networks in stable states)

### TUK

- 1) Transient phenomena in electrical networks
- 2) Power stations
- 3) Electrical networks (in stable states)

The following courses will be newly designed according to standard principles and uniform content so as to ensure compatibility of study programmes at each partner university:

- A) Mathematical analysis of electrical networks with neuron network exploitation. Mathematical and physical modelling of electric components and electric processes in balanced states. Identification and verification of parameters by means of experiment and calculation. General methodology of mathematical modelling of physical aspects.
- B) Power networks simulation and modelling. Adaptive controlling components, algorithmic prediction of trends, analysis of visual and sound (signal) information, artificial intelligence.
- C) Power systems operation and regulation Primary, secondary, tertiary controlling and regulation of components of electric systems. Prediction and consumption methods of electric energy. Production and consumption of electric energy in a free-market economy.

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