NORTHERN ARIZONA UNIVERSITY
College of Engineering, Forestry & Natural Sciences
Department of Mathematics & Statistics

Adel Mathematics Building
PO Box 5717
Flagstaff, AZ 86011-5717

928-523-3481
928-523-5847 fax
www.math.nau.edu

MAT 661 APPLIED MATHEMATICS
MASTER SYLLABUS

CATALOG DESCRIPTION
MAT 661 *Applied Mathematics* (3) Analysis of the equations of mathematical physics and science, including ordinary and partial differential equations, eigenfunction expansions, and related advanced topics. Letter grade only. *Prerequisite:* MAT 238 and MAT 239 and MAT 316 with grad of C or better.

LEARNING OUTCOMES Upon completion of the course, students will be able to:

1) Demonstrate an understanding of many of the fundamental mathematical equations with applications in physics, science, and engineering.
2) Apply a variety of mathematical theories and techniques toward solving, analyzing, and approximating solutions to many of these equations.

COURSE CONTENT
The course will consist of the core topics listed below, as well as other topics chosen by the instructor:

Core Topics:

1. Review of topics from multivariate calculus and linear algebra.
2. Ordinary Differential Equations – Existence theory, analytical and numerical techniques.
3. Laplace's Equation – separation of variables, maximum principle, etc.
4. Wave Equation – separation of variables, boundary conditions, etc.
5. Heat Equation – separation of variables, higher dimensional and non-square regions, theory.
6. Sturm Liouville problems.
7. Eigenfunction expansions and applications.
8. Introduction to numerical approximations for all of the above.

Optional Topics

1. Nonlinear PDE.
2. Green's Functions.
3. Topics from Physics, Applications in Science.
4. Advanced Numerical Methods.
5. First Order PDEs and the Method of Characteristics.
6. Calculus of Variations.

STRUCTURE AND APPROACH
The course will use any or all of: lecture, discussion, student presentations, and computer demonstrations.

ASSESSMENT
Assessment will include in-class written examinations, a written comprehensive final examination, and regular written homework sets and/or projects. Quizzes may be used. Substantial weight is placed on written work, some of which will consist of proofs.

Revised 2017; Effective Fall 2017: University approval of description and prerequisite change

CURRENT AND RECENT TEXTS

Introduction to Partial Differential Equations with Applications, E.C. Zachmanoglou and Dale W. Thoe, Dover, 1986.

Advanced Engineering Mathematics, 10th Edition, Erwin Kreyszig, 2011.