Operations Research (OR)

About Operations Research (OR): Operations Research is a multidisciplinary field that applies mathematical and analytical methods to help organizations make better decisions. Operations Research and Engineering combines two disciplines focused on the operation of complex systems. To equip students to learn statistically rooted frameworks to model and solve systems-level engineering problems. This also helps them for optimum utilization of resources in the organization.

Examination Scheme

In-Semester Exam :30 Marks
End-Semester Exam :70 Marks
Team Work (TW) :25 Marks

Course Contents:

Unit I: Introduction of Operations Research

Introduction to operations research and optimization techniques, applications of operations research in civil engineering, introduction to linear and non-linear programming methods, formulation of linear optimization models for civil engineering applications (objective function, constraints), graphical solutions to L P problems, local & global optima, unimodal function, convex and concave function.

Unit II: Stochastic Programming

Sequencing: n jobs through 2, 3 and M machines, queuing theory: elements of queuing system and its operating characteristics, waiting time and ideal time costs, Kendall‘s notation, classification of Queuing models, single channel Queuing theory: Model I (Single channel Poisson Arrival with exponential services times, Infinite population (M/M/1): (FCFS/ /), simulation: Monte Carlo simulation.

Unit III: Linear programming

The transportation model and its variants, assignment model and its variants

Unit IV: Linear programming

The simplex method, method of big M, two phase method, duality

Unit V: Nonlinear programming

Single variable unconstrained optimization: sequential search techniques-dichotomous, Fibonacci, golden section, multivariable optimization without constraints: the gradient vector and hessian matrix, gradient techniques, steepest ascent/decent technique, Newton’s Method, Multivariable optimization with equality constraints: Lagrange multiplier technique

Unit VI: Dynamic programming, Games Theory and Replacement Model

Dynamic programming: multi stage decision processes, principle of optimality, recursive equation, applications, Games theory: 2 persons games theory, various definitions, application of games theory, replacement of items whose maintenance and repair cost increase with time ignoring time value of money.