

## COURSE DESCRIPTION FORM

### NUCES

#### INSTITUTION

BS (Computer Science)

#### 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.)

<b>Course Code</b>	CS4104
<b>Course Title</b>	Applied Machine Learning
<b>Credit Hours</b>	3+0
<b>Prerequisites by Course(s) and Topics</b>	
<b>Assessment Instruments with Weights</b> (homework, quizzes, midterms, final, programming assignments, lab work, etc.)	30% Mid term 10% Continuous assessment (quiz + assignment) 10% Project 50% Final Exam
<b>Course Coordinator</b>	M. Shahzad
<b>URL (if any)</b>	NA
<b>Current Catalog Description</b>	NA
<b>Textbook (or Laboratory Manual for Laboratory Courses)</b>	<ul style="list-style-type: none"> <li>- Witten, I. H., Frank, E., and Hall, M. (2011). Data Mining: Practical Machine Learning Tools and Techniques, third edition, Elsevier: San Francisco, ISBN 978-0-12-3748560</li> <li>- Sandy Ryza, Uri Laserson, Sean Owen, Josh Wills. Advanced Analytics with Spark Patterns for Learning from Data at Scale (2017)</li> <li>- Applied Machine Learning by M. Gopal</li> <li>- Shai Shalev-Shwartz and Shai Ben-David. <i>Understanding Machine Learning: From Theory to Algorithms</i>. Cambridge University Press. 2014. Available <a href="#">free online</a>.</li> <li>- Trevor Hastie, Robert Tibshirani and Jerome Friedman. <i>The Elements of Statistical Learning: Data Mining, Inference, and Prediction, 2nd Edition</i>. Springer. 2009. Available <a href="#">free online</a>.</li> </ul>

	<ul style="list-style-type: none"> <li>- Lecture notes</li> <li>- Instructor provided reading material.</li> </ul>
<b>Reference Material</b>	Same as above (recommended textbooks)
<b>Course Goals</b>	The students should have a thorough knowledge of the working and steps of various important algorithms used in machine learning. After successfully completing this course, the student would be able to effectively applying machine learning methods to a variety of real-world problems related to medical, fintech, and cyber security.
<b>Topics Covered in the Course, with Number of Lectures on Each Topic</b> (assume 15-week instruction and one-hour lectures)	<p>Introduction to machine learning (2 hours)</p> <p>Review of ML concepts (3 hours, 1 Week)</p> <p>Exploratory data analysis (3 hours, 1 week)</p> <p>Decision Tree &amp; Naïve Bayes classification (3 hours, 1 weeks)</p> <p>Regression techniques (3 hours, 1 weeks)</p> <p>Neural Network (backpropagation) (3 hours, 1 week)</p> <p>Deep Learning (6 hours, 2 weeks)</p> <p>Ensemble learning (3 hours, 1 weeks)</p> <p>Association rule, aprior (3 hours, 1 week)</p> <p>Feature Selection, Class-imbalance (3 hours, 1 week)</p> <p>Explainable AI (3 hours, 1 week)</p> <p>Adaptive Learning (3 hours, 1 week)</p> <p>Hidden Markov Model (3 hours, 1 week)</p> <p>Time series prediction (3 hours, 1 week)</p> <p>Project Presentations (3 Hours, 1 weeks)</p>

<b>Laboratory Projects/Experiments Done in the Course</b>	<p>There will be a project on any topic related to your own area of research pertains to a course scope. The projects can be literature reviews, theoretical derivations or analyses, applications of machine learning methods to problems you are interested in.</p> <p><b>Here are Some Examples</b></p> <ul style="list-style-type: none"> <li>• <b>Apply/Develop a machine learning method to solve a specific problem</b> <ul style="list-style-type: none"> <li>○ A machine learning approach to classifying your incoming mail</li> <li>○ Predict stock prices based on past price variation</li> <li>○ Predict how people would rate movies, books, etc.</li> <li>○ Cluster gene expression data, how to modify existing methods to solve the problem better</li> </ul> </li> <li>• <b>Surveys/Reviews</b> <ul style="list-style-type: none"> <li>○ Complexity of classifiers, different concepts, comparison</li> <li>○ Algorithmic stability, which methods have stability guarantees, and where could we apply these concepts</li> <li>○ Collaborative filtering, what methods are available to solve collaborative filtering problems, in which context have they been found effective</li> <li>○ Machine learning methods for genomic data, are they effective, what is missing</li> <li>○ Calibration, which methods are calibrated, how to modify a method so as to improve calibration</li> </ul> </li> <li>• <b>Theoretical problems</b> <ul style="list-style-type: none"> <li>○ Generalization guarantees for a specific algorithm (ask us)</li> <li>○ Learnability of specific concept classes (ask us)</li> <li>○ Convergence/consistency of a specific estimation method (ask us)</li> </ul> </li> </ul>			
<b>Programming Assignments Done in the Course</b>	<p>Students were given assignment which they had to complete using software tool of their choice (MATLAB, Python)</p>			
<b>Class Time Spent on (in credit hours)</b>	<b>Theory</b>	<b>Problem Analysis</b>	<b>Solution Design</b>	<b>Social and Ethical Issues</b>
	25	7	7	None
<b>Oral and Written Communications</b>	<p>Every student is required to submit at least 1 written project reports of typically 15-20 pages and to make 1 oral presentations of typically 20 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.</p>			

**Instructor Name: M. Shahzad**

**Instructor Signature: \_\_\_\_\_**

**Date: \_\_\_\_\_**



**National Computing Education Accreditation Council**  
**NCEAC**



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