EE4146: DATA ENGINEERING AND MACHINE LEARNING

Effective Term
Semester A 2024/25

Part I Course Overview

Course Title
Data Engineering and Machine Learning

Subject Code
EE - Electrical Engineering
Course Number
4146

Academic Unit
Electrical Engineering (EE)

College/School
College of Engineering (EG)

Course Duration
One Semester

Credit Units
3

Level
B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
(MA3001 Differential Equations
or
EE3121 Differential Equations for Electrical Engineering)
or
EE3001 Foundations of Data Engineering
or
(MA3160 Probability and Stochastic Processes
or
EE3331 Probability Models in Information Engineering)

Precursors
EE3211 Modelling Techniques

Equivalent Courses

Nil

Exclusive Courses

Nil

Part II Course Details

Abstract

This course aim is to introduce the concept, techniques and fundamental background to informatics and learning systems.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Describe the current learning systems and methodologies used in engineering, IT and data industries		x	x	
2	Describe the use of supervised and unsupervised learning methods for engineering, IT and data engineering problems		x	x	
3	Analyze practical data engineering and machine learning problems using supervised or unsupervised learning methods		x	x	

A1: Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments
Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Learning and Teaching Activities (LTAs)

	LTAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lectures	Attend lectures where key concepts are described and illustrated. Complete computation and computer exercises to apply major concepts from lectures. Practical data engineering problems.	1, 2, 3	3 hrs/wk

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Tests (min.: 2)	1, 2, 3	35	
2	#Assignments (min.: 3)	1, 2, 3	15	

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

2

Additional Information for ATs

Remarks:
To pass the course, students are required to achieve at least 30% in course work and 30% in the examination.

may include homework, tutorial exercise, project/mini-project, presentation

Assessment Rubrics (AR)

Assessment Task

Examination

Criterion

Achievements in CILOs

Excellent (A+, A, A-)

High

Good (B+, B, B-)

Significant

Fair (C+, C, C-)

Moderate

Marginal (D)

Basic

Failure (F)

Not even reaching marginal levels

Assessment Task

Coursework

Criterion

Achievements in CILOs

Excellent (A+, A, A-)

High

Good (B+, B, B-)

Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Part III Other Information

Keyword Syllabus

Introduction to Data Engineering
Understand data engineering methodologies, learning systems and its analysis; formulate an IT/business/engineering problem from the perspective of learning systems; understand fundamental concepts in data engineering and classification; recognize issues in practical data engineering and IT problems.

Emerging Machine Learning Technology
Introduction to Machine Learning Technology: Statistical methods such as Discriminant Analysis, and Principal Component Analysis; Supervised learning such as Naïve Bayes classifier, K Nearest Neighbour, and neural networks; Unsupervised learning approaches such as Self-Organizing Map, and Clustering; High Dimensionality Reduction such as linear discriminant analysis (LDA), manifold learning, and feature selection methods; Diagnostic Analysis, and Practical Case Study.

Reading List

Compulsory Readings

	Title
1	Nil

Additional Readings

	Title
1	Richard O. Duda, Peter E. Hart, David G. Stork, Pattern Classification, Wiley
2	Trevor Hastie, Robert Tibshirani, Jerome Friedman, The elements of statistical learning data mining, interface and prediction, Springer
3	T. Kohonen, Self-Organizing Maps, Springer, Third edition
4	Tommy W. S. Chow and S. Y. Cho, Neural Networks and Computing: Learning algorithms and applications, (Imperial College Press, 2008)
5	Artificial Intelligence: Modern Approach (2nd Edition) Prentice Hall, Stuart J. Russell and Peter Norvig