

CSC 421 - APPLIED OPERATIONS RESEARCH

CREDIT HOURS: 3
PREREQUISITES: CSC 241; MTH 144 or 233; MTH 220
GRADE REMINDER: Must have a grade of C or better in each prerequisite course.

CATALOG DESCRIPTION

Quantitative techniques for resource management, decision making, and system analysis, with emphasis on development and use of computer implementations of mathematical models.

PURPOSE OF COURSE

To provide the student with an understanding of quantitative approaches to problem solving using methods of operations research. Deterministic models, including linear, integer, network, and nonlinear programming, and stochastic methods, including decision analysis, Markov models, and queuing systems, are applied to problems in constrained resource management, system analysis, and system optimization.

NOTE: Graduate students taking CSC 421 for graduate credit will be expected to complete additional requirements, including but not limited to special projects, class presentations, relevant research, and supplemental evaluation (i.e., additional questions, quizzes, tests). Graduate students are expected to perform at a higher level than undergraduates. Students should contact the course instructor early in the semester (i.e., before the end of the add/drop period) to determine the specific additional requirements.

EDUCATIONAL OBJECTIVES

Upon successful completion of the course, students should be able to:

1. Create mathematical models for analyzing or optimizing a variety of resource management problems.
2. Develop mathematical programming models for certain systems having deterministic parameters.
3. Develop models for systems that exhibit stochastic behavior.
4. Identify algorithms for optimizing deterministic models, and methods for quantitatively describing the behavior and characteristics of probabilistic systems.
5. Demonstrate familiarity with commercial software that is available to support the quantitative decision techniques and analysis methods studied.
6. Select existing software or develop new software for specific applications.

CONTENT

Hours

Overview of Operations Research	4
Historical development of the discipline	
Mathematical modeling	
Applications	

Linear Programming	12
Problem Formulation	
Graphical Solutions	
Simplex Method	
Interior and barrier methods	
Implementation of algorithms and use of computer programs	
Interpretation of computational results and sensitivity analysis	
Network Analysis	8
Maximum flow	
Shortest path	
Transportation models	
Assignment and matching problems	
Critical path analysis	
Dynamic programming	
Implementation of algorithms and use of computer programs	
Integer Programming	6
Problem complexity	
Branch and bound methods	
Scheduling models	
Implementation of algorithms and applications	
Markov Analysis	6
Transition probabilities	
First passage times and first passage probabilities	
Steady state analysis	
Software for solution of systems of steady state equations	
Queuing Models	4
Arrival and departure distributions	
Computation of performance characteristics of queuing systems	
Decisions Analysis	2
Decision trees	
Game Theory	
Exams (plus final)	3
	TOTAL 45

REFERENCES

- Carter, M.W., and Price, C. C., Operations Research: A Practical Introduction, CRC Press, Boca Raton, Fl., 2001.
- Hillier, F.S. and Lieberman, G. J. Introduction to Operations Research, 5th Ed. McGraw-Hill Publishing Co., New York, 1990.

Winston, W.L. Operations Research: Applications and Algorithms, Duxbury Press, Boston, 1987.

Taha, H.A. Operations Research: An Introduction, 5th Ed. Macmillan Publishing Co., New York, 1992.