

STUDY UNIT DESCRIPTION

Faculty of Electrical Engineering

CODE EPC2101

TITLE Electric drive control systems

LEVEL 02 - Years 2, 3 in Modular Undergraduate Course

ECTS CREDITS 5

DEPARTMENT Electric Drives

DESCRIPTION Mathematical description of electric motors and converters. Direct and frequency-based optimization criteria. Generalized description of dynamic system with regulators and feedbacks. Concept of multi-loop cascade control.

Principles of speed regulation for DC drives. DC motor as a dynamic element. Armature current regulation, speed regulation. Modular and symmetrical optimization criteria applied to DC drives. Control of DC drives in the armature and field-weakening domain. Positioning operation of electric drives.

Detailed description of thyristor rectifier as a control plant. Dynamic performances of systems with controlled rectifiers. DC/DC converter, variable frequency converter.

AC drive systems. Reference frames, vector-oriented control approach. Direct-torque control. Relay regulators. Indirect estimation of drive's coordinates, observers.

Study-unit Aims:

The unit aims to teach students to analyze dynamic behavior of electric drives systems in order to improve its regulation performances.

Learning Outcomes:

1. Knowledge & Understanding:

By the end of the study-unit the student will be able to:

- build transfer functions and compose the structure of control system for various electric drives;
- calculate parameters of current, speed and position regulators providing optimal performances;
- analyze dynamics in various control systems and perform regulator's adjustments.

2. Skills:

By the end of the study-unit the student will be able to:

- perform primary commissioning of the various types of converters;
- design control systems for electric drives to meet given

- regulation demands;
- simulate electromechanical systems, forecast their dynamics and regulation performances.

Main Text/s and any supplementary readings:

- Werner Leonard. Control of electrical drives: 3d edition. Springer-Verlag, Heidelberg. 2001.
- Uwe Helmke, John Moore. Optimization and dynamics of control systems: 2nd edition. Research School of Information Sciences and Engineering, Australian National University, Canberra, ACT 0200, Australia

ADDITIONAL NOTES

Pre-requisite Study-units: [EPC1201](#), [EPC1202](#)

STUDY-UNIT TYPE

Lecture and Tutorial

METHOD OF ASSESSMENT

Assessment Component/s	Resit Availability	Weighting
Practical	No	10%