Revised Concentration Elective Course

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

Title : Quantitative Operations Research

Pre-requisite: Nil

Objectives: The primary objective of the quantitative operations research course is to equip students with the knowledge and skills to effectively analyze and optimize complex systems using mathematical modeling and computational methods and as a result improve decision-making, resource allocation, and system performance.

Outcomes: Upon successful completion of this course, students will be able to understand and analyse quantitative decision making processes and will be able to formulate and solve mathematical programming models for different optimization problems

Course Code: SYSE-866
Credit Hours:3-0
Course Contents with proposed contact Hours (Weekly plan):

1. **Week 1:**Linear Programming
2. **Week 2,3:**Graphical and Simplex Method, Revised Simplex Method, Dual Simplex, Duality andSensitivity, Interior Point Method, Upper Bounding Technique, Transportation and Assignment
3. **Week 4:**Integer Programming with applications
4. **Week 5,6:**Branch and Bound Method, Cutting Plane Method
5. **Week 7:**Computational Complexity: Combinatorial Optimization-I
6. **Week 8:** Midterm Exam
7. **Week 9,10:**Combinatorial Optimization-II: Goal Programming
8. **Week 11, 12:**Multi-objective Optimization
9. **Week 13:**Dynamic Programming
10. **Week 14:**Nonlinear Optimization
11. **Week 15:**Heuristics
12. **Week 16,17:** Review and Case Study
13. **Week 18:** Final Exam

Details of lab work/workshop practice, if applicable:

Different optimization methods will be implemented in the lab using MATLAB optimization toolbox, Python, R, or specialized optimization software

Recommended reading, including textbooks, reference books with dates

1. Hillier F. & Lieberman G., Introduction to Operations Research, 8th edition, McGraw Hill
2. Winston, W.L., 2022. *Operations research: applications and algorithms*. Cengage Learning.
3. Taha, H.A. , 2003. Operations research: an introduction (Vol. 7). Upper Saddle River, NJ: Prentice hall.
4. Rardin, R.L. 1998. *Optimization in operations research* (Vol. 166). Upper Saddle River, NJ: Prentice Hall.

Nature of Assessments

Assessment will be carried out as per NUST statutes