

Specification for the book of courses

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|--|---|---|--|----------------------|
| Study program | | Electrical Engineering and Computer Science | | |
| Module | | Common | | |
| Type and level of studies | | Doctoral studies | | |
| The name of the course | | Diagnosis and Condition Monitoring of Electrical Machines | | |
| Lecturer (for lectures) | | Petronijević P. Milutin, Mitrović N. Nebojša | | |
| Lecturer/associate (for exercises) | | | | |
| Lecturer/associate (for OFE) | | | | |
| Number of ECTS | | 10 | Course status (obligatory/elective) | Elective |
| Prerequisites | None | | | |
| Course objectives | The study of modern methods of diagnosis and monitoring of electrical machines in electric drives with and without power electronics converters. Study of conventional and advanced techniques of parameter estimation and states of electrical machines. Application and development of advanced methods for the analysis of electrical and non-electrical quantities. | | | |
| Course outcomes | Students will be able to independently analyze the operating conditions of electrical machines and evaluate reliability of the electrical drives. The students will be capable to develop new methods for the analysis and estimation of electric machines states. | | | |
| Course outline | | | | |
| Theoretical teaching | Electric machine equations in the stationary and general reference frames: voltages, currents, torque and power. Real time signal processing. Motor current signature analysis. Monitoring the stator, rotor, and magnetizing flux linkage space phasor, practical implementation. Monitoring of the rotor speed and angle. The application of conventional techniques: tachometers, encoders, resolvers. Rotor slip and speed estimation. Torque and flux estimation. Stator frequency and rotor speed estimation utilizing the leakage flux. Estimation in inverter-fed electric drives. Estimation of the inertia. Standstill response test. Condition Monitoring. Non-invasive condition monitoring. Application of thermal vision. Eccentricity and broken cage diagnostic methods. Vibration monitoring. Application of machine learning. | | | |
| Practical teaching (exercises, OFE, study and research) | The part of teaching includes study and research work in the course area. It involves active studying of the basic scientific sources, computer simulations, performing of experiment in laboratory, solving research tasks and evaluation new scientific methods in the field. | | | |
| Textbooks/references | | | | |
| 1 | P. Vas, "Parameter Estimation, Condition Monitoring and Diagnosis of Electrical Machines", Clarendon Press Oxford, 1993 | | | |
| 2 | P. C., Krause, ..., "Analysis of Electric Machinery and Drive Systems", IEEE Press 2002 | | | |
| 3 | H. A. Toliyat, S. Choi, H. Meshgin-Kelk, S. Nand, "Electric Machines: Modeling, Condition Monitoring, and Fault Diagnosis", CRC Press, 2012 | | | |
| 4 | Peter Tavner, Li Ran, Jim Penman and Howard Sedding, "Condition Monitoring of Rotating Electrical Machines", 2nd Edition, IET, 2008 | | | |
| 5 | Faiz, J.; Ghorbanian, V.; Joksimovic, G. (ed.): "Fault Diagnosis of Induction Motors" , IET Digital Library. 2017 | | | |
| Number of classes of active education per week during semester/trimester/year | | | | |
| Lectures | Exercises | OFE | Study and research work | Other classes |
| 3 | 0 | 0 | 0 | 0 |
| Teaching methods | Teaching includes lectures and consultations, as well as individual work with the students during study and students research work presentation at conferences. | | | |
| Grade (maximum number of points 100) | | | | |
| Pre-exam duties | | Points | Final exam | Points |
| Activity during lectures | | | Written exam | |
| Exercises | | | Oral exam | 50 |
| Colloquia | | | | |
| Projects | | 50 | | |