SYE4001: DIGITAL MANUFACTURING AND OPERATIONS

Effective Term
Semester A 2024/25

Part I Course Overview

Course Title
Digital Manufacturing and Operations

Subject Code
SYE - Systems Engineering
Course Number
4001

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
ADSE4001 Digital Manufacturing and Operations

Exclusive Courses
Nil

Part II Course Details

Abstract

The ongoing digital innovation have brought profound opportunities to manufacturing services, supply chains, and business operations. By harnessing the power of data and the newly added digital connectivity to physical assets, factories and business operators have been able to save costs, improve productivity, and foster new sources of revenue.
This course provides basics of digitalization of manufacturing activities and operations. The students will learn about manufacturing systems, data-driven systems, big data, Industry 4.0 technologies, and the concept of industrial internet of things. Students will also learn through hands-on experience with digital manufacturing case studies and laboratory projects.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Apply skills in data mining and analytics related to digital manufacturing and operations	30		x	x
2	Discuss the applied research of case studies and projects	30	x	x	
3	Explain the successful implementation of smart digital technologies in manufacturing and operations.	40	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	Lecture	Students will engage in formal lectures to gain key knowledge points, methods, and techniques	1, 3	39 hours/semester
2	Laboratory	Students will engage in four laboratory sessions, in which the students will complete the required laboratory works. The students will gain hands-on experience to the students in the sessions.	1, 2, 3	12 hours/semester

3	Final Project	Students will participate in completing a final project in groups to implement the knowledge and techniques learned in lectures to real-world cases and explore related topics in-depth.	1, 2, 3	15 hours/semester

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	In-class Assignments	1, 3	10	
2	Laboratory & reports	1, 2, 3	20	
3	Final Project	1, 2, 3	20	

Continuous Assessment (%)

50

Examination (%)

50

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

Class Discussion

Criterion

Mastering of concept, theories in smart manufacturing and digital connectivity.

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

Laboratory work

Criterion
Levels of data analytical skill and understanding in its application in manufacturing and industrial operations

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
Levels of skillsets and experience in applied research related to example industries.

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
Examination

Criterion
Levels of understanding of concepts and practices learned in the class, reading materials and their ability to apply subject-related knowledge.

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

- Digital manufacturing systems
- Industrial 4.0 and industrial internet of things
- Data-driven systems
- Supervisory control and data acquisition
- Deep learning techniques in industrial applications
- Digital manufacturing case studies

Reading List

Compulsory Readings

	Title
1	Industry 4.0: The Industrial Internet of Things, Alasdair Gilchrist, 2016, Apress.
2	Handbook of Industry 4.0 and SMART Systems, Diego Galar Pascual, Pasquale Daponte, Uday Kumar, 2020, CRC Press

Additional Readings

	Title
1	Nil