

Semester:	7			
Course Code:	MI4030			
Course Name:	Industrial Engineering and Decision Sciences			
Credit Value:	3 (Notional hours:150)			
Pre-requisites:	None			
Core/ Optional:	Core			
Hourly Breakdown	Lecture hrs	Tutorial hrs	Practical class hrs	Independent Learning & Assessment hrs
	38	7	-	105

Course Aim: To introduce students the concepts, theory, and computational methods in operations research, industrial engineering and decision sciences as well as their application to real-life problems so that students can use these tools to identify, formulate, model and solve engineering problems in the domains of manufacturing, logistics and service, and other related industries.

Intended Learning Outcomes:

- **Identify, formulate and solve** engineering optimization problems using linear and integer programming tools
- **Identify, formulate and solve** engineering and project management problems using network models
- **Apply** data envelopment analysis and analytic hierarchy methods for decision-making
- **Apply** common non-conventional, evolutionary and heuristic algorithms to solve basic non-linear optimization problems

Course Content:

Introduction to Linear Programming

Introduction to model-building
 Formulating Linear Programming (LP) problems
 Graphical solution method
 Simplex method
 Sensitivity analysis
 Excel solver for LP models
 Applications in the manufacturing, logistics and service industries

Transportation, Transshipment and Assignment Problems

Formulation of transportation, transshipment and assignment problems
 Algorithms

Excel solver solutions

Applications in the manufacturing, logistics and service industries

Network Models

Shortest-path problems

Maximum flow, Minimum-cost network flow problems

Applications of network models in manufacturing, logistics and service industries

Network models in Project Management (Critical Path Method - CPM, Project Evaluation and Review Technique - PERT)

Integer Programming

Formulating integer programming problems

Branch and Bound method of solving pure-integer and mixed-integer programming problems

Applications of integer programming in manufacturing, logistics and service industries

Introduction to Multi Criteria Decision Making

Goal Programming

Introduction to Analytic Hierarchy Process (AHP)

Data Envelopment Analysis (DEA)

Introduction to Nonlinear Programming and Computational Intelligence Techniques

Introduction to non-linear programming

Evolutionary and Heuristic algorithms

Teaching/ Learning Methods:

Classroom lectures, tutorial discussions, in-class assignments, formative assessments, small group discussion classes

Assessment Strategy:

Continuous Assessment

40%

Final Assessment

60%

Details:

Tutorials/assignments/Quizzes - 30%

Mid Semester Examination- 0%

Other

Laboratory work - 10%

Theory (%)

60

Practical (%)

.....

Other (%) (specify)

.....

Recommended Reading:

- Winston, W.L., (2004). Operations Research: Applications and Algorithms, (4 ed.), Thomson Learning, CA.
- Taha, H.A., (2017). Operations Research: An Introduction, (10 ed.), Pearson Education Ltd.
- Hillier, F.S., & Lieberman, G.J., (2010). Introduction to Operations Research, (9 ed.), McGraw Hill, NY.

