THE COURSE OF POSTGRADUATE EDUCATION IN THE ELEKTRICAL POWER ENGINEERING AT THE FACULTY OF ELEKTRICAL ENGINEERING AND COMPUTER SCIENCE OF VŠB – TECHNICAL UNIVERSITY OF OSTRAVA, CZECH REPUBLIC

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Abstract — A marked activity of co-operation between VŠB – Technical University of Ostrava – Faculty of Electrical Engineering and Computer Science (FEI) and Severomoravská energetika (SME), joint-stock company, is the postgraduate course on electrical power engineering intended for employees of SME, joint-stock company. These hold prominent posts as engineers in SME, joint-stock company. The postgraduate course is provided by the Department of Power Engineering in co-operation with other departments of the Faculty. They are, above all, the Department of Informatics, Department of Electrical Machines and Apparatuses and Department of General Electrotechnics. Teachers from the Faculty of Economics conduct one complete education cycle. The postgraduate course was opened in 1999; other cycles being held in the years 2000 and 2001.

Index Terms — Electrical power engineering, Postgraduate course

INTRODUCTION

The postgraduate course is divided into the following four parts: theoretical electrical power engineering and applied mathematics, informatics, economics and electrical power engineering. The first three parts are completed by partial examinations of problems concerning the subjects taught. At the end of the course, the engineers elaborate final projects that have to be defended against the board of examiners formed by representatives of the Faculty of Electrical Engineering and Computer Science of VŠB – Technical University of Ostrava and SME, joint-stock company.

THEORETICAL ELECTRICAL POWER ENGINEERING AND APPLIED MATHEMATICS

This part of the postgraduate course includes the theoretical preparation for deepening the knowledge from the master study programme at the VŠB – Technical University of Ostrava. The pedagogical staffs of the Department of Electric Power Engineering and Department of Applied Mathematics ensure this part of the course.

Informatics

This part of the postgraduate course aims at making the participants familiar with the utilisation of computers and information systems in electrical power engineering. The teachers from the Department of Informatics provide the teaching.

It includes the following:

• Hardware, storage types, processor job and peripheral equipment
• Software in relation to the user, operating systems, types of applications software
• Computer networks, technical equipment, network topology, Internet
• Information systems, database management systems, languages for data definition and handling, query languages, data protection
• Information system architecture; central-controlled, distributed
• Design life cycle and characteristics of particular phases, life cycle models, job control when generating the information system

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• Information system specification, functional and non-functional requirements
• Information system analysis and elements of analytical models. The method of analysis access; functional, data and object-orientated
• Data models, functional models, data flow diagrams
• The design of system implementation, modular design, user communication, documentation of particular phases, system testing, maintenance.

**ECONOMICS IN ELECTRICAL POWER ENGINEERING**

This part of the postgraduate course makes the participants familiar with the methods of management and financial analysis of the electrical power company in connection with operation, maintenance and new investments. Teachers from the Faculty of Economics ensure the teaching.

It covers the following:

• Enterprise financial management and decision-making, the structure of enterprise financial management, financial decision-making
• Property and enterprise financial structure, enterprise assets classification, financial structure classification
• Internal and external sources of financing of enterprise demands, internal financial sources, their characteristics and importance, external sources of enterprise financing, forms of external financial sources, shares, bonds, loans, short-term financing, floating capital management
• Enterprise financial analysis, the principle, goal and phases of financial analysis, basic factors, their importance and evaluation
• Financial relations between enterprises and banks, deposit relations between the enterprise and the bank, loan relations between enterprises and banks
• Financial accounting, basic legal regulations, principles of book-keeping by single and double entry, utilisation of accounting outputs
• Taxation, individual income tax and income tax of legal persons, value-added tax, consumer tax, road-traffic tax, the other taxes, tax administration
• Financial and actuarial mathematics, methods of compound interest, financial and insurance operations
• Investment decision-making, methods of investment decision with using the time factor, evaluating criteria for investment efficiency
• Capital markets, financial markets, basic investment groups, securities market in the Czech Republic, world stock exchanges
• International finance, exchange markets and operations, balances of payments, rates of exchange, history of the international monetary system
• Managerial decision-making
• Foundations of the business law, legal regulations in economics
• Managerial information systems.

**ELECTRICAL POWER ENGINEERING**

This part of the course is the most extensive one and includes 4 sub-chapters.

**New regulations in electrical engineering**

• The overview of new norms that are in accordance with the EC regulations and EU documents
• The overview and the brief interpretation of laws and regulations in relation to the plants of power industry
• The overview of laws under preparation.

**Transformers**

• The principle and applications of transformers, voltage capacity, construction
• Non-linear events in transformers, unsymmetrical load, negative effects
• Short-circuit in transformers, kinds, causes, no-load switching of the transformer
• Diagnostics of transformers and transformer oils, diagnostic methods, expert systems, maintenance and repairs.

**Electric apparatuses**

• Basic terms, terminology, normalisation in the field of electric switching, protection and control apparatuses
• Modern trends in the design of electric apparatuses and control panels, including the metal-clad switchgears with the sulphur hexafluoride isolation. Properties of switching apparatuses, selection and introduction criteria, critical conditions
• Operation of electric apparatuses in the power distribution system, reliability and life, their influencing from the user’s point of view
• Modern trends in the diagnostics of electric apparatuses and control panels, determination, residual lives, diagnostics.

**Management of electrification systems**

• The universal characteristics of systems, relation between the balance of active and reactive powers, frequency and voltage.
• Means for voltage regulation. Static voltage characteristics of sources and loads.
• Methods of voltage regulation.
• Voltage regulations by transformers. Regulating transformer functions.
• The variable-ratio transformer model.
• Voltage regulation by reactive power – the synchronous condenser.
• Voltage regulation by the synchronous generator.
• Electrical protections.
• Design of electrical distribution networks.

The teachers from the Department of Electric Power Engineering, Department of Electrical Machines and Apparatuses and the Department of General Electrotechnics ensure this part of the postgraduate course.

The achieved knowledge from particular parts of the postgraduate course is verified by means of the final test.

CONCLUSION

The postgraduate course is completed by setting each participant in the course an individual project.

The set project follows up the concrete technical and developmental problems solved directly in operating practice of the electrical power company. Each participant in the course has his/her own supervisor, a teacher from the Department of Electrical Power Engineering, who supervises the work. The participants submit their projects in the written form and on floppy discs.

Each project is evaluated individually in the project defence procedure.

The final examinations of course participants take place against the board of examiners. The board of examiners consists of the Dean of the Faculty, the leading professor in the branch of Electrical Power Engineering, experts evaluating the particular projects and of representatives of the electrical power company that employs the participants in the course.

In our case this is Severomoravská energetika, joint-stock company (SME, a.s.). The postgraduate course was opened in the year 1999 and has continued to the year 2001.