

DEPARTMENT OF MECHATRONICS ENGINEERING
COURSE SYLLABUS

Course Details				
Code		Academic Year		Semester
MEC030		3		6
Title		T	A	L
Selected Topics in Computer Science I: Deep Learning		2		2
ECTS		6		
Language	German			
Level	Undergraduate	✓	Graduate	Postgraduate
Department / Program	Mechatronics Engineering			
Forms of Teaching and Learning	Face to face			
Course Type	Compulsory		Elective	✓
Objectives	The main objective of this course is to provide students with a theoretical understanding of artificial intelligence and deep learning, their optimization processes, and their applications, particularly in the field of computer vision. Students are expected to understand the transition from linear models to deep neural networks, gain proficiency in image processing with convolutional neural networks (CNNs), and develop robust models by approaching real-world problems from an engineering perspective.			
Content	The course begins with a definition of artificial intelligence and expectation management; the relationship between data, models, and loss functions is examined. Optimization techniques, backpropagation, and the training dynamics of neural networks are detailed. The second half focuses specifically on Computer Vision (CVI) topics; CNN architectures, transfer learning, and model robustness are covered. The course concludes with a final project. with theoretical information into practice It ends with the spilling .			
Prerequisites				
Coordinator				
Lecturer(s)	Research Assistant Dr. Onur Akgün			
Assistant(s)	Research Assistant Dr. Mustafa Erdem			
Work Placement				
Recommended or Required Reading				
Books / Lecture Notes	Current Academic Articles and Lecture Slides			
Other Sources	Deep Learning – Ian Goodfellow, Yoshua Bengio, Aaron Courville (MIT Press) Pattern Recognition and Machine Learning – Christopher Bishop CS231n: Deep Learning for Computer Vision , Stanford University A Recipe for Training Neural Networks by Andrej Karpathy			
Additional Course Material				
Documents				
Assignments	1 Project			
Exams	1 Midterm exam, 1 final exam			

DEPARTMENT OF MECHATRONICS ENGINEERING
COURSE SYLLABUS

Course Composition			
Mathematics und Basic Sciences	40		%
Engineering	30		%
Engineering Design	15		%
Social Sciences			%
Educational Sciences			%
Natural Sciences	15		%
Health Sciences			%
Expert Knowledge			%
Assessment			
Activity	Count	Percentage (%)	
Midterm Exam	1	30	
Quiz			
Assignments	10	10	
Attendance			
Recitations			
Projects	1	20	
Final Exam	1	40	
		Total	100
ECTS Points and Work Load			
Activity	Count	Duration	Work Load (Hours)
Lectures	14	3	42
Self-Study	14	3	42
Assignments			
Presentation / Seminar Preparation	1	20	20
Midterm Exam	1	2	2
Recitations			
Laboratory	10	3	30
Projects	1	70	70
Final Exam	1	2	2
		Total Work Load	208
		ECTS Points (Total Work Load / Hour)	6
Learning Outcomes			
1	They can differentiate between artificial intelligence and deep learning, distinguishing what they can and cannot do.		
2	They can mathematically analyze the training processes, loss functions, and optimization algorithms of neural networks.		

**DEPARTMENT OF MECHATRONICS ENGINEERING
COURSE SYLLABUS**

3	They can identify overfitting problems and solve them using regularization techniques.
4	We can develop image classification and object recognition models using Convolutional Neural Network (CNN) architectures.
5	They can evaluate the robustness and failure modes of trained models under real-world conditions.
6	
7	
8	
9	
10	
11	
12	

Weekly Content

1	Introduction & Expectation Management
2	Data, Models & Loss
3	Fundamentals of Optimization
4	From Linear Models to Neural Networks
5	Backpropagation & Training Dynamics
6	Generalization, Overfitting & Mini Project
7	Midterm Exam
8	Introduction to Computer Vision (CNNs)
9	Deep CNNs & Transfer Learning
10	Robustness & Generalization in the Real World I
11	Robustness & Generalization in the Real World II
12	Final Project Presentations I
13	Final Project Presentations II
14	Final Exam

Contribution of Learning Outcomes to Program Objectives (1-5)

	P1	P2	P3	P4	P5	P6	P7
1	5	5	5	5	4		
2	5	5	5	5	4		
3	5	5	5	5	4		
4	5	5	5	5	4		
5	5	5	5	5	4		

**DEPARTMENT OF MECHATRONICS ENGINEERING
COURSE SYLLABUS**

6							
7							
8							
9							
10							
11							
12							

Contribution Level 1: Low 2: Low-intermediate 3: Intermediate 4: High 5: Very High

Compiled by: Onur Akgun

Date of Compilation: 30.01.2026