SYLLABUS

1. Course title:

Design of mechatronic systems

2. Code:

3. Cycle of study:

I

4. ECTS credits:

4

5. Type of course:

Mandatory

6. Prerequisites:

7. Class restrictions:

8. Duration / semester(s):

1 | VIII

9. Weekly contact hours and student workload:

Semester (1)	I	Semester (2)		(for two-semester courses)	Workload: (hours)
9.1. Lectures	3			Classes:	45
9.2. Seminars	0			Individual work:	65,75
9.3. Laboratory / Practice classes	1			In total:	110,7

10. Faculty:

Faculty of Mechanical Engineering

11. Department/study program:

Mechatronics

12. Lecturer:

PhD Mirza Bećirović, assistant professor

13. Course aims:

The main goal of teaching the subject "Design of Mechatronic Systems" is to understand the nature, function and role of the elements that make up a mechatronic system and to master the necessary theoretical and practical skills in the field of study of the subject in order to increase knowledge in the field of mechatronic systems as well as the competitive

advantages of mechatronic systems through improving process efficiency and their successful integration with other segments in production processes.

14. Learning outcomes:

At the end of the semester, successful students, who have continuously performed their duties throughout the entire teaching period, will be able to understand what mechatronics is, to design and operate a mechatronic system, to recognize a mechatronic system and to be able to independently make decisions when the use of mechatronics makes sense.

15. Course content:

1. Introductory lectures
2. Fundamentals of mechatronic systems design;
3. Modeling of mechatronic systems; Mathematical modeling; Simulation tools (MATLAB/Simulink, LabVIEW, etc.);
4. Sensors and actuators in mechatronics; Selection and integration into the system;
5. Control of mechatronic systems; Fundamentals of control theory; Real-time control;
6. Mechanical design in mechatronic systems; Selection of materials and structures; 3D modeling and 3D printing;
7. Electronics and embedded systems in mechatronic systems; Microcontrollers (Arduino, STM32, Raspberry Pi)
8. Selection of project task with explanation and public presentation;
9. Programming of mechatronic systems; Programming languages (C/C++, Python, PLC languages)
10. Programming of mechatronic systems; Real-time operating systems (FreeRTOS, QNX); Communication between components (UART, SPI, I^2C, CAN bus);
11. HMI (Human-Machine Interface) for mechatronic systems;
12. Application of AI in mechatronic systems; Trends in mechatronics and Industry 4.0;
13. Examples of mechatronic system design, presentation of developed models;
14. Examples of mechatronic system design, presentation of developed models;
15. Defense of the project task, presentation of the developed model;

16. Learning methods:

- Lectures – theoretical lectures, active two-way communication between student and professor, mandatory student attendance;
- Laboratory and practical exercises – problem solving with tasks related to the topic of the subject being studied, assistance with the selected topic of the project assignment, active two-way communication between student and assistant, mandatory attendance at exercises;
- Project assignment – seminar/graphic works – independent work of the student on solving the assigned problem;
- Consultations – clarification of any ambiguities related to the topic, with the professor and assistant;

17. Assessment methods:

- Defense of the project assignment - seminar/graphic works - the student defends his/her work before the professor/assistant - answers the questions asked;
- Presentation of the project assignment model - the student presents the project assignment model, answers the questions/tasks asked in a given period of time related to the topic of study;
- Report on laboratory exercises - submitting a report on activities related to the implementation of certain laboratory exercises, answering the questions asked by the assistant;
- Final exam - oral response to the questions asked by the professor;
- Make-up exam (written) - solving the questions/tasks asked in a given period of time related to the topic of study;
- Make-up exam (oral) - oral response to the questions asked.

Grading system: (50)+(30)+(20)=(100) points
Grading scale is as follows:

Grade	Description	Letter/Points
5 (five)	Does not meet minimum criteria	F <54
6 (six)	Meets minimum criteria	E 54-64
7 (seven)	Generally good, but with significant shortcomings	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 with no or minor errors	A 95-100

18. Assessment components:

Grading will be based on the following activities:
- Attendance at classes = 0 points.
- Laboratory report = 10 points.
- Project assignment-seminar/graphic work = 40 points.
- Project assignment model = 30 points.
- Pre-exam obligations = 80 points.

- Final exam = 20 points.
- Total = 100 points.

When solving the obligations related to knowledge testing, the student must earn more than 50% of the maximum number of points prescribed for a given activity. If the student does not earn the required number of points from a certain form of knowledge testing, he/she will take a make-up exam from the given segment of knowledge testing.

19. Mandatory reading list:

1.Šarić B, Trakić E. , Osnovi mehatronike sa rješenim zadacima, Univerzitet u Tuzli, Mašinski fakultet, Tuzla 2019. ;
2. J. Johnson, P. Picton (1995.), Mechatronics: Designing Intelligent machines, concepts in artificial intelligence (Vol.1), Butterworth-Heinemann,
3. Iserman R., 2003. Mechatronic Systems. London: Springer-Verlag.;

20. Additional reading list:

1. Werner R. 2006. Einfuhrung in die Mechatronik. Wiesbaden: Fachvelage.;

21. Web sources:

22. Applicable from the academic year:

2025/2026

23. Adopted in the Faculty/Academy session: