Syllabus Outline

1. GENERAL
1.1 COURSE TITLE: **Operations Research**
1.2 COURSE NUMBER: **MT5803**
1.3 CONTACT HRS: (30 Hours- Teaching 10 hours- Project) Credits: 08
1.4 SEMESTER -OFFERED:
1.5 PREREQUISITE:
1.6 SYLLABUS COMMITTEE MEMBER:

2. OBJECTIVE
- Exposes students to some of the most fundamental concepts and algorithms in the field of Linear and Discrete Optimization, and Simulation
- To develop skill in effective LP model formulation and application and sensitivity analysis
- To discuss and model various business problems where optimization is required
- Hands-on practice of solver based implementation of problems and interpretation of results

3. COURSE CONTENT (Unit wise distribution of content and number of lectures)

Unit-I: Linear Programming
Formulation Graphical Methods Solvers (4 hours)
Unit-II: SIMPLEX
Convexity
The Simplex Method
Big-M method
2-phase method,
Shadow Price; Duality, Reduced Cost (5 hours)
Unit-III: Sensitivity Analysis (2 hours)

Unit-IV: Network Models
Transportation and Assignment Problems Shortest Path Prob. Min Spanning Tree
Max flow; Min cost (6 hours)
Unit-V: Goal Programming (3 hours)
Unit-VI: Mixed Integer Programming
MILP, BIP Branch & Bound Cutting Planes (6 hours)
Unit-VII: Decision making under risk
Decision Trees Simulation, Monte Carlo, Data table (4 hours)

4. READINGS
4.1 TEXT BOOKS:
1. Operations Research: An Introduction, 10/E, By Taha, Pearson Education, 2019
2. Introduction to Management Science; A Modeling and Case Studies Approach with Spreadsheets, 5/E, McGraw-Hill, 2019
4.2 REFERENCE BOOKS:
1. Introduction to Operations Research, Hillier & Lieberman, Tata McGrawHill
2. Data, Models, and Decisions : The Fundamentals of Management Science, Dimitris Bertsimas and Robert M Freund, Dynamic Ideas, 2004

3. Operations Research: Applications and Algorithms, 4/E, Wayne L Winston, Cengage Learning 2003
4. Network Flows: Theory, Algorithms, and Applications by by Ravindra K. Ahuja, Thomas L. Magnanti, James B. Orlin, Pearson, 1993

5. Quantitative Analysis for Management, 10/E, Render Barry et al.; Pearson Education, 2009

5. OUTCOME OF THE COURSE

- Understand the foundations of linear and of integer linear optimization
- Ability to model a business problem in terms of linear/integer linear constraints and objective function and drive managerial insights from sensitivity analysis
- Able to model network problems such as shortest paths, maxi-flows, spanning tree optimization problems, and solve them with the algorithms discussed in the course
- Model more complex business problems, and solve those using commercial solvers and perform discrete event simulation using MS Excel and ARENA