# MATH 450H: Advanced Differential Equations
## Fall 2009 Section 002 3 credit hours


**Instructor:** Dr. Trent Kull

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**Instructor's Teaching Schedule:** MW: 1 – 2p, Bancroft 154
Other: Independent

**Office Hours:** MW, 2 – 3:30p; other times by appointment.

**Instructor Website:** http://faculty.winthrop.edu/kullt/

### Modifications
The instructor reserves the right to make modifications to this syllabus. Students will be notified in class & by email.

### Course Content
An in-depth study of topics in differential equations. This is not limited to, but may include: Theory and application of Laplace transforms; explicit and implicit numerical approximations to ordinary differential equations; exact and numerical solution techniques for partial differential equations; qualitative nonlinear analysis; inverse problems. Students will work with numerical and symbolic mathematical technology throughout the course. Students will gain experience in instructor led research, which will be modified appropriately for possible graduate level credit. Prerequisites: MATH 305 and instructor permission.

### Course Goals and Departmental Goals for Students
Students apply fundamental mathematical concepts and techniques to solve problems and evaluate results.

- Students will review useful techniques learned in an introductory differential equations course (solving first and second order linear equations, solving systems of equations, etc.)
- Students will gain a working knowledge of numerical solutions techniques, partial differential equations, and nonlinear qualitative analysis
- Students will apply learned techniques to useful applications and inverse problems.
- Students will be introduced to graduate level mathematics, including: theory and application of real analysis, numerical analysis, and measure theory
- Students will gain experience in instructor led research

For purposes of departmental assessment of student learning in this course, homework and research projects will be collected and graded. Individual tests and course grades may also be used as an indication of progress toward the above goals.

### Grades
To ensure that you receive a certain letter grade (or better), you must attain a minimum overall percentage. These minima are: A: 90; B: 80; C: 70; D: 60.

## Assignments/Assessments

| Date | Event | Percentage |
|---|---|---|
| Various | Homework Projects | 75 |
| Various | Research Projects | 25 |

## Attendance Policy

The University Attendance policy as stated in the 2009-2010 catalog (http://www.winthrop.edu/uploadedFiles/recandreg/Catalogs/09-10/2009_10_catalog_Acad_Regs.pdf): if a student's absences in a course total 25 percent or more of the class meetings for the course, the student will receive a grade of N if the student withdraws from the course before the withdrawal deadline; after that date, unless warranted by documented extenuating circumstances as described in the previous section, a grade of F or U shall be assigned.

## Text and Materials

- Required Text: None. Reading material will be provided or obtained by the students as needed.
- MATH 300 (Linear Algebra) and MATH 305 (Introduction to Differential Equations) notes may be helpful and should be available to the students.

## Missed assignment policy

Students will coordinate with the instructor about missed or late assignments. This should be done in advance where possible, and in a reasonable time frame when not.

## Students with Disabilities

Winthrop University is dedicated to providing access to education. If you have a disability and need classroom accommodations, please contact Gena Smith, Coordinator, Services for Students with Disabilities (SSWD), at 323-3290, as soon as possible. Once you have your Professor Notification Form, please tell me so that I am aware of your accommodations. If you require special testing consideration for a disability, contact the SSWD and bring me the appropriate paperwork in a timely fashion.

## Policies

1. Review the student code of conduct for university polices on academic misconduct. Academic misconduct will not be tolerated and will result in a failing grade on the assignment and/or in the course. The full handbook is available online at: (http://www2.winthrop.edu/studentaffairs/handbook/StudentHandbook.pdf)
2. All electronic devises (including cell phones) other than a calculator should be on silent and kept in your book bag or purse throughout class time unless otherwise instructed. (Note if you have some educational, health, or physical reason for an electronic device you must work with your professor to inform them of the accommodation.)
3. A grade of C or better in MATH202 is required to enroll in MATH301.
4. Students are expected to use skills from MAED200 to implement the use of Mathematica.

**SU Deadline:** October 23 **Course Withdraw Date:** October 23
**Fall Break:** October 19 – 20

## Course Calendar

The following is a tentative guideline, as I want to keep the flexibility to modify the pace and add or remove topics as appropriate.

| | |
|---|---|
| August 26 | Introduction & review of ordinary differential equations (ODEs) solution techniques |
| 28 | |
| 31* | |
| September 2 | |
| 7* | Qualitative Analysis |
| 9 [1] | |
| 14 | |
| 16 | |
| 21* | |
| 23 | |
| 28* | Laplace transforms |
| 30 | |
| 5* | |
| 7 | |
| 12 | Numerical approximation of ODEs |
| 14 | |
| 21* | |
| 26* | |
| 28 | Partial differential equations (PDEs) |
| November 2* | |
| 4 | |
| 9 | |
| 11 | Numerical approximation of PDEs |
| 16* [3] | |
| 18 | |
| 23 | Inverse Problems |
| 30* | |
| December 2 | |
| 7* | |