

Course unit title:	Mechanical Engineering Design and Optimisation		
Course unit code:	ME 414		
Type of course unit:	Compulsory		
Level of course unit:	Bachelor (2 nd Cycle)		
Year of study:	4		
Semester when the unit is delivered:	8 (Spring)		
Number of ECTS credits allocated :	6		
Name of lecturer(s):	Dr.-Ing. Loucas Papadakis		
Learning outcomes of the course unit:	<ul style="list-style-type: none"> Analyze the position of the design process within the company. Describe new ways for planning and designing within a company. Describe product planning. Define product specifications and identify product purposes. Apply embodiment design methods. Work with simulations, modelling. Select the proper material, generate detail drawings and integrate single components into assemblies. Evaluate proposed solution and recommend the most appropriate one, based on categorised criteria. Formulate numerical optimization methods for solving design problems efficiently. 		
Mode of delivery:	Face-to-face		
Prerequisites:	ME 317	Co-requisites:	None
Recommended optional program components:	None		
Course contents:	<ul style="list-style-type: none"> The position of the design process within the company The necessity for systematic design, Design methods, Systems theory. Product planning and clarifying the task General approach. Product definition, Design specification, House of quality, Task clarification Conceptual design Abstracting to identify the essential problems. Establishing function structures, Developing working structures, Examples of conceptual design, Evaluating designs, Decision making techniques Embodiment design Basic rules and principles, Guidelines for embodiment design, Materials selection and design, Materials processing and design, Detail design Parametric design Modelling and Simulation, Cause and effect analysis Design for Minimum Cost Cost Factors, Fundamentals of cost calculations, Methods for estimating costs Optimization Unconstrained & constrained optimization, Global and local optima, Steepest descent method, Transformation methods, Strategies for solving optimization 		

	<p>problems</p> <ul style="list-style-type: none"> • Laboratory Work: Individual or small group modelling and problem solving, from selected areas such as structural, heat transfer, fluid mechanics with the use of common industrial packages such as, SOLIDWORKS, ANSYS Workbench and Matlab.
Recommended and/or required reading:	None
Textbooks:	<ul style="list-style-type: none"> • Engineering Design, Rudolph J. Eggert, Prentice Hall • Saeed Moaveni, Finite Element Analysis Theory and Application with ANSYS, Pearson Education, 2008 • Jasbir Arora, Optimization of Structural and Mechanical Systems, World Scientific Publishing, 2007
References:	<ul style="list-style-type: none"> • Engineering Design: A systematic approach, Pahl, Beitz, 2nd Edition, 1999 • Engineering Design, A Materials and Processing Approach, G. E. Dieter, McGraw–Hill International Editions, 3rd Edition, 2000 • Product Design and Development, Karl Ulrich Steven Eppinger, McGraw-Hill, 2004 • Mechanical Design, An Integrated Approach, Ansel C. Ugural, Mcgraw Hill, 2004. • Product Design, Techniques in Reverse Engineering and New Product Development, Kevin Otto, Kristin Wood, 2001 • Fundamental of Machines Components Design, Robert C. Juvinall, Kurt M. Marshek, 2000 • Mechanical Engineering Design, Ch. R. Mischke, J. Edward, McGraw-Hill, 7th Edition, 2004 • Engineering Design and Problem Solving, 2nd Edition, Steve K. Howell, Prentice Hall, 2002
Planned learning activities and teaching methods:	Lectures and lecture-based problem classes for exam preparations. Assignments for learning how to obtain and present relevant information. Computer laboratory sessions with aim to get with modern design, modelling and optimisation tools. Knowledge checking: One midterm examination, one project with report and final examination.
Assessment methods and criteria:	<ul style="list-style-type: none"> • Test: 20% • Project: 20% • Final Exam: 60%
Language of instruction:	English
Work placement(s):	No