

SYE6303: MULTISCALE DECISION MAKING FOR INDUSTRIAL ENTERPRISE

Effective Term

Semester A 2025/26

Part I Course Overview

Course Title

Multiscale Decision Making for Industrial Enterprise

Subject Code

SYE - Systems Engineering

Course Number

6303

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

Nil

Exclusive Courses

Nil

Part II Course Details

Abstract

This course is designed to provide students with a deep understanding of optimization techniques and their applications in industrial processes, with a special emphasis on the semiconductor industry. Students will explore various optimization methods across different scales, from individual processes to enterprise-wide systems, including process design, production planning, scheduling, optimal process control, and supply chain management. The course will also cover how to address uncertainties in production and supply chains, as well as strategies for flexible operations in response to volatile energy markets. Through a series of semiconductor industry case studies, students will gain practical insights into applying these techniques in real-world scenarios. This course is suitable for both management and semiconductor students, equipping them with the skills needed for effective decision-making in dynamic industrial environments.

Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Apply basic and advanced optimization techniques in industrial and enterprise-wide contexts.	20		x	
2	Analyze and optimize production planning, scheduling, logistics, and site design with a focus on the semiconductor industry	20		x	
3	Integrate process networks with supply chains in enterprise-wide optimization, particularly in semiconductor manufacturing.	20		x	
4	Manage and optimize production and supply chains under uncertainty	20		x	
5	Develop strategies for flexible operation of industrial processes in volatile energy markets	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	Lecture	Lectures on the topics of the keyword syllabus	1, 2, 3, 4 3hrs/week

2	Tutorial	Group projects are given to students for the investigation in relation to the CILOs. Students will discuss the projects during the tutorial period. The group assessment is based on the group presentation and the group report.	1, 2, 3, 4	1hrs/week
3	Self-Study	Students are required to carry out self-study on webs and search appropriate technical and managerial information/ data in conjunction with the lecturing materials to accomplish a set of given requirements. The work of the self-study will be presented as an individual report for assessment.	1, 2, 3, 4	3hrs/week

Assessment Tasks / Activities (ATs)

ATs		CILO No.	Weighting (%)	Remarks ("- for nil entry)	Allow Use of GenAI?
1	Continuous Assessment: Group Project	1, 2, 3, 4	40	-	Yes
2	Continuous Assessment: Home works	1, 2, 3, 4	30	-	Yes

Continuous Assessment (%)

70

Examination (%)

30

Examination Duration (Hours)

2

Minimum Continuous Assessment Passing Requirement (%)

30

Minimum Examination Passing Requirement (%)

30

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**

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

Criterion

Understanding of Concepts : Evaluate students' grasp of key optimization techniques, theoretical principles, and their applications in industrial processes, especially in the semiconductor industry.

Problem-Solving Skills: Assess students' ability to apply learned concepts to solve complex problems, including calculations, derivations, and analytical thinking.

Clarity and Organization: Consider the clarity of explanations, logical flow of ideas, and organization of answers.

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

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

Criterion

Evaluate how effectively the group applies course concepts to a real-world problem, particularly within the semiconductor industry or related fields.

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

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

Criterion

Evaluate how well students apply theoretical concepts learned in class to solve homework problems

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

Criterion

Understanding of Concepts : Evaluate students' grasp of key optimization techniques, theoretical principles, and their applications in industrial processes, especially in the semiconductor industry.

Problem-Solving Skills: Assess students' ability to apply learned concepts to solve complex problems, including calculations, derivations, and analytical thinking.

Clarity and Organization: Consider the clarity of explanations, logical flow of ideas, and organization of answers.

Excellent

(A+, A, A-) High

Good

(B+, B) Significant

Marginal

(B-, C+, C) Moderate/Basic

Failure

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Assessment Task

Group presentation & report (for students admitted from Semester A 2022/23 to Summer Term 2024)

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Part III Other Information

Keyword Syllabus

Week 1: Introduction to Optimization Techniques

Week 2-3: Production Planning and Scheduling in Semiconductor Manufacturing

Week 4: Process Design and Synthesis in Semiconductor Manufacturing

Week 5-6: Enterprise-Wide Optimization in the Semiconductor Industry

Week 7: Supply Chain Optimization under Uncertainty

Week 8-9: Flexible Operations in Volatile Energy Markets

Week 10: Advanced Optimization Methods

Week 12: Integration and Advanced Case Studies

Week 13: Future Trends in Optimization and Decision Making

Reading List

Compulsory Readings

Title	
1	Nil

Additional Readings

Title	
1	Nil