SYE4005: INDUSTRIAL DATA AND MANUFACTURING ANALYTICS

Effective Term
Semester A 2024/25

Part I Course Overview

Course Title
Industrial Data and Manufacturing Analytics

Subject Code
SYE - Systems Engineering
Course Number
4005

Academic Unit
Systems Engineering (SYE)

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
Nil

Precursors
Nil

Equivalent Courses
ADSE4005 Industrial Data and Manufacturing Analytics

Exclusive Courses
Nil

Part II Course Details

Abstract

In this course, students will develop essential skills in data analytics, empowering them to harness the vast amounts of data generated by manufacturing and industrial operations. Through a combination of lectures, assignments, and hands-on projects, students will gain mastery over data mining, processing, analysis, visualization, and interpretation techniques, while learning to effectively utilize cutting-edge tools and technologies. By actively engaging with Python programming and realworld industrial applications, students will acquire practical experience in big data integration and processing. Throughout the course, students will develop a deep understanding of how to leverage data-driven insights to enhance products and services in industrial settings, equipping them with the knowledge and skills necessary to tackle complex data analytics challenges and drive innovation in their future careers.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Understand basic concept of exploratory data analysis and its relationship to statistical learning, data mining, and potential applications	30	x		
2	Recognize and apply statistical methods for exploratory analysis in high-dimensional data	20	x	x	
3	Familiarize the principle of perception and be able to select suitable visualization techniques and methods for diverse types of datasets	20	x	x	
4	Demonstrate how exploratory data analytics and visualization can be applied to manufacturing and industrial problems	30	x	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	Formal lectures	1, 2, 3, 4	39 hours/semester
2	Final project	Group-based term project for students to apply the methods and techniques on a real-world problem.	1, 2, 3, 4	9 hours/semester
3	Laboratory work	Visualization tools and software package usage training	2, 3, 4	9 hours/semester

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Project	1, 2, 3, 4	15	
2	Course assignments	2, 3, 4	15	
3	Test	1, 2, 3	10	

Continuous Assessment (%)

40

Examination (%)

60

Examination Duration (Hours)

2

Additional Information for ATs

For a student to pass the course, at least 30% of the maximum mark for the examination should be obtained.

Assessment Rubrics (AR)

Assessment Task

Test

Criterion

Based on submitted written work to evaluate understanding of subject matter, evidence of knowledge base, capacity to analyse and synthesize, and evidence of original and critical thinking.

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

Course Assignment

Criterion

Based on submitted written work and lab attendance to evaluate understanding of subject matter, evidence of knowledge base, capacity to analyse and synthesize, and evidence of original and critical thinking.

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
Final Project

Criterion
Based on oral presentation and submitted written report to evaluate understanding of subject matter, evidence of knowledge base, capacity to analyse and synthesize, and evidence of original and critical thinking.

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

- Big data infrastructure; distributed file system; parallel processing; programming framework; cloud storage and computing; knowledge discovery; deep learning
- Software competency in data visualization software, Tableau, and the programming language Python
- Visualization of high-dimensional data, clustering and dimension reduction techniques
- Applications and case studies of data analysis, systems modelling, and optimization.

Reading List

Compulsory Readings

	Title
1	Nil

Additional Readings

	Title
1	Nil