SYLLABUS

1. Course title:

Automatic control 2

2. Code:

3. Cycle of study:

I

4. ECTS credits:

5

5. Type of course:

Mandatory

6. Prerequisites:

7. Class restrictions:

8. Duration / semester(s):

I | VIII

9. Weekly contact hours and student workload:

Semester (1)	I	Semester (2)		(for two-semester courses)	Workload: (hours)
9.1. Lectures	3			Classes:	56,25
9.2. Seminars	1			Individual work:	92,5
9.3. Laboratory / Practice classes	1			In total:	148,7

10. Faculty:

Faculty of Mechanical Engineering

11. Department/study program:

Mechatronic

12. Lecturer:

Ph.D. Almir Osmanović, Associate professor

13. Course aims:

To enable students for the analysis and synthesis of a automatic control system.

14. Learning outcomes:

After successfully completing the course, the student will be able to:
Understanding the basic concepts of digital control.
- Understand the basics of system stability in the frequency and time domain.
- Understand the working principles of industrial PID controllers.
- Understand the principles of control mechatronic components and systems.
Designing digital control systems for specific requirements.
- Implement and adjust the PID controller for different applications.
- Develop and implement simple logic control systems.
- Know the basic types of sensors for measurement (displacement, speed, pressure, temperature...)

15. Course content:

1. System stability: Bode plots.
2. Nyquist stability criterion.
2. State-space models.
3. State-space system modeling
4. Stability of systems in state space.
5. PID controller design
6. PID controller tuning methods (Ziegler-Nichols, etc.)
7. First test
8. Introduction and basic concepts of digital control.
9. Z - transfer functions.
10. Transfer function of discrete systems
11. Stability of discrete systems: stability criterion in the z-domain (pole position)
12. Measurement of linear and angular displacement, speed, force, torque, pressure, level, flow, temperature.
13. Fuzzy logic and fuzzy logic control.
14. Examples of automatic control systems in practice.
15. Second test.

16. Learning methods:

Lectures – Lectures present the theoretical part of the material accompanied by examples for easier understanding of the material. Lectures using multimedia tools, active learning techniques and with active participation and discussions of students.
Practical examples are worked on in auditory and laboratory exercises, with the acquisition of practical skills related to the topic of the studied subject, active learning techniques and with active participation and discussions of students.
Consultations represent an individual or group form of support for students, where they have the opportunity to ask additional questions, clarify ambiguities and receive specific guidelines regarding the teaching material and assignments. Consultations with teachers on a weekly basis.
Part of the teaching can also be organized through "distance learning", which is more closely regulated by the decision of the Senate.

17. Assessment methods:

Attendance at all classes is mandatory and a record is kept of it, on the basis of which the student receives a signature from the subject teacher after each semester. Due to illness or other justified reasons, a student may miss a maximum of 20% of classes.
A student has the right to take each individual knowledge assessment. After half of the semester, students take a written test (1 partial exam - test tasks) that covers the topics covered in the exercises so far. All students in the course take the test at the same time, which achieves uniformity in the level of knowledge being tested, as well as the conditions under which the student takes the exam. The test consists of tasks. On 1 test, a student can achieve a maximum of 20 points, and in order to pass the test, they must achieve a minimum of 50% of points. A student who has not passed the exam can take the exam again on the following test dates. Students take the second test (2 partial exams - test tasks) at the end of the semester. On 2 tests, a student can achieve a maximum of 20 points, and in order to pass the test, they must achieve a minimum of 50% of points. At the end of the semester, students take a theory test, which consists of multiple-choice, simple recall, or essay questions. Students can earn a maximum of 30 points on the test. As part of their pre-exam requirements, students are required to write an individual or group seminar paper on a given topic. The seminar paper is submitted in writing to the subject assistant and teacher, and then presented orally. All students in the group participate in the writing and presentation of the group seminar paper, whose participation is evaluated individually. For the completed and presented seminar paper, a student can earn 0-10 points.
The final exam is oral. In the oral exam, the student answers questions drawn from the subject topics covered in lectures and exercises. The oral exam can be passed if the student answers all questions correctly. The maximum number of points in the oral exam is 20.
To pass the course, a student must achieve a minimum of 54 cumulative points.

Grading system: (10)+(40)+(30)+(20)=100

Grade	described	by letter	points
5 (five)	Does not meet minimum criteria	F;FX	<54
6 (six)	meets the minimum criteria	E	54 -64
7 (seven)	Generally good, but with significant flaws	D	65-74
8 (eight)	Average, with noticeable errors	C	75-84
9 (nine)	Above average, with some errors	B	85-94
10 (ten)	Exceptional success without mistakes or with minor mistakes	A	95-100

18. Assessment components:

Grading will be based on the following activities:

PRE-EXAM OBLIGATIONS (total points):	**80**
Seminar paper	**10**
Tests - tasks (2 x 20 points)	**40**
Test - theory (30 points)	**30**
FINAL EXAM (total points):	**20**
TOTAL:	**100**

19. Mandatory reading list:

1. A. Veloni, Nikolaos I. Miridakis (2018). Digital Control Systems - Theoretical Problems and Simulation Tools. CRC Press.

20. Additional reading list:

1. D. Majetić; D. Brezak; J. Kasać (2015). Zbirka zadataka iz teorije automatskog upravljanja – Jednovarijabilni sustavi. Zagreb.

21. Web sources:

https://www.kth.se/student/kurser/kurs/EL1010?l=en

22. Applicable from the academic year:

2025/2026

23. Adopted in the Faculty/Academy session: