



**Bangladesh University of Business and Technology (BUBT)**  
**Faculty of Engineering & Applied Sciences (FEAS)**  
**Department of Computer Science and Engineering (CSE)**

**LAB COURSE OUTLINE**

1	Program	B.Sc. Engg. in CSE											
2	Course Code	CSE 478											
3	Course Title	Neural Network and Fuzzy Systems Lab											
4	Course Type	Core Course											
5	Academic Session	Fall 2021-22											
6	Credit Hour	1.50											
7	Intake	39											
8	Section	2											
9	Campus	Permanent Campus											
10	Course Teacher	<table><tr><td><b>Name:</b> T. M. Amir – UI – Haque Bhuiyan</td><td colspan="2"><b>Designation:</b> Assistant Professor</td></tr><tr><td colspan="3"><b>Specialization:</b> Artificial Intelligence (Machine Learning, Data Mining, Deep Learning, Computer Vision) IoT, Blockchain</td></tr><tr><td><b>Room No. 314/B-1</b></td><td><b>Email:</b> <a href="mailto:amir@bubt.edu.bd">amir@bubt.edu.bd</a></td><td><b>Cell No.</b> 01732-802625</td></tr></table>			<b>Name:</b> T. M. Amir – UI – Haque Bhuiyan	<b>Designation:</b> Assistant Professor		<b>Specialization:</b> Artificial Intelligence (Machine Learning, Data Mining, Deep Learning, Computer Vision) IoT, Blockchain			<b>Room No. 314/B-1</b>	<b>Email:</b> <a href="mailto:amir@bubt.edu.bd">amir@bubt.edu.bd</a>	<b>Cell No.</b> 01732-802625
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11	Class Schedule	<table><tr><td><b>Class Day</b></td><td><b>Class Hours</b></td><td><b>Class Room</b></td></tr><tr><td>Thursday</td><td>9:30 AM – 11.30 AM</td><td>R:518/B-2</td></tr></table>			<b>Class Day</b>	<b>Class Hours</b>	<b>Class Room</b>	Thursday	9:30 AM – 11.30 AM	R:518/B-2			
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12	Course Objectives	This lab course is based on ‘CSE 477: Neural Network and Fuzzy Systems’ theory course. In this lab course, students can learn to apply fuzzy concepts into programming language to solve different problems. They will also learn to apply neural network concepts to build neural network models and eventually develop a project focusing the neural network concepts to solve real world problems.											
13	Text Book	1.Jason brownlee. Deep learning with python. 2020 2. Jason Brownlee. Generative Adversarial Networks with Python, 2020 3. Jason Brownlee. Long Short-Term Memory Networks With Python											
14	Reference Materials	1. <a href="https://keras.io/examples/">https://keras.io/examples/</a> . 2. <a href="https://www.tensorflow.org/tutorials">https://www.tensorflow.org/tutorials</a>											
15	Course Outcomes (COs)	Upon completing this course students will be able to: <b>CO1: Demonstrate the usage of Python library and frameworks to implement different fuzzy and neural network techniques</b> <b>CO2: Implement</b> different fuzzy and neural network models for solving problems using Python library and frameworks. <b>CO3: Apply</b> neural network concepts using Python library to solve real world problems in a team											

	<b>Mapping of COs toPOs</b>	<table><tr><td>C O</td><td>PO 1</td><td>PO 2</td><td>PO 3</td><td>PO 4</td><td>PO5</td><td>PO6</td><td>PO7</td><td>PO8</td><td>PO9</td><td>PO10</td><td>PO11</td><td>PO12</td></tr><tr><td>CO1</td><td></td><td></td><td></td><td></td><td>√</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>CO2</td><td></td><td></td><td>√</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>CO3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>√</td><td></td><td></td><td></td></tr></table>												C O	PO 1	PO 2	PO 3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	CO1					√								CO2			√										CO3									√			
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16	Teaching Strategy	Maximum topics will be covered from the textbook. For the rest of the topics, reference books will be followed. Some class notes will be uploaded on the web. White board will be used for most of the time. Multimedia projector and a PC will be used for the convenience of the students to understand codes practically. Students must participate in classroom discussions for case studies, problems solving and project developments.																																																															
17	Assessm ent and Marks Distribu tion:	<table><tr><td>Class Attendance and Interaction</td><td>:</td><td>10%</td></tr><tr><td>Presentation</td><td>:</td><td>10%</td></tr><tr><td>Viva</td><td>:</td><td>10%</td></tr><tr><td>Lab Performance Evaluation</td><td>:</td><td>30%</td></tr><tr><td>Final Project</td><td>:</td><td>40%</td></tr></table>												Class Attendance and Interaction	:	10%	Presentation	:	10%	Viva	:	10%	Lab Performance Evaluation	:	30%	Final Project	:	40%																																					
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18	Weekly Schedule																																																																
	Week	Lab	Topics									CO																																																					
	Week1	Lab1	Introduction to Tensorflow with python: Students will learn tensorflow library in python and able to use tensorflow library functions to build feedforward and backpropagation neural network																																																														
	Week2	Lab2	Introduction to Keras Library: Students will learn the basics of keras library and learn to use keras in building neural network models																																																														
	Week3	Lab3	Image classification from scratch									CO1																																																					
	Week4	Lab4	Structured data classification from scratch																																																														
	Week5	Lab5	Time Series Forecasting , Anomaly Detection									CO1																																																					
	Week6	Lab6	Lab Performance Evaluation									CO2																																																					
	Week7		Mid-Term Week																																																														
	Week8	Lab7	NLP Application: Text Classification																																																														
	Week9	Lab8	Audio Data: Speaker Recognition									CO2																																																					
	Week10	Lab9	Discussion on project.																																																														

	Week11	Lab10	GAN: Develop a DCGAN for Grayscale Handwritten Digits				CO2			
	Week12	Lab11	Moving Square Video Prediction Problem with LSTM				CO2			
	Week13	Lab12	Project Evaluation, Presentation and Viva							
	Week14	Lab13	Lab Performance Evaluation				CO3			
	Week 15		Final Term Week							
19	Overall CO Assessment Criteria	Assessment methods of COs are given below:								
		Assessment Area		Course Outcomes CO			Assessment Area Mark			
			CO1	CO2	CO3					
		Attendance								
		Presentation								
		Viva								
		Lab Performance	10	20		30				
		Project Evaluation			40	40				
		Total Mark	10	20	40	70				
20	Lab Performance Assessment Details									
		Lab #	Criteria	COs	Excellent(5)	Good(4)	Satisfactory(3)	Unsatisfactory (0-2)	Marks (30)	
					Student demonstrates an accurate understanding of the lab objectives and concepts. The student can correctly answer questions and if appropriate, can explain concepts to the course teacher.	Student arrives on time to lab, but may be unprepared. Answers to questions are basic and superficial suggesting that concepts are not fully grasped.	Student tardiness or unpreparedness makes it impossible to fully anticipate. If able to participate, student has difficulty explaining key lab concepts.	Student was absent from lab or did not participate. There was no attempt to make prior arrangements to make up the lab.		
		L- 6	Tensorflow, Keras, Application of CNN	CO1 , CO2					10+5	
	L-13	Application of CNN, GAN, LSTM	CO2					15		
21	Lab Project Assessment Details									
		Criteria	Excellent(5)	Good(4)	Satisfactory(3)	Unsatisfactory(0-2)	Marks (40)			
		Project completeness	Student demonstrates project	Student can demonstrate	Student can explain some	Students were either absent or know nothing	10			

			completely	some main parts of the project	of the term of the projects but cannot describe in detail	about the project																					
		Usage of Library	Student uses python library where appropriate	Student uses python library but somewhere unknowingly	Student has very few understanding of python library	Student has no concept of python library or they do not use any	10																				
		Project Report	Student has the complete understanding of the project and the report. The report is appropriate formatted and no portion of the content is copied.	Student has a basic knowledge of content, but may lack some understanding of some concepts. The report is appropriate formatted with some irregularities although no portion of the content is copied.	Student has lack of knowledge about project and the report. The report is not formatted at all and the content of the report is inappropriate.	Student either did not submit the report or the report is copied and totally inappropriate	10																				
		Presentation and viva	Student delivers presentation appropriately and explains the questions properly.	Student seems unprepared in the presentation but can share his knowledge appropriately	Student expresses his lack of knowledge in the presentation	Student is absent or the cannot deliver presentation	10																				
22	Grading Policy	The following chart will be followed for grading. This has been customized from the guideline provided by the School of Engineering and Computer Science. <table><tr><td>A+</td><td>A</td><td>A-</td><td>B+</td><td>B</td><td>B-</td><td>C+</td><td>C</td><td>D</td><td>F</td></tr><tr><td>≥ 80</td><td>75-&lt;80</td><td>70-&lt;75</td><td>65-&lt;70</td><td>60-&lt;65</td><td>55-&lt;60</td><td>50-&lt;55</td><td>45-&lt;50</td><td>40-&lt;45</td><td>&lt;40</td></tr></table>						A+	A	A-	B+	B	B-	C+	C	D	F	≥ 80	75-<80	70-<75	65-<70	60-<65	55-<60	50-<55	45-<50	40-<45	<40
A+	A	A-	B+	B	B-	C+	C	D	F																		
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23	Additional Course Policies	Assignments	There will be at least two assignments. Average marks of the assignments will be counted. No late homework will be accepted. <b>Any kind of copy/manipulation in assignment will carry zero mark.</b> Two or more copied assignments will carry zero mark in all assignments. <b>Zero tolerance will be shown in this regard.</b> Solutions to assignment problems will be provided through web and on hand.																								
		Lab Performance	There will be at least six lab performance evaluations. These will be taken as per the weekly schedule. During evaluation, following instructions will be strictly maintained: 1. Every student is expected to be regular in Lab classes. 2. Do NOT copy lines of code from anybody else. 3. Do NOT ask to see another student’s code. 4. Do NOT pass code or program to other members of the class 5. If the instructor is at all uncomfortable about the originality of student’s work, no mark will be given. 6. There will be no make-up evaluation of lab performance (except, at the discretion of the instructor, in the case of documented medical or family emergencies).																								
		Project	<b>Introduction</b> In this course CSE - 352, you will develop a small scale project exploiting the technology and features of Python.  <b>Instructions</b>																								

			<ul style="list-style-type: none"> <li>Project must be based on advanced knowledge of AI and Python programming in order to use modern AI tools and techniques.</li> <li>You can propose your project proposal but that must be up to the standard.</li> <li>Focus on real life problems while finalizing your proposal.</li> </ul> <p><b>Problem Definition</b></p> <p>In your project report you should present the situation you have tackled while implementing your project and how you managed to solve it. Your document should start by:</p> <ul style="list-style-type: none"> <li>Illustrate the problem.</li> <li>Specify how you will solve the problem.</li> <li>You must have at least five features for your intended project.</li> <li>Mention the object-oriented principles (Encapsulation, Polymorphism, Inheritance, Abstraction) used in your project.</li> </ul> <p><b>Design and Programming</b></p> <ul style="list-style-type: none"> <li>You can use standard packages, but provide proper reference in the report.</li> <li>You may use python (or other language) to write program by exploiting AI models in your project.</li> <li>The graphical user interface is not mandatory but for representation purpose you can incorporate it.</li> <li>Your data in your project report.</li> </ul> <p><b>Team Work</b></p> <ul style="list-style-type: none"> <li>A group can be formed with maximum three members</li> <li>Every member of a group should have equal contribution to the project (N.B. They will be asked about their individual role)</li> </ul> <p><b>Project Submission</b></p> <p>Remember to properly indent your code and add comments as required before submitting your full project source code. You also have to submit your Project report, Project presentation Slide along with your project source code.</p> <p><b>Note:</b></p> <p>By following the above points, you will be meeting the basic requirements. Make sure the Project report reflects also good word-processing skills (headers/footers/page numbering, etc.) as marks will be rewarded for that as well in your report.</p>
24	<b>Additional Information</b>	a. Academic Calendar Fall 2021-22: <a href="https://www.bubt.edu.bd/Home/page_details/Academic_Calender">https://www.bubt.edu.bd/Home/page_details/Academic_Calender</a> b. Academic Policies: <a href="http://www.bubt.edu.bd/academics/academic-rules-a-regulations">http://www.bubt.edu.bd/academics/academic-rules-a-regulations</a> . c. Grading & Evaluation: <a href="http://www.bubt.edu.bd/academics/academic-rules-a-regulations">http://www.bubt.edu.bd/academics/academic-rules-a-regulations</a> . d. Proctorial Rules: <a href="http://www.bubt.edu.bd/administrator/proctors-office">http://www.bubt.edu.bd/administrator/proctors-office</a> .	
25		<p><b>Bloom's Taxonomy for Teaching-Learning</b></p> <p>Bloom's Taxonomy is a set of three hierarchical models used to classify educational learning objectives into levels of complexity and specificity. The three lists cover the learning objectives in Cognitive, Affective and Psychomotor domains. The Cognitive domain list has been the primary focus of most education and is frequently used to structure curriculum learning objectives, assessments and activities. The three domains and respective levels are illustrated below.</p>	



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**Descriptions of Affective Domain (Krathwohl, Bloom, Masia, 1973)**

**The affective domain** includes the manner in which we deal with things emotionally, such as feelings, values, appreciation, enthusiasms, motivations, and attitudes.

Level	Category	Meaning	Keywords
A1	Receiving	Awareness, willingness to hear, selected attention.	acknowledge, asks, attentive, courteous, dutiful, follows, gives, listens, understands
A2	Responding	Active participation on the part of the learners. Attend and react to a particular phenomenon. Learning outcomes may emphasize compliance in responding, willingness to respond, or satisfaction in responding (motivation).	answers, assists, aids, complies, conforms, discusses, greets, helps, labels, performs, presents, tells
A3	Valuing	The worth or value a person attaches to a particular object, phenomenon, or behavior. This ranges from simple acceptance to the more complex state of commitment. Valuing is based on the internalization of a set of specified values, while clues to these values are expressed in the learner's overt behavior and are often identifiable.	appreciates, cherish, treasure, demonstrates, initiates, invites, joins, justifies, proposes, respect, shares
A4	Organizing	Organizes values into priorities by contrasting different values, resolving conflicts between them, and creating a unique value system. The emphasis is on comparing, relating, and synthesizing values.	compares, relates, synthesizes
A5	Characterizing	Has a value system that controls their behavior. The behavior is pervasive, consistent, predictable, and most important characteristic of the learner. Instructional objectives are concerned with the student's general patterns of adjustment (personal, social, emotional).	acts, discriminates, displays, influences, modifies, performs, qualifies, questions, revises, serves, solves, verifies

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**Descriptions of Psychomotor Domain (Simpson, 1972)**

**The psychomotor domain** includes physical movement, coordination, and use of the motor-skill areas. Development of these skills requires practice and is measured in terms of speed, precision, distance, procedures, or techniques in execution.

Level	Category	Meaning	Keywords
P1	Perception	The ability to use sensory cues to guide motor activity. This ranges from sensory stimulation, through cue selection, to translation.	chooses, describes, detects, differentiates, distinguishes, identifies, isolates, relates, selects.
P2	Set	Readiness to act. It includes mental, physical, and emotional sets. These three sets are dispositions that predetermine a person's response to different situations (sometimes called mindsets).	begins, displays, explains, moves, proceeds, reacts, shows, states, volunteers.
P3	Guided Response	The early stages in learning a complex skill that includes imitation and trial and error. Adequacy of performance is achieved by practicing.	copies, traces, follows, react, reproduce, responds
P4	Mechanism	This is the intermediate stage in learning a complex skill. Learned responses have become habitual and the movements can be performed with some confidence and proficiency.	assembles, calibrates, constructs, dismantles, displays, fastens, fixes, grinds, heats, manipulates, measures, mends, mixes, organizes, sketches.



	P5	Complex overt Response	The skillful performance of motor acts that involve complex movement patterns. Proficiency is indicated by a quick, accurate, and highly coordinated performance, requiring a minimum of energy. This category includes performing without hesitation, and automatic performance.	assembles, builds, calibrates, constructs, dismantles, displays, fastens, fixes, grinds, heats, manipulates, measures, mends, mixes, organizes, sketches.
	P6	Adaptation	Skills are well developed and the individual can modify movement patterns to fit special requirements.	adapts, alters, changes, rearranges, reorganizes, revises, varies.
	P7	Origination	Creating new movement patterns to fit a particular situation or specific problem. Learning outcomes emphasize creativity based upon highly developed skills.	arranges, builds, combines, composes, constructs, creates, designs, initiate, makes, originates.
29	<b>Graduate Attributes (Program Outcomes) for B.Sc. in Engineering Program based on Washington Accord</b>			
	<p>Program Outcomes (POs) are narrower statements that describe what students are expected to know and be able to do by the Time of graduation. These relate to the knowledge skills and attitudes that students acquire while progressing through the program. The students of the B.Sc. in CSE program are expected to achieve the following graduate attributes or program outcomes at the time of graduation.</p> <p><b>PO1–Engineering knowledge (Cognitive):</b> Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.</p> <p><b>PO2–Problem analysis (Cognitive):</b> Identify, formulate, research the literature and analyze complex engineering problems and reach substantiated conclusions using first principles of mathematics, the natural sciences and the engineering sciences.</p> <p><b>PO3–Design/development of solutions (Cognitive, Affective):</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety as well as cultural, societal and environmental concerns.</p> <p><b>PO4–Investigation (Cognitive, Psychomotor):</b> Conduct investigations of complex problems, considering design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.</p> <p><b>PO5–Modern tool usage (Psychomotor, Cognitive):</b> Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.</p> <p><b>PO6–The engineer and society (Affective):</b> Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.</p> <p><b>PO7–Environment and sustainability (Affective, Cognitive):</b> Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of, and need for sustainable development.</p> <p><b>PO8–Ethics (Affective):</b> Apply ethical principles and commit to professional ethics, responsibilities and the norms of the engineering practice.</p> <p><b>PO9–Individual work and teamwork (Psychomotor, Affective):</b> Function effectively as an individual and as a member or leader of diverse teams as well as in multidisciplinary settings.</p> <p><b>PO10–Communication (Psychomotor, Affective):</b> Communicate effectively about complex engineering activities with the engineering community and with society at large. Be able to comprehend and write effective reports, design documentation, make effective presentations and give and receive clear instructions.</p> <p><b>PO11–Project management and finance (Cognitive, Psychomotor):</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work as a member or a leader of a team to manage projects in multidisciplinary environments.</p> <p><b>PO12–Life-long learning (Affective, Psychomotor):</b> Recognize the need for and have the preparation and ability to engage in independent, life-long learning in the broadest context of technological change.</p>			



30	Social & Moral Capital		
	<p>Our promises are based on the three cardinal principles:            (a) What we do believe (b) What we do practice, and (c) What we will promote</p> <p>However, students are advised to undertake the following commitments for moral development.</p>		
	<ol style="list-style-type: none"> <li>1. To be punctual and attentive in class</li> <li>2. To maintain inclusive learning environment</li> <li>3. To ensure mutual respect</li> <li>4. To be cooperative in group learning.</li> <li>5. To be innovative and Creative</li> <li>6. To follow dress code and wearing ID card</li> <li>7. To be always proactive</li> </ol>	<ol style="list-style-type: none"> <li>8. Try to follow and review day to day class</li> <li>9. To avoid conspiracy</li> <li>10. To prioritize honesty &amp; faith</li> <li>11. To be motivated for asking question and encourage feedback</li> <li>12. To develop attitude for speaking in English</li> <li>13. Do not ignore to carry out any assignments or commitments</li> <li>14. To be clean and decent in all levels.</li> </ol>	<ol style="list-style-type: none"> <li>15. To be sincere for class preparation</li> <li>16. Do not forget to switch-off the cell phone in class</li> <li>17. Do not forget to carry course pack and learning stuffs in class</li> <li>18. To maintain loyalty and trust to the university</li> <li>19. Must avoid unfair means and plagiarism in exam, reports and assignments</li> <li>20. Must maintain eco-friendly environment in the campus.</li> </ol>

**Prepared by:**

**Checked by:**

**Approved by:**

T. M. Amir – Ul – Haque Bhuiyan