DESCRIPTION OF COURSE CSE 472

PART A: GENERAL INFORMATION

1 **Course Title**: MACHINE LEARNING SESSIONAL

2 **Type of Course**: SESSIONAL

3 **Offered to**: DEPARTMENT OF CSE

4 **Pre-requisite Course(s)**: NONE

PART B: COURSE DETAILS

1. Course Content (As approved by the Academic Council)

Sessional based on CSE 471 (Machine learning)

2. Course Objectives

The students are expected to:

i. Understand the basic concepts of machine learning
ii. Apply different machine learning algorithms and models to different tasks
iii. Develop machine learning models for different applications

3. Knowledge required

Technical

- Introductory knowledge of probability, statistics, and linear algebra is recommended. Knowledge of any high-level programming language, such as Python, may be an added advantage for the learners

Analytical

- None

4. Course Outcomes (COs)

CO No.	CO Statement After undergoing this course, students should be able to:	Corresponding PO(s)*	Domains and Taxonomy level(s)**	Delivery Method(s) and Activity(-ies)	Assessment Tool(s)
CO1	**Understand** the basic concepts of machine learning.	-	C2	Lecture and Demonstration	Take-home and in-class assignments, Projects, Presentation, Viva-voce
CO2	**Apply** different machine learning algorithms and models to different tasks	PO1, PO5	C3	Lecture, Demonstration and hands-on	Take-home and in-class assignments, Projects, Presentation, Viva-voce
CO3	**Develop** machine learning models for different applications	PO3, PO4, PO6, PO7, PO8	C6	Lecture and Demonstration	Take-home and in-class assignments, Projects, Presentation, Viva-voce

***Program Outcomes (POs)**

PO(a): Engineering knowledge; PO(b): Problem analysis; PO(c): Design/development of solutions; PO(d): Investigation; PO(e): Modern tool usage; PO(f): The engineer and society; PO(g): Environment and sustainability; PO(h): Ethics; PO(i): Individual work and teamwork; PO(j): Communication; PO(k): Project management and finance; PO(l): Life-long learning.

****Domains**

C-Cognitive: C1: Knowledge; C2: Comprehension; C3: Application; C4: Analysis; C5: Synthesis; C6: Evaluation
A-Affective: A1: Receiving; A2: Responding; A3: Valuing; A4: Organizing; A5: Characterizing
P-Psychomotor: P1: Perception; P2: Set; P3: Guided Response; P4: Mechanism; P5: Complex Overt Response; P6: Adaptation; P7: Organization

5. Mapping of Knowledge Profile, Complex Engineering Problem Solving and Complex Engineering Activities

COs	K1	K2	K3	K4	K5	K6	K7	K8	P1	P2	P3	P4	P5	P6	P7	A1	A2	A3	A4	A5
CO1		√	√	√	√	√			√										√	
CO2		√	√	√	√	√			√	√	√				√	√	√		√	√
CO3		√	√	√	√	√	√		√	√	√				√	√	√	√	√	√
CO4		√	√	√	√	√		√	√	√	√	√	√				√	√		√

K-Knowledge Profile:

K1: A systematic, theory-based understanding of the natural sciences applicable to the discipline; **K2:** Conceptually based mathematics, numerical analysis, statistics and the formal aspects of computer and information science to support analysis and modeling applicable to the discipline; **K3:** A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline; **K4:** Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline; **K5:** Knowledge that supports engineering design in a practice area; **K6:** Knowledge of engineering practice (technology) in the practice areas in the engineering discipline; **K7:**Comprehension of the role of engineering in society and identified issues in engineering practice in the discipline: ethics and the engineer's professional responsibility to public safety; the impacts of engineering activity; economic, social, cultural, environmental and sustainability; **K8:** Engagement with selected knowledge in the research literature of the discipline

P-Range of Complex Engineering Problem Solving:

P1: Cannot be resolved without in-depth engineering knowledge at the level of one or more of K3, K4, K5, K6, or K8, which allows a fundamentals-based, first principles analytical approach; **P2:** Involve wide-ranging or conflicting technical, engineering, and other issues; **P3:** Have no obvious solution and require abstract thinking, originality in analysis to formulate suitable models; **P4:** Involve infrequently encountered issues; **P5:** Are outside problems encompassed by standards and codes of practice for professional engineering; **P6:** Involve diverse groups of stakeholders with widely varying needs; **P7:** Are high-level problems including many component parts or sub-problems

A-Range of Complex Engineering Activities:

A1: Involve the use of diverse resources (and for this purpose, resources include people, money, equipment, materials, information and technologies); **A2:** Require resolution of significant problems arising from interactions between wide-ranging or conflicting technical, engineering or other issues; **A3:** Involve creative use of engineering principles and research-based knowledge in novel ways; **A4:** Have significant consequences in a range of contexts, characterized by difficulty of prediction and mitigation; **A5:** Can extend beyond previous experiences by applying principles-based approaches

6. Lecture/ Activity Plan

Week	Sessional Topics	Corresponding CO(s)
Week 1	Assignment 1 Declaration [Monday]: Data Preprocessing	CO1
Week 2	Assignment 1 Submission [by Sunday before 10:00 PM] Assignment 1 Evaluation Assignment 2 Declaration: Classification with Ensemble [Feature Matrix Data]	CO1
Week 3	Assignment 1 Evaluation Assignment 2 Submission [by Friday before 10:00 PM]	CO2
Week 4	Assignment 2 Evaluation Assignment 3 Declaration: Function Approximation with Neural Network and Backpropagation [Image Data]	CO2
	Term Break	
Week 5	Assignment 2 Evaluation	CO2, CO3
Week 6	Project Group Formation and Proposal Finalization	CO3
Week 7	Project Proposal Presentation Assignment 3 Submission [by Friday before 10:00 PM] Assignment 4 Declaration: Clustering with EM Algorithm and Dimensionality Reduction with PCA [Text Data]	CO2
Week 8	Assignment 3 Evaluation	CO2
Week 9	Assignment 3 Evaluation Assignment 4 Submission [by Friday before 10:00 PM]	CO2
Week 10	Assignment 4 Evaluation	CO2, CO3
Week 11	Assignment 4 Evaluation	CO2
Week 12	Project Checkpoint (with respective supervisors) Project Submission [by Friday before 10:00 PM]	CO3
Week 13	Final Project Presentation	CO3

7. Assessment Strategy

- Class Attendance: Class attendance will be recorded in every class.
- Assignments and Projects: There will be four assignments and one project.

8. Distribution of Marks (Tentative)

Attendance: 10 %
Assignments: 60%
Projects: 30%
Total: 100%

9. Textbook/ Reference

a. Artificial Intelligence: A Modern Approach (4th Edition) by Stuart Russel and Peter Norvig
b. Dive into Deep Learning (https://d2l.ai/)