

Prefix, Number and Name of Course:

ACM 611 Discrete Foundations of Applied Mathematics From a Problem Solving Perspective

Credit Hours: 1

In Class Instructional Hours: 1

Labs: 0

Field Work: 0

Catalog Description:

Prerequisite: Instructor permission.

Problem solving and applications of Discrete Mathematics, including Combinatorics, Graph Theory, Logic, Linear Algebra, Number Theory and Set Theory. Emphasis on team building and group management through problem solving activities.

Reasons for Addition:

To create a one-semester-hour core module for the graduate Professional Applied and Discrete Mathematics program where students will be actively engaged in problem solving in Discrete Mathematics.

Student Learning Outcomes: Students will:	Course Content References:	Assessment:
1. integrate and synthesize principles from Abstract and Linear Algebra and Number Theory and apply them to solve problems in Discrete Mathematics in the setting of real life situations.	I,II,III,IV	Group work in class, individual homework assignments, examinations, and projects.
2. integrate and synthesize principles from Abstract and Graph Theory, Combinatorics, and Number Theory and apply them to solve problems in Discrete Mathematics in the setting of real life situations.	I,II,III,IV	Group work in class, individual homework assignments, examinations, and projects.
3. integrate and synthesize principles from Logic and Set Theory and apply them to solve problems in Discrete Mathematics in the setting of real life situations.	I,II,III,IV	Group work in class, individual homework assignments, examinations, and projects.
4. communicate, both verbally and in writing, solutions to complex problems from discrete mathematics.	I,II,III,IV	Group work in class, individual homework assignments, examinations, and projects.

5. demonstrate ability to manage and communicate with team members when solving problems.	I,II,III,IV	Group work in class, individual homework assignments, examinations, and projects.
<p>Course Content:</p> <p>I. Applied advanced algebra</p> <ul style="list-style-type: none"> A. Problems in polynomial rings B. Problems in groups C. Problems in fields <p>II. Applied linear algebra</p> <ul style="list-style-type: none"> A. Problems in matrices and transformations B. Problems in eigenvalues, eigenvectors C. Problems in matrix diagonalization D. Problems in vector spaces <p>III. Applied graph theory, combinatorics and number theory</p> <ul style="list-style-type: none"> A. Problems in counting B. Problems in network flow C. Problems in random walks on graphs <p>IV. Applied logic and set theory</p> <ul style="list-style-type: none"> A. Problems in decision trees B. Problems in infinite sets and cardinality 		

Resources:

Scholarships in the Field:

Carre, B., *Graphs and networks*, Oxford: Clarendon Press, 1979.

Chaitin-Chatelin, F., *Eigenvalues of matrices*, New York: Wiley, 1993.

Durrett, R., *Random Graph Dynamics*, New York: Cambridge University Press, 2007.

Joyner, D., Kreminski, R. and Turisco, J., *Applied abstract algebra*, Baltimore: Johns Hopkins University Press, 2004.

Kelarev, A. V., *Graph Algebras and Automata*, New York: Marcel Dekker, 2003.

Korfhage, R. R., *Discrete Computational Structures*, Florida: Academic Press, 1984.

Roberts, F. S., *Graph theory and its applications to problems of society*, Philadelphia: Society for Industrial and Applied Mathematics, 1978.

Rorres, C. and Anton, H., *Applications of Linear Algebra*, 3rd ed., New York: John Wiley & Sons, 1984.

Vazirani, V. V., *Approximation algorithms*, ; New York : Springer, 2001.

West, D. B., *Introduction to Graph Theory*, 2nd ed., New Jersey: Prentice-Hall Inc., 2001.

Periodicals:

College Mathematics Journal

Discrete Mathematics

Mathematics Magazine

Notices of the American Mathematical Society

Siam Journal on Discrete Mathematics

The American Mathematical Monthly

Electronic and/or Audiovisual Resources:

Interdisciplinary Lively Applications Projects. Consortium for Mathematics and Its Applications, Inc., COMAP (800-772-6627, www.comap.com).

Numerical Recipes: The Art of Scientific Computing (third edition) (www.nr.com).

Undergraduate Applications in Mathematics Modules, COMAP.

Scientific computing FAQ (<http://mathcom.com/corpdir/techinfo.mdir/index.html>).

The Scientist and Engineer's Guide to Digital Signal Processing (by Steven W. Smith, Ph.D. <http://www.dspguide.com/pdfbook.html>).