

# ADSE4001: DIGITAL MANUFACTURING AND OPERATIONS

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## Effective Term

Semester A 2023/24

## Part I Course Overview

### Course Title

Digital Manufacturing and Operations

### Subject Code

ADSE - Advanced Design and System 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

Nil

### 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 acquire knowledge in manufacturing systems, cyber-physical systems, big data, industry 4.0 technologies and industrial internet of things. The students will also work on digital manufacturing case studies and laboratory projects.

### Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Acquire skills in data mining and analytics related to digital manufacturing and operations	30		x	x
2	Gain experiences in applied research of case studies and projects	30	x	x	
3	Deepen understanding in successful implement of smart digital technologies in manufacturing and business 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 self-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.

### Teaching and Learning Activities (TLAs)

TLAs	Brief Description	CILO No.	Hours/week (if applicable)	
1	Lecture	Formal lectures to introduce key knowledge points, methods, and techniques	1, 3	39 hours/semester
2	Laboratory	There will be four laboratory sessions, in which the students will complete the required laboratory works. The sessions will provide hands-on experience to the students.	1, 2, 3	12 hours/semester

3	Final Project	Students will be asked to complete 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
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**Assessment Tasks / Activities (ATs)**

	ATs	CILO No.	Weighting (%)	Remarks
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

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**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

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**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

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## Part III Other Information

### Keyword Syllabus

- Digital manufacturing systems
- Industry 4.0
- Cyber-physical Systems
- Industrial internet of things
- Supervisory control and data acquisition
- Remote terminal unit
- Human machine interface
- 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