SYLLABUS

1. Course title:

CAD SYSTEMS

2. Code:

3. Cycle of study:

4. ECTS credits:

3

5. Type of course:

Mandatory

6. Prerequisites:

7. Class restrictions:

8. Duration / semester(s):

1 | VII

9. Weekly contact hours and student workload:

Semester (1)	1	Semester (2)		(for two-semester courses)	Workload: (hours)
9.1. Lectures	2			Classes:	33.75
9.2. Seminars	0			Individual work:	53.46
9.3. Laboratory / Practice classes	1			In total:	87.21

10. Faculty:

Mechanical Engineering

11. Department/study program:

Mechatronics

12. Lecturer:

Dr.Sc. Salko Ćosić°°

13. Course aims:

Acquiring basic theoretical and practical knowledge in the field of Computer Aaided Design in mechanical engineering using modern CAD systems, mastering the mathematical foundations of computer graphics, 3D modeling and computer-aided optimization and simulation of mechatronic objects and systems.

14. Learning outcomes:

Students who have successfully mastered the course content will be able to independently create complex 2D and 3D models of technical objects, to perform numerical calculations and FEM simulations on them, to optimize processes or systems using software tools and to create complete technical/technological documentation.

15. Course content:

1. Introduction, role and importance of computer-aided design and CAD systems in mechatronics, simultaneous design
2. Basics of computer graphics, computer representation of images, color models
3. Geometric modeling, basic coordinate 2D and 3D transformations
4. Curves, parametric definition, plane and spatial, synthetic curves, Bezier, SPLINE, BSPLINE
5. Surface modeling, surface models
6. Solid modeling, CSG, Boolean operations, type forms, spatial decomposition
7. Parametric models, parameterization, example - design table (SW)
8. Test no. 1
9. Technical optimization, optimization model, optimization conditions of the first and second order, examples (MATLAB/SIMULINK)
10. Multidimensional optimization, conditional optimization, numerical algorithms, KKT conditions
11. Basics of numerical modeling in mechatronics, FEM, CFD, modeling of sensors and actuators
12. FEM - theoretical basics, strict and integral formulation, RR principle, interpolation f-s, stiffness matrix, coupling
13. FEM in the field of strength, heat transfer, modeling of the piezoelectric effect, examples, commercial FEM software
14. Topological optimization, theoretical basis, SIMP, examples
15. Test no.2

16. Learning methods:

Lectures and presentations with analysis of examples, problems for independent practice, laboratory exercises with program tasks, consultations with the teacher and assistant.

17. Assessment methods:

Partial knowledge tests are conducted in the middle and at the end of the semester and include a practical part (program assignments) and a theory test. A student who has achieved at least 54% of points has passed the partial knowledge test. At the final exam, the student is exempted from the part of the exam that was passed through partial tests. In order to enter a grade, it is necessary to pass both the practical and theoretical parts of the exam.

Rating:
5 (five, F,FX) <54, does not meet minimum criteria,
6 (six, E) 54 - 64, meets minimum criteria
7 (seven, D) 65 - 74, generally good, but with significant flaws,
8 (eight, C) 75-84, average, with noticeable flaws
9 (nine, B) 85 - 94, above average, with a few errors,
10 (ten, A) 95 - 100, outstanding achievement without errors or with minor errors

18. Assessment components:

1. Partial test - tasks 15, theory 15
2. Partial test - tasks 15, theory 15
3. Final exam: 40

19. Mandatory reading list:

1. Kuang-Hua C: Computer-Aided Engineering Design, Elsevier 2015

20. Additional reading list:

1. M. Kalenbacher: Numerical Simulation of Mechatronic Sensors and Actuators, 2ed, Springer 2009

21. Web sources:

22. Applicable from the academic year:

2025/2026

23. Adopted in the Faculty/Academy session: