

DESCRIPTION OF THE COURSES

- Course code: ELR3268
- Course title: **TESTING AND DIAGNOSIS OF ELECTRICAL MACHINES AND DRIVES**
- Language of the lecturer: polish

| <i>Course form</i> | <i>Lecture</i> | <i>Classes</i> | <i>Laboratory</i> | <i>Project</i> | <i>Seminar</i> |
|--------------------------------------|----------------|----------------|-------------------|----------------|----------------|
| <i>Number of hours/week*</i> | <i>1</i> | | <i>1</i> | | |
| <i>Number of hours/semester*</i> | <i>11</i> | | <i>11</i> | | |
| <i>Form of the course completion</i> | <i>Exam</i> | | <i>Credit</i> | | |
| ECTS credits | <i>3</i> | | <i>1</i> | | |
| Total Student's Workload | <i>90</i> | | <i>30</i> | | |

- Level of the course (basic/advanced): advanced
- Prerequisites: Electrical Machines, Electrical drives
- Name, first name and degree of the lecturer/supervisor: dr hab. inż. Czesław T. Kowalski
- Names, first names and degrees of the team's members: dr inż. Krzysztof Dyrz, dr inż. Marcin Pawlak
- Year:.....2..... Semester:.....2.....
- Type of the course (obligatory/optional): obligatory
- Aims of the course (effects of the course):
- Form of the teaching (traditional/e-learning): traditional
- Course description: Testing of electrical machine in machine manufacture (actual norms and technical conditions). Industrial testing of electrical machines and drives. Chosen methods and measurement systems of electrical and non-electrical values and basic machine parameters. Chosen types of electrical machine testing (thermal, vibration and noises testing, insulation testing, influence of static converter supply). Automation of testing of electrical machine parameters and basic characteristics (testing devices, software, professional solutions). Methods of technical diagnosis and monitoring of electrical machines. Fault detection methods (typical faults of the insulation system, windings, faults and abnormal mode detection during the drive system operation). Vibro-acoustic diagnosis, thermal diagnosis of windings insulation of electrical machines. Diagnosis of rolling and slide bearings in electrical machines. Diagnosis of electrical drives, influence of load machine to the drive system operation. Diagnosis of converter-fed drives, testing of the converter static influence to the operation of electrical machine. Computer-aided monitoring and diagnosis of electrical machines and drives. Industrial monitoring and diagnosis systems. Future trends in monitoring and diagnosis techniques of electrical machines – application of neural networks and fuzzy logic to incipient fault detection.
- Lecture:

| <i>Particular lectures contents</i> | <i>Number of hours</i> |
|--|------------------------|
| 1. Test types of electrical machines; testing in machine manufacture, actual norms and technical conditions. Industrial testing of electrical machines and drives. | <i>1</i> |
| 2. Chosen methods and measurement systems of electrical and non-electrical | <i>1</i> |

| | |
|---|---|
| values and BASIC machine parameters. | |
| 3. Basic definitions, rules and methods in technical diagnosis and monitoring of electrical machines. | 1 |
| 4. Fault detection methods (typical faults of the insulation system, windings, faults and abnormal mode detection during the drive system operation). | 1 |
| 5. Vibro-acoustic diagnosis of electrical machines. | 2 |
| 6. Diagnosis of rolling and slide bearings in electrical machines. | 2 |
| 7. Computer-aided monitoring and diagnosis of electrical machines and drives. Industrial monitoring and diagnosis systems. | 2 |
| 8. Future trends in monitoring and diagnosis techniques of electrical machines – application of neural networks and fuzzy logic to incipient fault detection. | 1 |

- Classes – the contents:
- Seminars – the contents:
- Laboratory – the contents:

1. Testing of dynamical processes of the induction motor supplied from the net.
2. Testing of the influence of the converter supply to the induction motor dynamics and characteristics.
3. Diagnosis of the squirrel-cage rotors of the induction motors – part 1.
4. Application of DAC in monitoring and diagnostic systems of electrical drives.
5. Short circuit detection in the stator of the induction motor.
6. Vibration diagnosis of rolling bearings of the induction motor.
7. Modern methods for electrical signal recording of electrical machines.
8. Testing and diagnosis of the high-voltage induction motor in industry (video film).
13. Application of neural networks to the rotor fault detection of the induction motors.
 - Project – the contents:
 - Basic literature:
Kowalski Cz., Monitorowanie i diagnostyka uszkodzeń silników indukcyjnych z wykorzystaniem sieci neuronowych, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2005
Cempel Cz., Tomaszewski F. (edytorzy), Diagnostyka techniczna maszyn, MCNEMT, Radom 1992
Cempel Cz., Diagnostyka wibroakustyczna maszyn, PWN, Warszawa 1989
 - Additional literature:
Vas P., Parameter estimation, condition monitoring and diagnosis of electrical machines, Oxford Science Publications, 1993, (Monographs in Electrical and Electronic Engineering No. 27)
- Conditions of the course acceptance/creditation: Lecture – exam, laboratory - credit

* - depending on a system of studies