

Electric Machines and Drives

Code: MK3VHAJR06JX20-EN

ECTS Credit Points: 6

Evaluation: mid-semester grade

Semester: 6th semester

Its prerequisite(s): Electronics and Electrotechnics

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 2+2

Topics:

Fundamentals and classification of electrical machines. Direct Current machines: structure, theory of operation, mechanical and electrical commutation, theory of operation modes. Fundamentals of transformers: theory, operation under different load conditions: open and short circuit, resistive and inductive loads. Tri-phase transformers. Theory and operation of rotating magnetic field. Synchronous machines: theory and operation of helical synchronous machine. Stepper motor and drives. Special electrical machines and its applications. Rectifier bridge circuits. Summary of drive circuits for AC machines. VSD: variable speed drives.

Literature:

Compulsory:

- Austin Hughes “Electric Motors and Drives”, Elsevier, 3rd ed. 2006, ISBN-13: 978-0-7506-4718-2
- Muhammad H. Rashid, “Power Electronics Handbook”, Elsevier, 3rd ed. 2011, ISBN 978-0-12-382036-5
- Jan A. Melkebeek “Electrical Machines and Drives”, Springer 2018, ISBN 978-3-319-72729-5
- V. Rakini, V. S. Nagarajan “Electrical Machine Design” Pearson, 2018, ISBN 978-93-325-8557-7

Schedule

1st week Registration week

2nd week:

Lecture: Classification of electrical energy converters.

Practice: Laboratory introduction and safety issues.

4th week:

Lecture: DC Machines: operating conditions.

Practice: DC Machines: operating conditions.

3rd week:

Lecture: Direct Current electrical machines: structure, electrical and mechanical commutator

Practice: DC motor start circuits.

5th week:

Lecture: Transformers: Theory of operation, induced voltage, open, short cut, and load conditions.

6th week: Lecture: Tri-phase transformers. Practice: Measurement of transformers: open and short cut conditions.	Practice: Measurement of DC machines: mechanical and electrical variables and power. 7th week: Lecture: Theory and application of rotating fields. Practice: Transformers: calculation of iron core and copper losses.
8th week: 1st drawing week	
9th week: Lecture: Synchronous machines: theory and operation of tri-phase, with cylindrical rotor. Practice: Synchronous motor starter circuits. 11th week: Lecture: Tri-phase induction motors: load conditions and operations. Practice: Smooth starter circuit commissioning. 13th week: Lecture: Special motors: EC and BLDC. Theory and operation Practice: VSD: Variable speed drive practice. Control.	10th week: Lecture: Tri-phase induction motors: theory and operational conditions. Practice: Induction motor starter circuits. 12th week: Lecture: Stepping motors: theory and operational conditions. Practice: VSD: Variable speed drive practice. Commissioning 14th week: Lecture: Rectifier circuits. One and tri-phase. Practice: VSD: Variable speed drive practice. Monitoring.
15th week: 2nd drawing week	

Requirements

A, for signature:

Attendance on the lectures is recommended, but not compulsory.

Participation at practice is compulsory. Student must attend the practices and may not miss more than three practice during the semester. In case a student misses more than three, the subject will not be signed and the student must repeat the course. The attendance on practice will be recorded by the practice leader. Being late is counted as an absence. In case of further absences, a medical certificate needs to be presented. Missed practices should be made up for at a later date, to be discussed with the tutor.

The correct solution of the project and submission before deadline.

B, for grade:

The practical grade is the evaluation of the project.