STUDY MODULE DESCRIPTION FORM

Name of the module/subject	Code
Fundamentals of diagnostics mechatronic devices	**1010324381010326892**

Field of study	Profile of study (general academic, practical)	Year /Semester
Electrical Engineering	**general academic**	**4 / 8**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
Electrical Systems in Mechatronics	**Polish**	**obligatory**

Cycle of study:	Form of study (full-time,part-time)
First-cycle studies	**part-time**

No. of hours	No. of credits
Lecture: **9** Classes: **-** Laboratory: **9** Project/seminars: **-**	**2**

Status of the course in the study program (Basic, major, other)	(university-wide, from another field)
other	**university-wide**

Education areas and fields of science and art	ECTS distribution (number and %)
technical sciences	**2 100%**
Technical sciences	**2 100%**

Responsible for subject / lecturer:

dr hab. inż. Wojciech Pietrowski
email: wojciech.pietrowski@put.poznan.pl
tel. 61 665 2396
Faculty of Electrical Engineering
ul. Piotrowo 3A 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Basic knowledge of electrical circuit theory, construction, electrical machinery, computer and numerical methods, electrical metrology. News from the construction, analysis and synthesis of electromechanical transducers and measurement methods used in mechatronics
2	**Skills**	Principles of construction and operation of electrical systems and mechatronics with the use of informatics tools.
3	**Social competencies**	Is aware of the need to broaden their competence, willingness to work together as a team

Assumptions and objectives of the course:

-Introduction to basic issues and concepts related to technical diagnostics mechatronic devices and selected operational problems that require diagnostic mechatronic devices.

The acquisition of basic skills needed to determine the relationship between symptom and damage to equipment failure. The acquisition of knowledge in the field of vibration measurement, signal processing, measurement in the diagnosis of machines and their interpretation in accordance with the applicable standards

The acquisition of skills in selected packages computational modeling of mechatronic equipment faults

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Testing methods to characterize the principle of mechatronic devices small and very low power - [K_W13++]
2. Propose a model of an electromechanical transducer circuit, including mechatronic system damage - [K_W02++]
3. Propose a procedure for measuring the damaged equipment mechatronic - [K_W05+++]
4. Formulate the problem of analysis of diagnostic signals - [K_W02++]

Skills:

1. Create software for the analysis of diagnostic signals - [K_U04+++]
2. Prepare a numerical model of the mechatronic circuit including damage - [K_U10+++]
3. Carry out measurements and computer simulation of mechatronic system operating conditions including damage - [K_U02+++, K_U10++, K_U14++, K_U15+++]

Social competencies:

1. Ability to act in an entrepreneurial manner in the area of ??mechatronics, electrical systems - [K_K04+++]

Assessment methods of study outcomes

Lecture:

assess the knowledge and skills listed on the written exam of a problematic,

evaluation of the lectures (rewarding activity and quality of speech).

Laboratory:

test and favoring knowledge necessary for the accomplishment of problems in the area of laboratory tasks,

assessment of knowledge and skills related to the implementation of the tasks your practice, the assessment report performed exercise.

Get extra points for the activity in the classroom, and in particular for:

propose to discuss additional? Wych aspects of the subject;

effective use of the knowledge gained during solving the given problem;

ability to work within a team practice performing the task detailed in the laboratory;

developed aesthetic diligence reports and tasks? the self-study.

Course description

The problems of degradation of the equipment, and electrical equipment. Classification of damage to machinery and electrical equipment. Signals and their parameters, Digital Signal Processing in the diagnosis. Diagnostic measure. Advanced Topics analysis of measurement data. Measurement of electrical and non-electrical sensors used in the diagnosis. Systems for the collection and processing of data. Computer hardware diagnostic systems. Dynamic state models of machines and electrical equipment. Classification of diagnostic signals. Planning diagnostic experience. Methods of diagnosis: stimulus and passive. Condition monitoring of machinery and electrical equipment. Expert systems. Examples of solutions of systems of diagnosis and monitoring of electrical machines.

Basic bibliography:

1. C. Cempel, Podstawy wibroakustycznej diagnostyki maszyn. WNT Warszawa 1982
2. W. Latek, Badanie maszyn elektrycznych w przemyśle. WMT Warszawa 1987
3. W. Paszek, Dynamika maszyn elektrycznych prądu przemiennego. HELION 1998
4. T. P. Zieliński, Cyfrowe przetwarzanie sygnałów. WKŁ Warszawa 2005
5. C. Cempel, Podstawy wibroakustycznej diagnostyki maszyn. WNT Warszawa 1982
6. W. Latek, Badanie maszyn elektrycznych w przemyśle. WMT Warszawa 1987
7. W. Paszek, Dynamika maszyn elektrycznych prądu przemiennego. HELION 1998
8. T. P. Zieliński, Cyfrowe przetwarzanie sygnałów. WKŁ Warszawa 2005
9. A. Biernat: Analiza sygnałów diagnostycznych maszyn elektrycznych, Politechnika Warszawska, 2015
10. J. Przybysz: Hydrogeneratory. Zagadnienia eksploatacyjne, Instytut Energetyki, Warszawa, 2014
11. Cz. T. Kowalski: Diagnostyka układów napędowych z silnikiem indukcyjnym z zastosowaniem metod sztucznej inteligencji, Wrocław, 2013

Additional bibliography:

1. C. Cempel, Wibroakustyka stosowana. PWN Warszawa-Poznań 1977
2. M. Krauss, E. Woschni, Systemy pomiarowo-informacyjne PWN Warszawa 1979
3. C. Cempel, Wibroakustyka stosowana. PWN Warszawa-Poznań 1977
4. M. Krauss, E. Woschni, Systemy pomiarowo-informacyjne PWN Warszawa 1979

Result of average student's workload

Activity	Time (working hours)
1. Participation in lecture classes	9
2. Participation in laboratory activities	9
3. Consultation on the lecture	4
4. Preparation for laboratory exercises	10
5. Making reports	8
6. Preparation for the pass of lectures	8
7. Presence at the lecture exam	4

Student’s workload

Source of workload	hours	ECTS
Total workload	52	2
Contact hours	26	1
Practical activities	22	1