Course Syllabi: UMA031 Optimization Techniques (L : T : P :: 3 : 1 : 0)

1. **Course number and name:** UMA031; Optimization Techniques

2. **Credits and contact hours:** Credits: 3.5; Hours: 4

3. **Text book, title, author, and year**

   - *Taha, H.A., Operations Research: An Introduction, Prentice Hall of India (2007) 8th ed.*
   - *Kasana, H.S., Introductory Operation Research: Theory and Applications, Springer Verlag (2005).*
   - *Rardin, Ronald L., Optimization in Operations research, Pearson Education (2005). Ravindran A, Phllips D.T. and Solberg J.J. Operation Research: Principles and Practice, John Wiley (2007).*

   a. Other supplemental materials
      - Nil

4. **Specific course information**

   a. Brief description of the content of the course (catalog description)

   Scope of Operations Research: Introduction to linear and non-linear programming formulation of different models.
   Linear Programming: Geometry of linear programming, Graphical method, Linear programming (LP) in standard form, Solution of LP by simplex and revised simplex methods, Exceptional cases in LP, Duality theory, Dual Simple method, Sensitivity analysis.
   Network Analysis: Transportation problem (with transshipment), Assignment problem, Traveling-salesman problem, Shortest route problem, Minimal spanning tree, Maximum flow problem.
   Integer Programming: Branch and bound algorithm, Travelling salesman problem.
   Dynamic programming: Forward recursions, General problem, Reliability problem, Capital budgeting problem, Cargo-loading problem.
   CPM and PERT: Drawing of networks, Removal of redundancy, Network computations, Free slack, Total slack, Crashing, Resource allocation.
   Non-Linear Programming: Characteristics, Concepts of convexity, maxima and minima of functions of n-variables using Lagrange multipliers and Kuhn-Tuker conditions, One dimensional search methods, Fibonacci, golden section method and gradient methods for unconstrained problems.
   Software: Introduction to software for optimization techniques (TORA).

5. **Specific goals for the course**

   After the completion of the course, the students will be able to:
   - Formulate and solve linear programming problems.
   - Solve the problems on networks models such as Transportation, Assignment, Shortest path, minimal spanning tree, and Maximal flow.
   - Solve the problems of Project Management using CPM and PERT
   - Solve Non-linear Programming problems of some kinds.
   - Implement the Linear programming techniques using C or any other optimization software.

6. **Brief list of topics to be covered**
    - Linear Programming
    - Network Analysis
    - Integer Programming
    - Dynamic Programming
    - Non-Linear Programming