COURSE DESCRIPTION FORM

INSTITUTION: FAST School of Computing, National University of Computer and Emerging Sciences, Karachi

BS-CS **Spring 2024**

PROGRAM(S) TO BE EVALUATED

Course Description

(Fill out the following table for each course in your computer science curriculum. A filled out form should not be more than 2-3 pages.)

<table>
<tr><td>Course Code</td><td>CS4045</td></tr>
<tr><td>Course Title</td><td>Deep Learning for Perception</td></tr>
<tr><td>Credit Hours</td><td>3</td></tr>
<tr><td>Prerequisites by Course(s) and Topics</td><td></td></tr>
<tr><td>Assessment Instruments with Weights (homework, quizzes, midterms, final, programming assignments, lab work, etc.)</td><td>100% Theory
Assessment items of Theory Part
<table>
<tr><th>Assessment Item</th><th>Number</th><th>Weight (%)</th></tr>
<tr><td>Assignments</td><td>2</td><td>5</td></tr>
<tr><td>Lab Wtg</td><td>8</td><td>10</td></tr>
<tr><td>Midterm Exams</td><td>2</td><td>30</td></tr>
<tr><td>Project</td><td>1</td><td>10</td></tr>
<tr><td>Final Exam</td><td>1</td><td>50</td></tr>
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<tr><td>Course Instructors</td><td>Sumaiyah Zahid</td></tr>
<tr><td>Lab Instructors (if any)</td><td></td></tr>
<tr><td>Course Coordinator</td><td>Dr. Jawwad Ahmed Shamsi</td></tr>
<tr><td>URL (if any)</td><td></td></tr>
<tr><td>Current Catalog Description</td><td>Deep neural networks have achieved state of the art performance on several compute vision and speech recognition benchmarks. Deep learning algorithms extract layered high and low-level features from raw data. With increasing non-line hidden layers, the discriminative power of the network improves. This course</td></tr>
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	builds on the fundamentals of Neural networks and artificial intelligence and covers advanced topics in neural networks, convolutional and recurrent network structures, deep unsupervised and reinforcement learning. It also embeds applications of these algorithms to several real-world problem in computer vision, speech recognition, natural language processing, game theory, etc.
Textbook (or **Laboratory Manual** for Laboratory Courses)	1. Deep Learning Tutorial, LISA lab, University of Montreal 2. Deep Learning by Ian Goodfellow, Yoshua Bengio, and Aaron Courville, http://www.deeplearningbook.org/ Author: Ian Goodfellow, Yoshua Bengio, and Aaron Courville
Reference Material	Research Papers
Rules and Regulations	• All assignments will be considered. • No late submissions will be allowed. • Plagiarism in one item of the assessment instrument will result in cancellation of all items of the corresponding instrument.
Course Learning Outcomes	**A. Course Learning Outcomes (CLOs)** CLO-1 Student should be able to describe what Deep Learning is and the skill sets needed for Deep Learning CLO-2 Students should be able to understand supervised and unsupervised methods of Deep Learning CLO-3 Students should be able to apply most important deep learning methods using open-source tools CLO-4 Students should be able to work as a team while integrating important components in deep learning **B. Program Learning Outcomes (PLOs)** **PLO-1. Computing Knowledge: Apply knowledge of mathematics, natural sciences, computing fundamentals, and a computing specialization to the solution of complex computing problems.** **PLO-4. Investigation & Experimentation: Conduct investigation of complex computing problems using research based knowledge and research based methods.** **PLO-5. Modern Tool Usage: Create, select, and apply appropriate techniques, resources and modern computing tools, including prediction and modeling for complex computing problems.**

PLO-9. Individual & Team Work Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.

C. Mapping of CLOs on PLOs
(CLO: Course Learning Outcome, PLOs: Program Learning Outcomes)

		PLOs											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLOs	1	✔											
	2	✔											
	3				✔	✔							
	4				✔	✔				✔			

Topics Covered in the Course, with Number of Lectures on Each Topic (assume 15-week instruction and one-hour lectures)

Topics to be covered:

List of Topics	No. of Weeks	Contact Hours	CLO(s)
Introduction, Logistic Regression	**2**	**6**	**2, 3**
Neural Networks	**1**	**3**	**2, 3**
Introduction to Deep Neural Network	**1**	**3**	**1**
Regularization, Dropout, Drop Connect	**1**	**3**	**1, 2, 3**
Mid Term 1			
CNN / CNN Architectures	**2**	**6**	**2,4**
RNN, LSTM, GRU	**2**	**6**	**2,3**
Mid Term 2 (2 hour exam)			

	<table><tr><td>Ensemble of Deep Learning</td><td>**1**</td><td>**3**</td><td>**2,4**</td></tr><tr><td>AutoEncoders</td><td>**1**</td><td>**3**</td><td>**2,3**</td></tr><tr><td>Transformers</td><td>**2**</td><td>**6**</td><td>**4**</td></tr><tr><td>Project Presentations</td><td>**1**</td><td>**3**</td><td>**4**</td></tr><tr><td>Total</td><td>**16**</td><td>**45**</td><td></td></tr></table>
Programming Assignments Done in the Course	Using TensorFlow and Pytorch in Python.

Class Time Spent (in hours)	**Theory**	**Problem Analysis**	**Solution Design**	**Social and Ethical Issues**
	28	10	5	2

Oral and Written Communications	Every student is required to submit at least __1__ written reports of typically __10_ pages and to make __1___ oral presentations of typically __15___ minute's duration. Include only material that is graded for grammar, spelling, style, and so forth, as well as for technical content, completeness, and accuracy.