

Murray State University

Revised 7/28/15

DEPARTMENT: MATHEMATICS AND STATISTICS

COURSE PREFIX: MAT COURSE NUMBER: 524 CREDIT HOURS: 3

I. TITLE: Boundary Value Problems

II. COURSE DESCRIPTION AND PREREQUISITE(S): Analytic and computational techniques for linear first and second order partial differential equations, initial, and boundary value problems. Classification, Fourier series, separation of variables, finite difference and/or finite element methods.

Prerequisite(s): MAT 309, 338, and 335 or permission of instructor, and 338

III. COURSE OBJECTIVES:

The student will

- A. classify second order partial differential equations;
- B. find solutions and discuss the existence of solutions for second order partial differential equations using maximum principle techniques;
- C. use separation of variables to solve second and higher ordered partial differential equations;
- D. use Sturm Liouville theory to analyze boundary value problems;
- E. understand Fourier series and apply the techniques to solve second order partial differential equations;
- F. solve certain higher order differential equations;
- G. study numerical aspects of solutions of boundary value problems in different domains;
- H. develop computational strategies and explanations related to research based questions involving higher ordered boundary value problems; and
- I. introduce concepts to the class through integrative studies of numerical techniques and physical problems

IV. CONTENT OUTLINE:

- A. Classification studies of second order partial differential equations
- B. Maximum principles
- C. Solutions strategies using Green's Theorem, separation of variables, and Fourier Series
- D. Existence and uniqueness of second order boundary value equations in symmetric domains
- E. Solution investigation with Bessel Functions

V. INSTRUCTIONAL ACTIVITIES:

Lecture, daily assignments, group work, projects, reading assignments, oral presentations, and quizzes the material, as per instructor course design.

VI. FIELD, CLINICAL, AND/OR LABORATORY EXPERIENCES:

None

VII. TEXT(S) AND RESOURCES:

Applied Partial Differential Equations with Fourier Series and Boundary Value Problems,
by Richard Haberman.

VIII. EVALUATION AND GRADING PROCEDURES:

These are instructor specific, based on problem sets, presentations, and exams.

IX. ATTENDANCE POLICY:

Students are expected to adhere to the MSU Attendance Policy outlined in the current *MSU Bulletin*.

X. ACADEMIC HONESTY POLICY:

Murray State University takes seriously its moral and educational obligation to maintain high standards of academic honesty and ethical behavior. Instructors are expected to evaluate students' academic achievements accurately, as well as ascertain that work submitted by students is authentic and the result of their own efforts, and consistent with established academic standards. Students are obligated to respect and abide by the basic standards of personal and professional integrity.

Violations of Academic Honesty include:

Cheating - Intentionally using or attempting to use unauthorized information such as books, notes, study aids, or other electronic, online, or digital devices in any academic exercise; as well as unauthorized communication of information by any means to or from others during any academic exercise.

Fabrication and Falsification - Intentional alteration or invention of any information or citation in an academic exercise. Falsification involves changing information whereas fabrication involves inventing or counterfeiting information.

Multiple Submission - The submission of substantial portions of the same academic work, including oral reports, for credit more than once without authorization from the instructor.

Plagiarism - Intentionally or knowingly representing the words, ideas, creative work, or data of someone else as one's own in any academic exercise, without due and proper acknowledgement.

Instructors should outline their expectations that may go beyond the scope of this policy at the beginning of each course and identify such expectations and restrictions in the course syllabus. When an instructor receives evidence, either directly or indirectly, of academic dishonesty, he or she should investigate the instance. The faculty member should then take appropriate disciplinary action.

Disciplinary action may include, but is not limited to the following:

- 1) Requiring the student(s) to repeat the exercise or do additional related exercise(s).
- 2) Lowering the grade or failing the student(s) on the particular exercise(s) involved.
- 3) Lowering the grade or failing the student(s) in the course.

If the disciplinary action results in the awarding of a grade of E in the course, the student(s) may not drop the course.

Faculty reserve the right to invalidate any exercise or other evaluative measures if substantial evidence exists that the integrity of the exercise has been compromised. Faculty also reserve the right to document in the course syllabi further academic honesty policy elements related to the individual disciplines.

A student may appeal the decision of the faculty member with the department chair in writing within five working days. Note: If, at any point in this process, the student alleges that actions have taken place that may be in violation of the Murray State University Non-Discrimination Statement, this process must be suspended and the matter be directed to the Office of Equal Opportunity. Any appeal will be forwarded to the appropriate university committee as determined by the Provost.

XI. NON-DISCRIMINATION POLICY AND STUDENTS WITH DISABILITIES:

Policy Statement

Murray State University endorses the intent of all federal and state laws created to prohibit discrimination. Murray State University does not discriminate on the basis of race, color, national origin, gender, sexual orientation, religion, age, veteran status, or disability in employment, admissions, or the provision of services and provides, upon request, reasonable accommodation including auxiliary aids and services necessary to afford individuals with disabilities equal access to participate in all programs and activities. For more information, contact the Executive Director of Institutional Diversity, Equity and Access, 103 Wells Hall, (270) 809-3155 (voice), (270) 809-3361 (TDD).

Students with Disabilities

Students requiring special assistance due to a disability should visit the Office of Student Disability Services immediately for assistance with accommodations. For more information, students should contact the Office of Student Disability Services, 423 Wells Hall, Murray, KY 42017. 270-809-2018 (voice) 270-809-5889 (TTD).