STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Control of Mechatronic Systems**		Code **1010321271010326006**
Field of study **Electrical Engineering**	Profile of study (general academic, practical) **(brak)**	Year /Semester **4 / 7**
Elective path/specialty **Electrical Systems in Mechatronics**	Subject offered in: **polish**	Course (compulsory, elective) **obligatory**
Cycle of study: **First-cycle studies**	Form of study (full-time,part-time) **full-time**	
No. of hours Lecture: **-** Classes: **-** Laboratory: **2** Project/seminars: **-**		No. of credits **3**
Status of the course in the study program (Basic, major, other) **(brak)**	(university-wide, from another field) **(brak)**	
Education areas and fields of science and art **technical sciences** **Technical sciences**		ECTS distribution (number and %) **3 100%** **3 100%**

Responsible for subject / lecturer:

Ph. D. Wiesław Łyskawiński
email: Wieslaw.Lyskawinski@put.poznan.pl
tel. 61 665 2781
Faculty of Electrical Engineering
ul. Piotrowo 3A, 60-965 Poznań

Responsible for subject / lecturer:

Ph. D. Cezary Jędryczka
email: Cezary.Jedryczka@put.poznan.pl
tel. 61 647 5803
Faculty of Electrical Engineering
ul. Piotrowo 3A, 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Elementary knowledge of electrical machines, power electronics and control theory
2	**Skills**	Principles of programming on a general level. Skill of effective self-education in a field related to the chosen field of study
3	**Social competencies**	The awareness of the need to boarding skills and knowledge. Demonstrate a willingness to cooperate in a team

Assumptions and objectives of the course:

Students master the skills of setting up and configuration of advanced frequency converters and automation actuators. Students learn how to elaborate algorithms and develop programs for the control systems of selected process by using programmable logic controllers. Consolidation of skills algorithmization of control process in mechatronics.

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

Knowledge:

1. distinguish the structures and control methods of mechatronical systems and able to characterize the principle of operation of automatic control systems of speed, torque and displacement - [K_W22 +++]

Skills:

1. can formulate rules for cascade control, modular and symmetrical optimization criteria and apply direct and indirect control of flux and torque and vector control - [K_U10++]

Social competencies:

1. able to think and act in an entrepreneurial manner in the area of automation of mechatronical systems - [K_K04 ++]

Assessment methods of study outcomes

Laboratory:
- test and favoring knowledge necessary to soleve the problems in the area of laboratory tasks
- continuous evaluation for each course - rewarding gain skills
- assessment of knowledge and skills related to the implementation of the tasks in practice
- evaluation of the reports from performed exercise

Extra points for the activity in the classroom, in particular for:
- proposals to discuss supplementary aspects of the subject;
- effectiveness of the application of the knowledge gained during solving the given problem;
- comments related to the improvement of teaching materials;
- quality and diligence of the developed reports - in the self-study.

Course description

General control structure of mechatronic system ? requirements and problems. Advanced configuration of frequency converters. Speed controls of squirrel-cage induction motors. PLC programming languages. Direct as well as indirect flux and torque control, vector control methods with open and closed-loop. Speed control systems of the synchronous motors: mathematical models, flux and torque control structures. Sensorless control of permanent magnets synchronous motors. Position control systems, electric servo drives using asynchronous and synchronous machines and stepper motors.

Basic bibliography:

1. Deskur J., Kaczmarek T., Zawirski K., Automatyka napędu elektrycznego, Wydawnictwo Politechniki Poznańskiej, Poznań 2012.
2. Napęd elektryczny robotów, Wyd.2, Kaczmarek T., Wyd. Politechniki Poznańskiej, Poznań, 1998
3. Układy napędowe z silnikami synchronicznymi , Kaczmarek T., Zawirski K., Wyd. PP, Poznań, 2000
4. Drive solutions, Mechatronics for production and logistics, pod redakcją Dr. Edwin Kiel, wyd. Springer, ISBN 978-3-540-76704-6

Additional bibliography:

1. Automatyka napędu przekształtnikowego, Tunia H., Kaźmierkowski M.P., PWN, Warszawa, 1988
2. Dokumentacje techniczne wykorzystywanych przemienników częstotliwości oraz układów sterowania (dostępne w laboratorium).
3. Control of Electrical Drives, Leonhard W., Springer-Verlag, Berlin-Heidelberg-NewYork-Tokyo, 1985

Result of average student's workload

Activity	Time (working hours)
1. participation in laboratory classes	30
2. participation in the consultations	10
3. preparation and development of laboratory reports	30

Student's workload

Source of workload	hours	ECTS
Total workload	70	3
Contact hours	40	2
Practical activities	60	2