هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104

2023

Course Specification

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Course Specification

Course Title:	Deep Learning
Course Code:	DSC 432
Program:	Applied Statistics & Data Management
Department:	Mathematics
College:	College of Science
Institution:	Majmaah University, Saudi Arabia
Version:	1
Last Revision Date:	21-9-2023

Table of Contents:

A. General information about the course:

Course Identification					
1. Credit hours:	3(2+2)				
2. Course type					
a.	University ☐	College ☐	Department☒	Track☐	Others☐
b.	Required ☒	Elective☐			
3. Level/year at which this course is offered: 8					
4. Course general Description					
5. Pre-requirements for this course (if any): DSC323 (Machine learning II)					
6. Co- requirements for this course (if any): N/A					
7. Course Main Objective(s)					

1	Understand motivation and functioning of the most common types of deep neural networks
2	Understand the choices and limitations of a model for a given setting
3	Apply deep learning techniques to practical problems
4	Critically evaluate model performance and interpret results
5	Write reports in which results are assessed and summarized in relation to aims methods and available data

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	9	**20%**
2.	E-learning	9	**20%**
3.	Hybrid • Traditional classroom • E-learning	27	**60%**
4.	Distance learning		

2. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	25

2.	Laboratory/Studio	
3.	Field	
4.	Tutorial	20
5.	Others (specify)	
	Total	45

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Build and train deep neural networks, implement vectorized neural networks, identify architecture parameters, and apply DL to your applications	K2	**Direct teaching**: Inquiry-based instruction Power Points and discussions **Aimed teaching**: Discovery and oral questions	• Home work • Quiz • Midterms • Final Exams • E-exam • Oral Exam
1.2	Use best practices to train and develop test sets and analyze bias/variance for building DL applications, use standard NN techniques, apply optimization algorithms, and implement a neural network in TensorFlow			
1,3…	Use strategies for reducing errors in ML systems, understand complex ML settings, and apply end-to-end, transfer, and multi-task learning			
2.0	Skills			
2.1	Build a Convolutional Neural Network, apply it to visual detection and recognition tasks, use neural style transfer to generate art, and apply these algorithms to image, video, and other 2D/3D data	S2	**Direct teaching**: Lectures Differentiation **Aimed teaching**: Discovery and oral questions **Indirect teaching**: Peer Learning	• Home work • Quiz • Midterms • Final Exams

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.2	Build and train Recurrent Neural Networks and its variants (GRUs, LSTMs), apply RNNs to character-level language modeling, work with NLP and Word Embeddings, and use HuggingFace tokenizers and transformers to perform Named Entity Recognition and Question Answering			
3.0	Values, autonomy, and responsibility			
3.1	Illustrate how take up responsibility.	V2	**Direct teaching**: Lectures Differentiation **Aimed teaching**: Discovery and oral questions **Indirect teaching**: Peer Learning	• Home work • Quiz • Midterms • Final Exams
3.2	Must be shown the ability of working independently and with groups.			
..3.3.	Students can actively and critically participate in class activities;			

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to Machine Learning and Deep Learning	4
2.	Feed-Forward Neural Networks: Overall Structure of a Neural Network - Evaluating the Output of a Neural Network – Backpropagation (implement a simple network using PyTorch. The idea of introducing all the building blocks necessary for the first network makes the process of lazy learning)	9
3	Automatic Differentiation in Deep Learning Numerical Differentiation - Symbolic Differentiation - Automatic Differentiation Fundamentals (Implementing Automatic Differentition (Autograd) in PyTorch)	8
4	Convolutional Neural Networks: Convolution Operator	5

5	Advanced Deep architectures: o Recurrent Neural networks (RNNs) o Advanced RNN: LSTM, GRU, o Generative Adversarial Networks (GANs) o Advanced GANs	9
6	Implement deep learning algorithms and solve real-world problems	5
7	Practical sessions: Computer Vision - Natural Language Processing (NLP) - Sequence modeling – Natural	5
Total		45

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	**Midterm Exam1**	**6th**	**15%**
	Midterm Exam2	**12th**	**15%**
2.	**Homework + Presentation**	**During semester**	**20%**
3.	**Quizzes**	**4th - 9th**	**10%**
.4	**Final Examination**	**12th**	**40%**
			100%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.)

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	Ian Goodfellow and Yoshua Bengio and Aaron Courville,Deep Learning , MIT Press, 2016
Supportive References	Deep Learning with PyTorch, Eli Stevens, Luca Antiga, and Thomas Viehmann, Soumith Chintala, 2nd Edition 2022.
Electronic Materials	Google scholar DSL
Other Learning Materials	-

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classroom with capacity of 30-students. Computer Lab of Mathematics Department
Technology equipment (projector, smart board, software)	Mathematical & Statistical software packages like: 1- R, SPSS, MATHEMATICA. 2- MATLAB. 3- MAPLE. SCIENTIFIC WORKPLACE, PYTHON
Other equipment (depending on the nature of the specialty)	-

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students/ internal committee	Direct (Students evaluation electronically organized by Deanship of registration and admission)/ Verification of students' papers
Effectiveness of students assessment	Staff members (Peer Reviewer)	Indirect (Frequent meetings consultation among the teaching staffs)
Quality of learning resources	Staff members (Peer Reviewer)	Indirect (Frequent meetings consultation among the teaching staffs)

Assessment Areas/Issues	Assessor	Assessment Methods
The extent to which CLOs have been achieved	Staff members (Peer Reviewer)	Direct (Meeting between course coordinators and the tutors)
Other	-	-

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

G. Specification Approval Data

COUNCIL /COMMITTEE	
REFERENCE NO.	
DATE	21-9-2023