

SYE3060: OPERATIONS RESEARCH

Effective Term

Semester A 2024/25

Part I Course Overview

Course Title

Operations Research

Subject Code

SYE - Systems Engineering

Course Number

3060

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

MA1201 Calculus and Basic Linear Algebra II or MA1301 Enhanced Calculus and Linear Algebra II

Equivalent Courses

SEEM3060 Operations Research or ADSE3060 Operations Research

Exclusive Courses

Nil

Part II Course Details

Abstract

Engineers and managers have to make decisions in intelligent manufacturing, production and operations planning and scheduling. In this course, students will learn essential modelling skills and solution techniques for formulating various

practical decision-making problems in intelligent manufacturing, production and operations planning and scheduling as optimization models and solving these models.

Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Define decision variables and formulate objective functions and constraints for problems such as intelligent manufacturing, production and operations planning and scheduling.	30			
2	Apply the principles of dynamic programming to solve problems such as intelligent manufacturing, production and operations planning and scheduling.	25			
3	Represent a decision-making problem in forms of directed or undirected graphs.	15			
4	Solve mathematical models for problems such as intelligent manufacturing, production and operations planning and scheduling using appropriate solution techniques, such as the simplex method, the branch-and-bound method, Hungarian method, Dijkstra's algorithm, the Ford-Fulkerson method, CPM, etc.	30			

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	Lectures	Students will engage in lectures and discussions to gain knowledge about the key concepts described in CILOs 1-4.	1, 2, 3, 4	39 hours/semester

Assessment Tasks / Activities (ATs)

ATs		CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Assignments, and Test and/or Project	1, 2, 3, 4	40	

Continuous Assessment (%)

40

Examination (%)

60

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

Homework sets, and test and/or project

Criterion

Submitted written work.

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

2-hr final examination (either open or closed book based on instructor's discretion)

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.

Part III Other Information

Keyword Syllabus

- Linear programming formulation, models and solution techniques;
- Integer programming formulation, models and solution techniques;
- Dynamic programming formulation, models and solution techniques;
- Distance network models and network optimization formulation and models;
- Decision making under uncertainty.

Reading List**Compulsory Readings**

Title	
1	Lecture notes and slides provided by the instructor.

Additional Readings

Title	
1	Operations Research, 3rd Edition, Winston
2	Introduction to Operations Research, 8th Edition, Hillier & Lieberman
3	Management Science, Mathur & Solow
4	Online learning material is provided via University computer network