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

<table>
<thead>
<tr>
<th></th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overview of Operations Research</td>
<td>4</td>
</tr>
<tr>
<td>Historical development of the discipline</td>
<td></td>
</tr>
<tr>
<td>Mathematical modeling</td>
<td></td>
</tr>
<tr>
<td>Applications</td>
<td></td>
</tr>
</tbody>
</table>
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

