COURSE DESCRIPTION FORM

INSTITUTION FAST – National University

PROGRAM (S) TO BE EVALUATED

A. 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.)

Course Code	CS5102
Course Title	Deep Learning
Credit Hours	3
Prerequisites by Course(s) and Topics	Undergraduate machine learning or artificial intelligence Undergraduate programming/Python
Assessment Instruments with Weights (homework, quizzes, midterms, final, programming assignments, lab work, etc.)	• 1 Mid-term exam: 15% each • Final exam: 40% • 3 Projects: 30%
Course Coordinator	
URL (if any)	piazza.com/nu.edu.pk/fall2018/cs5102/home
Current Catalog Description	
Textbook (or **Laboratory Manual** for Laboratory Courses)	- Deep Learning by Ian Goodfellow, Yoshua Bengio - Stanford deep learning for visual recognition http://cs231n.stanford.edu/2017/syllabus.html
Reference Material	- Neural Networks and Deep Learning by Michael Nielsen (Dec 2014). - Pattern Recognition and Machine Learning, Christopher M Bishop, Springer 2006. - Deep learning for medical imaging @ Purdue https://docs.google.com/document/d/1zEL-nu_To7Olc3cD-dg5iADvWrErAQSJD8n-1CLrGGA/edit#heading=h.ml4r2vcdki0v

Course Goals	– Understand the fundamentals of neural networks – Understand deep learning with CNNs – Apply deep learning to real problems, especially in the context of vision and language processing
Topics Covered in the Course, with Number of Lectures on Each Topic (assume 15-week instruction and one-hour lectures)	**Learning overview:** Introduction and motivation, biological neural network and its history, learning vs programming, learning components, supervised learning, classification vs regression **Basics of Neural Networks:** Perceptron, Multilayer Perceptron, Gradient Descent in MLPs, Activation functions, Back-propagation **Convolutional Neural Networks:** Motivation for CNNs, basics of convolution, distinguishing features of CNNs, What makes CNNs tick, deep learning with CNNs **Deep learning - Applications:** Applying CNNs: transfer learning, CNNs in computer vision, Recurrent NNs, Inception and GoogleNet, LSTMs and deep learning for NLP, Generative Adversarial Networks Practical issues: Overview of Python, GPU, Cloud-based GPU solutions, useful libraries
Laboratory Projects/Experiments Done in the Course	Project 1: Implementation of NN backpropagation(MATLAB) Project 2: Implementation of a CNN(cats vs dogs problem) in Keras Training, testing and visualization Hyperparameter tuning: optimizer, layers, parameters etc Project 3: Implementation/modification of DL model for: a) GAN for generating skin cancer data *or* b) LSTM model for describing the scene of a movie

Class Time Spent on (in credit hours)	**Theory**	**Problem Analysis**	**Solution Design**	**Social and Ethical Issues**
	0.9	0.9	0.9	0.3
Oral and Written Communications	Every student is required to submit at least 3 written reports of typically 5-10 pages. These reports are NOT graded for oral and verbal proficiency beyond what is expected of a technical report.			

Instructor Name M Usman Sadiq

Instructor Signature _____

Date _____