Operations Research (OR)

Courses

OR 6205. Deterministic Operations Research. (4 Hours)
Introduces the theory, computation, and application of deterministic models to represent industrial operations. Includes linear programming formulation and solution using spreadsheet and algebraic languages software; simplex, big-M, two-phase, revised simplex, and dual simplex algorithms for solving linear programs; introduction to the theory of simplex, fundamental insight, duality, and sensitivity analysis; transportation, assignment, and transshipment problems; shortest path, minimum spanning tree, maximum flow, minimum cost network flow problems and project networks; and discrete-state and continuous-state dynamic programming models and applications. Requires knowledge of linear algebra.

OR 6500. Metaheuristics and Applications. (4 Hours)
Focuses on solving large combinatorial optimization problems. Metaheuristic search aims to find a "very good" solution that satisfies the problem constraints. Describes multiple metaheuristic search methods such as simulated annealing (SA), tabu search (TS), genetic algorithms (GA), particle swarm optimization (PSO), and multiobjective methods. Uses algorithms to find values of discrete and/or continuous variables that optimize a system's performance. Discusses the application of metaheuristics to a variety of different problems, including hub location allocation, parallel machine scheduling, travelling salesman problem (TSP), curve fitting, clustering, n-queen, min one, etc. Incorporates practical experiments to demonstrate the advantages and disadvantages of metaheuristic search methods for different applications.

Prerequisite(s): OR 6205 with a minimum grade of C-

OR 6962. Elective. (1-4 Hours)
Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

OR 7230. Probabilistic Operation Research. (4 Hours)
Introduces the theory and use of stochastic models to represent industrial operations. Topics include discrete-state Markov chains and applications, state transitions and properties, first passage probabilities, steady-state analysis; absorbing chains and absorption probabilities; introduction to continuous-time Markov chains, transition rates and steady-state analysis; basic elements of queuing systems, birth-and-death process, and special cases; steady-state analysis of simple queuing models including M/M/s, M/M/s/K, M/M/s/N/N and their special cases; and queuing models involving nonexponential distributions.

Prerequisite(s): IE 6200 with a minimum grade of C or MATH 7241 with a minimum grade of C

OR 7235. Inventory Theory. (4 Hours)
Considers the nature and characteristics of inventory systems. Examines techniques of constructing and analyzing mathematical models of inventory systems with a view toward determining operating policies for such systems.

Prerequisite(s): OR 6205 with a minimum grade of C

OR 7240. Integer and Nonlinear Optimization. (4 Hours)
Covers important families of mathematical programming problems and optimization methods. Discusses the cutting plane and the branch and bound algorithm for binary and mixed integer programming problems. Introduces nonlinear programming including unconstrained optimization, the Kuhn-Tucker conditions, gradient methods, and separable, quadratic, and geometric programming.

Prerequisite(s): OR 6205 with a minimum grade of C

OR 7245. Network Analysis and Advanced Optimization. (4 Hours)
Considers concepts of advanced linear programming and network flows. Includes theory of the simplex method, the revised simplex algorithm using LU factorization, and simplex for bounded variables and primal-dual methods; methods for solving large-scale models such as Danzig-Wolfe decomposition, Bender's partitioning, Lagrangian relaxation, and subgradient optimization; computational complexity and Karmarkar's algorithm; minimum cost network flows, network simplex, and generalized and multicommodity network flow problems; and special types of network problems including the traveling salesman, routing, network location, and reliability problems.

Prerequisite(s): OR 6205 with a minimum grade of C

OR 7270. Convex Optimization and Applications. (4 Hours)
Studies convex optimization, a branch of optimization techniques that deals with convex problems. Convex optimization problems appear in many real-world applications and at the same time are theoretically very interesting. Offers students an opportunity to obtain the skills required for solving convex problems and using techniques of convex analysis in solving nonconvex problems. Covers convex analysis, convex optimization problems, second-order cone programming, semidefinite programming, optimality conditions and duality theory, convex geometric problems, theory of computational complexity and convergence rate of algorithms, interior point methods, and relaxations and approximation algorithms. Applications include convex optimization, nonconvex quadratic optimization, combinatorial and network optimization problems, and optimal control problems.

Prerequisite(s): OR 6205 with a minimum grade of C-

OR 7310. Logistics, Warehousing, and Scheduling. (4 Hours)
Explores the determination of needs and requirements for logistics within large-scale manufacturing and business environments. Examines warehousing and scheduling in the context of a business logistics system. Introduces managerial, mathematical, and software tools and techniques for modeling and optimizing various aspects of the business supply chain. Considers approaches to examining warehousing operations and the associated algorithms.

Prerequisite(s): (IE 6200 with a minimum grade of C or MATH 7241 with a minimum grade of C); OR 6205 with a minimum grade of C

OR 7374. Special Topics in Operations Research. (4 Hours)
Offers topics of interest to the staff member conducting this class for advanced study. May be repeated up to 2 times for a maximum of 12 semester hours.

OR 7945. Master's Project. (4 Hours)
Offers theoretical or experimental work under individual faculty supervision.

OR 7962. Elective. (1-4 Hours)
Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

OR 7986. Research. (0 Hours)
Offers students an opportunity to conduct full-time research under faculty supervision.

OR 7990. Thesis. (4 Hours)
Offers analytical and/or experimental work conducted under the direction of the faculty in fulfillment of the requirements for the degree.

Prerequisite(s): OR 7945 with a minimum grade of C-

OR 7996. Thesis Continuation - Half-Time. (0 Hours)
Continues thesis work conducted under the supervision of a departmental faculty member.