



UNIVERSITETI / UNIVERSITY
"ISA BOLETINI"
MITROVICË

Course Curriculum Model (Syllabus)		
Faculty:	FACULTY OF MECHANICAL AND COMPUTER ENGINEERING	
Department:	Mechanical Engineering and Economic Engineering	
Study Program	MSc in Manufacturing Technology and Management	
Level:	Master	
Code of the course:	107MTM	
Course:	Virtual Product Development	
Course Status:	Elective	Mandatory/ Elective
Semester:	I	Winter/Summer
Number of hours per week:	2+0	
ECTS:	5	
Time / location:	Wednesday, 9 ⁰⁰ -10 ³⁰ , K5	
Academic Year / Semester	2026/2027	
Language of Instruction:	Albanian (with flexibility in English)	
Lecturer:	Prof. Ass. Dr. Fatmir Azemi	
Assistant:		
Contact details:	Professor	Assistant
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	Telephone:	
Course Description	This course introduces students to the concepts, tools, and processes used in Virtual Product Development (VPD). It covers the integration of CAD, CAE, CAM, PLM systems, and virtual prototyping in the product development lifecycle. Students will learn how to apply digital tools for conceptual design, engineering analysis, manufacturing planning, and lifecycle management.	
Course Purpose / Course Goals	The aim of this course is to provide students with the ability to design, analyze, and optimize products entirely in a virtual environment, minimizing the need for physical prototypes, reducing development time, and increasing product quality.	
Course Objectives	-Understand the principles and benefits of Virtual Product Development. -Learn to use CAD/CAE/CAM/PLM tools for product lifecycle management. -Apply simulation and analysis techniques to evaluate product performance. -Integrate virtual development into modern manufacturing environments.	

Intended Learning Outcomes (ILOs)	Knowledge: K1: Explain the fundamentals of virtual product development and related technologies. K2: Understand the integration of design, engineering, and manufacturing in a virtual environment. K3: Identify industry standards and best practices in VPD. Skills: S1: Develop 3D product models using CAD tools. S2: Conduct engineering analysis using CAE software. S3: Manage product data and workflows in PLM systems. Competences: C1: Design and optimize products virtually before manufacturing. C2: Collaborate in multidisciplinary teams using virtual tools. C3: Evaluate the economic and technical benefits of VPD.

	Weeks	Lecture
Program	<i>First week</i>	Introduction to Virtual Product Development
	<i>Second week</i>	Role of CAD/CAE/CAM/PLM in VPD
	<i>Third week</i>	Product Lifecycle Management concepts
	<i>Fourth week</i>	3D modeling principles and best practices
	<i>Fifth week</i>	Finite Element Analysis in the virtual environment
	<i>Sixth week</i>	Design optimization techniques
	<i>Seventh week</i>	Midterm Exam
	<i>Eighth week</i>	Simulation-driven design and validation
	<i>Ninth week</i>	Integration of manufacturing planning in VPD
	<i>Tenth week</i>	Collaboration in distributed engineering environments
	<i>Eleventh week</i>	Case studies in automotive and aerospace industries
	<i>Twelfth week</i>	Sustainability and cost reduction through VPD
	<i>Thirteenth week</i>	Industry 4.0 and digital twin concepts
	<i>Fourteenth week</i>	Student presentations of virtual projects
	<i>Fifteenth week</i>	Course review and final project submission

Literature / Reading List:	
Literature	- Stark, J. – Product Lifecycle Management: 21st Century Paradigm for Product Realisation, Springer. - Chang, T.C. et al. – Computer-Aided Manufacturing, Prentice Hall. - Pahl, G., Beitz, W. – Engineering Design: A Systematic Approach, Springer. - Verhagen, W.J.C. et al. – Virtual Prototyping: Integrating Physical and Virtual Testing, Elsevier. - Relevant research papers from: Computer-Aided Design, Journal of Engineering Design, International Journal of Product Lifecycle Management

Teaching and Learning Methods	Teaching and Learning Methods The course is delivered using a combination of traditional and modern teaching methods to ensure the acquisition of theoretical knowledge and the development of practical skills. The main methods include: • Structured Lectures – for presenting fundamental and advanced concepts. • Problem-Based Learning (PBL) – students work on solving real manufacturing problems by researching and applying innovative solutions. • Flipped Classroom – learning materials are provided in advance, while class time is used for discussions, hands-on activities, and practical applications. • Project-Based Learning – development of complete projects simulating industrial scenarios. • Case Study Method – analysis and discussion of real-world industry situations to understand practical applications of virtual product development. • Laboratory Demonstrations – practical presentation and explanation of processes such as virtual prototyping, digital twin implementation, and CAD/CAE/CAM integration. • Computer Simulations – use of specialized software (e.g., CATIA, SolidWorks, ANSYS) for product modeling, analysis, and optimization. • Industrial Guest Lectures – presentations from experts sharing current trends and applications in virtual product development and Industry 4.0.			
	Contribution to student workload (which should correspond to student learning outcomes - 1 ECTS credit = 25 hours)			
	Activity	Hours	Days/weeks	Total
	Lectures	2	15	30
	Exercise sessions (with TA)	2	15	30
	Practical work	3	3	9
	Office hours	1	15	15
	Fieldwork	1	2	2
	Midterms, seminars	2	2	4
	Homework	3	2	6
	Self-study	4	3	12
	Final exam preparation	3	3	9
	Time spent in exams	2	2	4
	Projects, presentations, etc.	2	2	4
Total				125

Evaluation	Assessment Methods and Criteria:		
	Activity	Weight (%)	
	Midterm Exam	20%	
	Project Report & Defense	30%	
	Seminar Presentation	10%	
	Final Exam	40%	
	Total	100%	
	(according to the Statute and Regulation for studies of UMIB)		
Final grade		Points (%)	Mark

		91 – 100	10
		81 - 90	9
		71 - 80	8
		61 - 70	7
		51 - 60	6
Academic policies	Criteria for regular attendance and rules of etiquette during the organization of the lesson are set.		
	Attendance, Ethics and Deadlines (Virtual Product Development)		
	Criteria for regular attendance and rules of conduct during the teaching process are established. Students are expected to actively participate in lectures, laboratory sessions, modeling activities, simulation exercises, and discussions related to virtual product development.		
	Computer-Based Work		
	All assignments, 3D models, simulations, technical reports, and presentations must be prepared using appropriate CAD/CAE/CAM software tools. Students are required to comply with technical and professional standards in product design, analysis, and documentation. Clear visual presentation and proper documentation of results are mandatory.		
	Academic Ethics		
	All models, simulations, projects, and reports must be the original work of the student or assigned group. Copying models, simulations, or materials from other sources without proper citation is strictly prohibited. Any violation of academic integrity will negatively affect the final grade.		
	Deadlines		
	Submission deadlines for assignments, projects, and reports will be defined at the beginning of the semester or activity. Late submissions will not be accepted without valid justification. Students are responsible for completing all course requirements within the specified deadlines.		
	Consultations		
	Students have the right to request consultations with the instructor regarding modeling, simulation, virtual product development tasks, and technical report preparation whenever necessary.		
	Rules of conduct and academic policies:		
	• active participation of students in lectures or participation in discussion, comments and free expression of opinion, opinion and academic position (with arguments) • mandatory independent work and use of additional sources of information (various scientific websites, scientific journals, conference proceedings, etc.) • respecting lecture schedules without compromising academic freedom (silent cell phones) of respecting the word, thoughts and ideas of colleagues, • it is not allowed to arrive late and leave without a valid reason from the lecture, test or exam or preparation and holding of relevant lectures, (obligation of the teacher). • if the student is absent more than four times without reason in lectures and exercises, does not receive the signature for attendance. or the student cannot take the exam without an official document, • if the student is dissatisfied with the grade obtained, has the right to complain in writing to the dean, within two working days after the announcement of the results, UMIB Statute or if the student does not follow the rules, in the exam uses tools that are not allowed, it is evaluated with a negative grade.		
	Plagiarism or cheating will be penalized according to university regulations.		