COURSE DESCRIPTION CARD - SYLLABUS

Course name
Electrical machines and drives in control engineering

Course

Field of study
Automatic Control and Robotics

Year/Semester
2/3

Area of study (specialization)

Profile of study
general academic

Level of study
First-cycle studies

Course offered in
english

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

3

Lecturers

Responsible for the course/lecturer:
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Responsible for the course/lecturer:
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Prerequisites

Knowledge - Student should have knowledge in chosen branches of physics including the electricity and the magnetism and the knowledge of the theory of electric circuits.
Skills - Student is able to obtain information from literature, databases and other sources; has abilities of the self-education for improving qualifications and the update of professional competence.
Competencies - Student is aware of a need to expand his competence and readiness to undertake the cooperation in the team; has an awareness of the importance and understands other aspects of engineering activity, including its influence on the environment.

Course objective

Getting to know principles of magnetic circuits analysis. Getting knowledge of operation, characteristics and methods of analysis of: transformers, induction motors, synchronous motors, brushed d.c. motors, electronically commutated motors as well as the other electromechanical converters.

Course-related learning outcomes

Knowledge

1. The student has a knowledge tidied up in the structure, the application and control of the automation and robotics systems.
2. Student knows and understands typical engineering technologies, knows and understands principles of the selection of servo- and measuring-testing devices.

Skills

1. Student is able to use models of simple electromechanical systems, as well as to use them for analysis and design automations and robotics systems.
2. Student is able to select the kind and parameters of servo- and measuring system, control unit for the chosen application and to effect their integration in the form of the ultimate measuring-control system.

Social competences

1. Student has an awareness of the need for the professional approach towards technical issues, of meticulous acquainting oneself with documentation and environmental conditions, in which devices and their elements can function.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:
Lecture:

- constant progress monitoring during all classes (awarding a bonus to the actively participating students),
- evaluation of student?s knowledge and skills on a written examination in a form of test.

Getting additional points for the activity during classes, particularly for:
- proposing answers to the questions and tasks presented during the lectures,
- suggestions on how to improve the teaching materials.

Programme content

Magnetic circuits and transformers. Rotating machine principles: distributed windings, rotating magnetic field and rotating electromotive force. Induction motors: construction, principle of operation, equivalent diagram scheme;, basic characteristics, angular velocity control. Single-phase induction motors. Synchronous machines: construction, principle of operation, phasor diagrams. Permanent magnet motors.. Starting up the synchronous motors. Synchronous motor optimal control. Reluctance motors. The stepper motors The brushed direct current motors: construction, principles of operation, the armature reaction, commutation. The torque-speed characteristic and speed control. The brushed DC motors. Brushless direct current motors. Tachometers. Special electromechanical converters.

Teaching methods

Methods of education:
- lecture with multimedia presentation supplemented with examples given on the board,

- interactive lecture with questions to students,
- student activity is taken into account during the course of the assessment process.

Bibliography

Basic

1. R. Crowder, Electric Drives and Electromechanical systems, Elsevier, 2006
2. Robert M. Del Vecchio, Bertrand Poulin, Pierre T. Feghali, Dilipkumar M. Shah, Rajendra Ahuja Transformer Design Principles: With Applications to Core-Form Power Transformers, 2nd Edition, CRC Press, 2010.
3. M. S. Sarna, Electric Machines, Steady-State Theory and Dynamic Performance, West Publishing Company, 1996 .
4. W.H. Yeadon, A.W. Yeadon, Handbook of small electrical motors, McGraw-Hill, 2001
5. Electric Machinery Fundamentals by Stephen J. Chapman, 4th Edition, McGraw-Hill, 2005
6. Electric Motor Drives – Modeling, Analysis and Control by R. Krishnan Pren. Hall Inc., NJ, 2001

Additional

1. T. Wildi, Electrical Machines, Drives, and Power Systems, Prentice Hall, Sixth edition, Pearson new international edition, 2014.
2. Research papers.

Breakdown of average student's workload

	Hours	ECTS
Total workload	80	3,0
Classes requiring direct contact with the teacher	35	1,0
Student's own work (literature studies, preparation for lectures, preparation for tests/exam) [1]	45	2,0

[1] delete or add other activities as appropriate