

DESIGN OF MECHATRONIC SYSTEMS

Course Workload		Assessment form (examination/ graded test/ ungraded test)
ECTS	Hours	
3	108	Ungraded test

The module aims to introduce the student to design concepts for mechatronic and robotic systems. The topics will cover modern design approaches including (a) manual design methods, (b) analytical optimization design methods, (c) topological optimization, and (d) generative and evolutionary approaches to create physically realizable mechatronic and robotic systems. The module will contain theoretical material summarizing modern methods of automating the design process and practical examples of their implementation in the MATLAB development environment. We will discuss methods of analysis, modeling, choice of actuation method, verification of synthesized design and physical prototyping. The course will provide practical knowledge of mechanical design and analysis of robotic systems.

Course structure:

1. DESIGN OF MECHATRONIC SYSTEMS ASSEMBLIES
 - 1.1. Development of kinematic diagrams of mechanisms.
 - 1.2. Development of component layouts.
2. SOLVING LOCAL OPTIMIZATION PROBLEMS OF MECHATRONIC SYSTEMS WITH GRADIENT METHODS
 - 2.1. The concept of optimization problems.
 - 2.2. Gradient method of unconditional optimization.
3. SOLVING GLOBAL OPTIMIZATION PROBLEMS OF MECHATRONIC SYSTEMS WITH NON-GRADIENT METHODS
 - 3.1. Random search algorithms.
 - 3.2. Annealing simulation algorithms.
 - 3.3. Genetic algorithms.