



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:	205MTM	
Course:	Machine Learning & AI Models in Manufacturing	
Course Status:	Elective	
Semester:	III	Winter
Number of hours per week:	2+1	
ECTS:	5	
Time / location:	Tuesday, 9 ⁰⁰ -10 ³⁰ , K3	
Academic Year / Semester	2026/2027	
Language of Instruction:	Albanian (with flexibility in English)	
Lecturer:	Prof. Ass. Dr. Berat Ujkani	
Assistant:		
Contact details:	Professor	Assistant
Email:	berat.ujkani@umib.net	
Telephone:		
Course Description	This course introduces students to the principles and applications of Machine Learning and Artificial Intelligence in the context of modern manufacturing systems. It covers data-driven approaches to process optimization, predictive maintenance, quality control, supply chain management, robotics, and intelligent decision-making. Through lectures and hands-on exercises, students will gain both theoretical understanding and practical skills to design, implement, and evaluate ML/AI models tailored for manufacturing environments.	
Course Purpose / Course Goals	The purpose of this course is to provide students with foundational and advanced knowledge of ML/AI techniques applicable to manufacturing. It aims to bridge the gap between theoretical ML/AI models and their practical deployment in industrial environments as well as prepare graduates for roles requiring digital transformation and Industry 4.0 expertise in manufacturing sectors.	
Course Objectives	• Understand core ML concepts and algorithms relevant to manufacturing. • Recognize challenges and opportunities of applying AI in production systems. • Develop the ability to design predictive and prescriptive models using manufacturing datasets. • Critically evaluate AI/ML applications for efficiency, sustainability, and competitiveness in manufacturing. • Gain practical experience with Python tools and frameworks.	

Intended Learning Outcomes (ILOs)	Upon successful completion, students will be able to:
	• Explain the fundamental concepts of machine learning and AI models relevant to manufacturing systems. • Analyze different types of manufacturing data (time-series, image, sensor, and production data) to identify appropriate ML/AI techniques. • Apply supervised, unsupervised, and deep learning methods to solve manufacturing problems such as predictive maintenance, quality control, and demand forecasting. • Evaluate the performance of ML/AI models using appropriate metrics and interpret results in the context of manufacturing decision-making. • Design and implement a small-scale ML/AI solution for a real or simulated manufacturing dataset using modern software tools. • Critically assess the opportunities, limitations, and ethical implications of deploying AI in manufacturing, including its impact on productivity, sustainability, and workforce.

	Weeks	Lecture
Program	First week	Introduction
	Second week	Data Types
	Third week	Fundamentals of Machine Learning
	Fourth week	Regression models and applications in process monitoring
	Fifth week	Classification models for defect detection & quality control
	Sixth week	Clustering & dimensionality reduction
	Seventh week	Midterm Exam
	Eighth week	Time-series forecasting
	Ninth week	Deep Learning for manufacturing
	Tenth week	Reinforcement Learning and intelligent robotics
	Eleventh week	Digital Twins and simulation-driven AI models
	Twelfth week	AI for supply chain optimization
	Thirteenth week	Ethical, social, and sustainability aspects of AI
	Fourteenth week	Student project presentations
	Fifteenth week	Course review and final exam preparation

Literature / Reading List:	
Literature	Core Textbooks
	• Hastie, T., Tibshirani, R., & Friedman, J. (2017). The Elements of Statistical Learning. Springer. • Goodfellow, I., Bengio, Y., & Courville, A. (2016). Deep Learning. MIT Press. • Groover, M. P. (2020). Automation, Production Systems, and Computer-Integrated Manufacturing (Industry 4.0 chapters). Pearson.
	Supplementary
	• Kuhn, M., & Johnson, K. (2020). Applied Predictive Modeling. Springer. • Selected journal articles

Teaching and	Lectures, Case Studies, Group Projects, Practical Lab Sessions, Industrial Guest Lectures
	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 (%)	
	Assignments/Exercises	20%	
	Mid-term Exam	20%	
	Project Work	30%	
	Final Exam	30%	
	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. Ethics in teaching: • Graphic works should be personal works of each student. There will be no tolerance for copying, "borrowing" from the Internet or any other material. The same or similar works will have negative evaluations in the final evaluation of the student. Time: • In agreement with the students, the deadlines for submitting works will be determined. There will be no tolerance for delays in the submission of works. Failure to arrive at the time when the assignment is explained does not justify the student for not submitting the paper. The deadline will be given earlier. If you are going to travel abroad, then you need to submit the paperwork in advance. The student has the right to request a consultation with the professor whenever he / she deems it reasonable and necessary for the performance of his / her work. Rules of conduct and academic policies: • active participation of students in lectures o 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 o 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. o 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 o 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.
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