

SYE6106: INTELLIGENT MANUFACTURING FOR ENGINEERING MANAGERS

Effective Term

Semester A 2025/26

Part I Course Overview

Course Title

Intelligent Manufacturing for Engineering Managers

Subject Code

SYE - Systems Engineering

Course Number

6106

Academic Unit

Systems Engineering (SYE)

College/School

College of Engineering (EG)

Course Duration

One Semester

Credit Units

3

Level

P5, P6 - Postgraduate Degree

Medium of Instruction

English

Medium of Assessment

English

Prerequisites

Nil

Precursors

Nil

Equivalent Courses

SEEM6106 Intelligent Manufacturing for Engineering Managers (offered until 2021/22) / ADSE6106 Intelligent Manufacturing for Engineering Managers (offered until 2023/24)

Exclusive Courses

Nil

Part II Course Details

Abstract

The objective of this course is to provide engineering managers an overview of technologies associated with smart intelligent manufacturing, such that they can make better decisions when exploring smart manufacturing in their own organizations.

The fourth Industrial revolution has brought enormous changes to the manufacturing industry. This course provides an overview of technologies used in smart manufacturing. We focus on key enabling technologies, such as artificial intelligence, data-driven analysis, internet of things, advanced analytics, intelligent quality control, additive manufacturing, process automation, and cybersecurity. Some time will also be spent to understand the historical context and the business case associated with smart manufacturing implementation.

Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Elaborate on Industry 4.0 and how artificial intelligence, internet of things (IoT), information, technology and data are influencing the development of intelligent manufacturing. Understand the historical perspective, from Industry 1.0 to 4.0.	10	x		
2	Understand various technologies that enable intelligent manufacturing. This course focusses on the following technologies: - Artificial intelligence - Machine learning and data-driven analysis - Industrial Internet of things (IIoT) - Advanced analytics - Process automation and Lean - Additive manufacturing - Intelligent quality control	50	x	x	
3	Discuss and assess the technologies and their advantages and drawbacks. And the business case, opportunities and threats associated with advanced manufacturing.	20	x		
4	Apply and analyse, using a selected manufacturing technology, a case study of intelligent manufacturing	20		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	Large class activity	Weekly lectures. Lectures will be supplemented by: - Discussions - Cases - Small group exercises - Guest lectures (to be determined) to facilitate conceptual understanding and introduction to applications.	1, 2, 3, 4	3 hr / week

Assessment Tasks / Activities (ATs)

ATs		CILO No.	Weighting (%)	Remarks ("- " for nil entry)	Allow Use of GenAI?
1	Mid-term test	1, 3, 4	50	-	No

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

2

Minimum Continuous Assessment Passing Requirement (%)

30

Minimum Examination Passing Requirement (%)

30

Assessment Rubrics (AR)**Assessment Task**

Mid-term test (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Examination questions are designed to assess student' s level of achievement of the intended learning outcomes, with emphasis placed on conceptual understanding, math derivation and correct application.

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 exam (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Examination questions are designed to assess student's level of achievement of the intended learning outcomes, with emphasis placed on conceptual understanding and correct application.

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

Mid-term test (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Examination questions are designed to assess student's level of achievement of the intended learning outcomes, with emphasis placed on conceptual understanding, math derivation and correct application.

Excellent

(A+, A, A-) Excellent

Good

(B+, B) Good

Marginal

(B-, C+, C) Marginal

Failure

(F) Failure

Assessment Task

Final exam (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Examination questions are designed to assess student's level of achievement of the intended learning outcomes, with emphasis placed on conceptual understanding and correct application.

Excellent

(A+, A, A-) Excellent

Good

(B+, B) Good

Marginal

(B-, C+, C) Marginal

Failure

(F) Failure

Additional Information for AR

The test and examination will be numerically-marked and grades-awarded accordingly.

Part III Other Information**Keyword Syllabus**

- Additive manufacturing
- Advanced analytics
- Artificial intelligence and machine learning
- Data driven process analysis and thinking
- Industry 4.0
- Industrial internet of things (IIoT)
- Intelligent quality control
- Intelligent/smart manufacturing
- Process automation and Lean
- Smart enterprise
- Cybersecurity

Reading List**Compulsory Readings**

Title	
1	Lecture notes and slides
2	To be announced on canvas
3	Conway, J. (2016). The Industrial Internet of Things: an evolution to a smart manufacturing enterprise. Schneider Electric.
4	Achillas, C., Tzetzis, D., & Raimondo, M. O. (2017). Alternative production strategies based on the comparison of additive and traditional manufacturing technologies. International Journal of Production Research, 55(12), 3497-3509.
5	Gardan, J. (2016). Additive manufacturing technologies: state of the art and trends. International Journal of Production Research, 54(10), 3118-3132.
6	Sanders, A., Elangeswaran, C., & Wulfsberg, J. P. (2016). Industry 4.0 implies lean manufacturing: Research activities in industry 4.0 function as enablers for lean manufacturing. Journal of Industrial Engineering and Management (JIEM), 9(3), 811-833.

Additional Readings

Title	
1	To be announced on canvas