School of Interdisciplinary Engineering and Sciences (SINES)
National University of Sciences & Technology (NUST)

Title : Modelling Simulation & Optimization

Pre-requisite: Nil

Objectives: This course provides an overview of Modeling, simulations and their techniques. The course addresses the modeling and simulation in the systems engineering process and provides methods for architecting and managing the development of complex models/simulations.

Outcomes: After taking the course, the student will have more exposure to modeling and simulation at the systems level.

Course Code: SYSE-804

Credit Hours: 3-0

Course Contents with proposed contact Hours (Weekly plan):

1. Introduction to Modelling, Simulation & Optimization (3 hours)
2. Decisions, Alternatives, Modeling & Simulation (2 hours)
3. M&S in System Life Cycle (3 hours)
4. Decision Evaluation (2 hours)
5. Multi-Criteria Decision Evaluation (3 hours)
    (i) Ranking Methods
    (ii) Elimination Methods
    (iii) Weighting Methods
    (iv) Effectiveness Value Methods (Subjective methods, Measurement based methods & Utility Function Methods)
6. Alternative Evaluation with Probable state of nature (2 hours)
7. Economic Modelling and Decision Making (6 hours)
8. Multiple Criteria Multiple Alternatives Decision Evaluation (Decision Evaluation Display) (3 hours)
9. Classical Optimization Theory (3 hours)
10. Unconstrained & Constrained Optimization (3 hours)
11. Inventory System Mathematical Representation (Inventory Stock, Shortage Stock, Cost Function) (3 hours)
12. Multivariate Optimization for Inventory Models (3 hours)
13. Queuing Network Models (6 hours)

Details of lab work/workshop practice, if applicable:

Handson Labs using MATLAB

Recommended reading, including textbooks, reference books with dates

1. Benjamin S. Blanchard, System Engineering Management. 5th ed. Wiley 2004
2. Howard Eisner, Essentials of Project and Systems Engineering Management, 2nd ed. Wiley. 2011
3. Alexander Kossiakoff, Steven M. Biemer, Samuel J. Seymour, David A. Flanigan, Systems Engineering Principles and Practice, Wiley 2020
4. Guide to the Systems Engineering Body of Knowledge (SEBoK), Version 2.7 Oct. 2022 Editor: Robert J. Cloutier

Nature of Assessments

Assessment will be carried out as per NUST statutes