



## Course Specifications

<b>Course Title:</b>	<b>Deep Learning</b>
<b>Course Code:</b>	<b>506PMAI-3</b>
<b>Program:</b>	<b>Professional Master of Artificial Intelligence</b>
<b>Department:</b>	<b>Computer Science</b>
<b>College:</b>	<b>Computer Science and information systems</b>
<b>Institution:</b>	<b>Najran University</b>

## Table of Contents

<b>A. Course Identification</b> .....	<b>3</b>
6. Mode of Instruction (mark all that apply) .....	3
<b>B. Course Objectives and Learning Outcomes</b> .....	<b>3</b>
1. Course Description .....	3
2. Course Main Objective.....	3
3. Course Learning Outcomes .....	4
<b>C. Course Content</b> .....	<b>4</b>
<b>D. Teaching and Assessment</b> .....	<b>5</b>
1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods.....	5
2. Assessment Tasks for Students .....	5
<b>E. Student Academic Counseling and Support</b> .....	<b>6</b>
<b>F. Learning Resources and Facilities</b> .....	<b>6</b>
1. Learning Resources .....	6
2. Facilities Required.....	6
<b>G. Course Quality Evaluation</b> .....	<b>6</b>
<b>H. Specification Approval Data</b> .....	<b>7</b>

## A. Course Identification

<b>1. Credit hours:</b> 3
<b>2. Course type</b>
a. University <input type="checkbox"/> College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Others <input type="checkbox"/>
b. Required <input checked="" type="checkbox"/> Elective <input type="checkbox"/>
<b>3. Level/year at which this course is offered:</b> 4 <sup>th</sup> level/ 2 <sup>nd</sup> year
<b>4. Pre-requisites for this course (if any):</b> None
<b>5. Co-requisites for this course (if any):</b> NA

### 6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	50	100%
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

### 7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	50
2	Laboratory/Studio	
3	Tutorial	
4	Others (specify)	
	<b>Total</b>	50

## B. Course Objectives and Learning Outcomes

### 1. Course Description:

This course covers the theory and practice of deep learning from a variety of perspectives. It explores topics such as perceptron, convolutional neural network, autoencoder, recurrent neural network (LSTM, GRU). This course will teach the students how the forward propagation and backward propagation is done, and how to train a neural network from scratch or by using transfer learning approach. The student will also learn about generative adversarial networks and style transfer networks. In the practical part, students will use Python programming language with Keras and Tensorflow library to implement the aspects of the course to train neural network.

### 2. Course Main Objective

The main objective of this course is to provide an in-depth understanding of the principles, techniques, algorithms, and applications of deep learning. Moreover, the student will learn how to train a neural network from scratch.

### 3. Course Learning Outcomes

CLOs		Aligned PLOs
<b>1</b>	<b>Knowledge and Understanding</b>	
1.1	describe the key concepts of deep learning and its role in solving real problems;	K1
1.2	explain different deep learning algorithms and their practical implementations and applications	K1, K2
1.3		
1...		
<b>2</b>	<b>Skills</b>	
2.1	Train deep learning models to solve a wide range of problems in many applications such as computer vision and natural language processing.	S1, S4
2.2	Evaluate the applicability of different deep learning architectures	S2
2.3	Build appropriate deep learning architecture to solve real problems	S2, S4
2.4		
2.5		
<b>3</b>	<b>Competences:</b>	
3.1	Communicate clearly and effectively using the technical language of the field	C2
3.2		
3.3		
3...		

### C. Course Content

No	List of Topics	Contact Hours
1	Introduction	3
2	Neural Network basics	3
3	Shallow Neural Network	3
4	Deep Neural Network	3
5	Training Neural Network	3
6	Optimization Algorithms	3
7	Convolutional Neural Network I	3
8	Convolutional Neural Network II	3
9	Recurrent Neural Network I	3
10	Recurrent Neural Network II	3
11	Autoencoders	3
12	Generative adversarial Network I	8
13	Generative adversarial Network II	3
14	Style Transfer Learning I	3
15	Style Transfer Learning II	3
<b>Total</b>		<b>50</b>

## D. Teaching and Assessment

### 1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
<b>1.0</b>	<b>Knowledge and Understanding</b>		
1.1	describe the key concepts of deep learning and its role in solving real problems;	<ul style="list-style-type: none"> <li>Giving Lectures in PPT, recalling the lecture through asking Questions. Clarifying doubts on Lecture.</li> <li>Discussions of real life problems, among teacher, students</li> </ul>	Quiz Theory Assignments Midterm Examination Final Examination
1.2	explain different deep learning algorithms and their practical implementations and applications		
...			
<b>2.0</b>	<b>Skills</b>		
2.1	Train deep learning models to solve a wide range of problems in many applications such as computer vision and natural language processing.	<ul style="list-style-type: none"> <li>Giving Lectures in PPT, recalling the lecture through asking Questions. Clarifying doubts on Lecture.</li> <li>Conducting a discussion of real life problems, among teacher, students</li> <li>Cooperative learning among the students.</li> <li>Encourage students to browse different journals, seminars or websites at their leisure time to have a better understanding about the course</li> </ul>	Quiz Lab Assignments Midterm Examination Final Examination,
2.2	Evaluate the applicability of different deep learning architectures		Quiz, Theory Assignments Final Examination
2.3	Build appropriate deep learning architecture to solve real problems.		Midterm Examination Min-project Final Examination
2.4			
2.5			
<b>3.0</b>	<b>Competences</b>		
3.1	Communicate clearly and effectively using the technical language of the field		Mini-Project presentation
3.2			
...			

### 2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Quiz1	3 <sup>rd</sup> week	5%
2	Midterm	6 <sup>th</sup> week	20%
3	Mini-Project	9 <sup>th</sup> week	15%
4	Lab Assignments	2 <sup>nd</sup> , 4 <sup>th</sup> , 7 <sup>th</sup> , 10 <sup>th</sup> week	15%
5	Quiz2	10 <sup>th</sup> week	5%
7	Final Exam	12 <sup>th</sup> or 13 <sup>th</sup> week	40%
8			

\*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

## E. Student Academic Counseling and Support

**Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :**

- Weekly office hours
- Pre-booked Appointments
- Additional office hours prior exams
- Weekly academic advising hours

## F. Learning Resources and Facilities

### 1. Learning Resources

<b>Required Textbooks</b>	<ul style="list-style-type: none"> <li>• Deep Learning (Adaptive Computation and Machine Learning series) Illustrated Edition by Ian Goodfellow, Yoshua Bengio, Aaron Courville, 2016</li> </ul>
<b>Essential References Materials</b>	
<b>Electronic Materials</b>	
<b>Other Learning Materials</b>	

### 2. Facilities Required

Item	Resources
<b>Accommodation</b> (Classrooms, laboratories, demonstration rooms/labs, etc.)	Room B-59 Laboratory B-113L
<b>Technology Resources</b> (AV, data show, Smart Board, software, etc.)	Data show, PCs.
<b>Other Resources</b> (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	<ul style="list-style-type: none"> <li>• Printer is important in the lab to print reports and some snapshots.</li> <li>• Projector and PC for the lab instructor is required</li> <li>• GPUs cluster</li> </ul>

## G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Online course survey	Students	Indirect
course learning outcomes achievement survey	Students	Indirect
achievement of course	instructor	Direct

Evaluation Areas/Issues	Evaluators	Evaluation Methods
learning outcomes		

**Evaluation areas** (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

**Evaluators** (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

**Assessment Methods** (Direct, Indirect)

## H. Specification Approval Data

Council / Committee	Computer Science Departmental Council
Reference No.	14440203-0185-00002
Date	1st Sep, 2022