SDSC4109: SMART MANUFACTURING AND AUTOMATION

Effective Term
Semester B 2022/23

Part I Course Overview

Course Title
Smart Manufacturing and Automation

Subject Code
SDSC - School of Data Science
Course Number
4109

Academic Unit
School of Data Science (DS)

College/School
School of Data Science (DS)

Course Duration
One Semester

Credit Units
3

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

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
Students must complete a minimum of 45 CUs to be eligible

Precursors
Nil

Equivalent Courses
Nil

Exclusive Courses
Nil

Part II Course Details

Abstract

This course aims to offer students the statistics and optimization methodologies in smart manufacturing and automation. The students will learn how the artificial intelligence (AI), machine learning (ML) and optimization techniques can be utilized to solve the real manufacturing problems.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Understand the basic principles of smart manufacturing and automation strategies.	20	x		
2	Understand basic machine learning and optimization techniques for smart manufacturing.	20	x		
3	Apply appropriate models and solution methods to improve the production efficiency.	30	x	x	
4	Apply commercial software for real-world projects.	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.

Teaching and Learning Activities (TLAs)

	TLAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lectures and in-class discussions	Lectures, in-class exercises, in-class Q&A and discussions will be used to implement the CILOs.	1, 2, 3, 4	26 hours/semester
2	Tutorials	Each group of students working on their group project will discuss and consult with the instructor regarding the progress and the obstacles encountered.	2, 3, 4	13 hours/semester

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Assignments	1, 2, 3, 4	15	
2	Project	3, 4	35	

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

2

Assessment Rubrics (AR)

Assessment Task

Course work

Criterion

Tutorial exercises and assignments;Term project

Excellent (A+, A, A-)

Strong evidence of capacity to analyse and synthesize; superior grasp of subject matter.

Good (B+, B, B-)

Evidence of grasp of subject, some evidence of critical capacity and analytic ability.

Fair (C+, C, C-)

Student who is profiting from the university experience; understanding of the subject; ability to develop solutions to simple problems in the material.

Marginal (D)

Sufficient familiarity with the subject matter to enable the student to progress without repeating the course.

Failure (F)

Little evidence of familiarity with the subject matter; weakness in critical and analytic skills.

Assessment Task

Examination

Criterion

Based on submitted written work

Excellent (A+, A, A-)

Strong evidence of capacity to analyse and synthesize; superior grasp of subject matter.

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Part III Other Information

Keyword Syllabus

Manufacturing and service systems, factory physics, capacity management, neural networks, principal component analysis, association rules, tabu search, simulated annealing

Reading List

Compulsory Readings

	Title
1	Lecture notes and slides provided by the instructor

Additional Readings

	Title
1	Nahmias, S. (2008), Production and Operations Analysis, 6th ed., McGraw-Hill/Irwin.
2	Saravanan, R. (2006), Manufacturing Optimization through Intelligent Techniques, CRC Press