Department of Mathematics, UAB
Introduction to Differential Equations
MA252-1F, Spring 2020

Instructor. Dr. Abinash Nayak, Room 4054, University Hall.
Prerequisite Courses. MA126, or permission of instructor.
Class Meetings. MWF: 1.25 pm – 2:15 pm, Room HHB 221.
Term Dates: First day of classes Monday January 13, 2020, and the last day of classes is Friday April 24, 2020.
Phone/Email: (205) 934-2156 / nash101@uab.edu
Office Hours: TBA ; you can also email/phone for an appointment.
Grading. There will be approximately one written course assignment/modeling project per week; these collectively will constitute 50% of the course grade. There will be two in-class tests, (tentatively) around the middle of February and April; each counts 25% of the course grade. There is no final examination for this course.
Syllabus. This is a first course in ordinary differential equations from a more modern perspective. A hundred years ago it was important for engineers and scientists to be familiar with a myriad of clever mathematical tricks aimed at producing closed-form solutions for differential equations (DE's) of interest. In the last thirty years or so, this process has been both extended and simplified by the ready availability of powerful software, such as MAPLE, for numerical computations and computer algebra applications. It is the aim of this course to provide both the theoretical background needed to understand how DE's work, and familiarity with the various software tools needed to facilitate their use in modeling.

We cover first order differential equations (separable, linear, exact, and additional non-linear examples using MAPLE), modeling with first order DE's, examples of systems of first order DE's, theory of higher order linear DE's (homogeneous and non-homogeneous, superposition of solutions, linear independence (via Wronskians) and general solutions, initial and boundary value problems), solution of constant coefficient homogeneous linear equations, non-homogeneous linear equations by variation of parameters and Green's functions, with complicated cases done using MAPLE, and the theory and application of Laplace transforms. Modeling projects in the course will emphasize the use of MAPLE to do the heavy lifting.
Aims of the Course. Upon successful completion of the course a student should

- be familiar with the standard types of ordinary differential equation and their methods of solution;
- understand that differential equations provide a precise quantitative connection between the laws of Physics and modeling applications in Science and Engineering;
- be able to use computer algebra software (such as MAPLE) to facilitate the computations that arise in the context of practical modeling projects.

Reference Books. There is no prescribed textbook for this course. Many books, such as **"A First Course in Differential Equations with Modeling Applications", Dennis G Zill, Brooks/Cole**, any edition, or *Elementary Differential Equations and Boundary Value Problems*, William E. Boyce and Richard C. DiPrima, Wiley, any edition, cover well the theoretical material in the course. Other DE texts are OK too – see me regarding questions on this. There is no text for the modeling component of the course, which we will do as an in-class/homework activity. Regular class attendance is highly recommended for this reason. I will provide handouts and files for the assignments and MAPLE work, and review sheets for the tests.
Mac Lab (HHB221) Hours of Operation: Posted on door to HHB221 after term begins.
Printing in HHB221. You must first use the web browser Safari to login to BlazerNET with your Blazer-id, in order to access the printer from the machines in the Mac Lab.
Additional MAPLE Machines. Outside of class time additional machines with MAPLE are available in the Math Learning Laboratory (MLL) in HHB202. Upon entry to the MLL, turn right; the MAPLE-equipped machines are against the far wall. Be forewarned that there is no printing available here – you should save your MAPLE worksheet both as a `*.mw` file, for later editing, and as a `*.pdf` file for printing elsewhere.
Saving Files. As all user-created files are automatically removed from HHB221 machines overnight, you should save copies of all your files created on these machines to a USB drive (memory stick). This applies particularly to `*.mw` (MAPLE worksheet) files that often take considerable effort to re-create.
Class Website: All the lecture notes and assignments will be uploaded in the canvas.
Assignment Rules. *All assignments must be your own work; do not copy the work of others or allow your work to be copied.* Each assignment must be written as a report in your own words, adhering to the guidelines listed. Points will be deducted for clear transgressions of these rules. As a practical matter, you can add commentary to a MAPLE worksheet using the MAPLE "text" facility, or leave space for the later insertion of hand-written material; see `http://people.cas.uab.edu/~iknowles/ma252-w19/assignments/ass0.pdf`

1. Your **name**, **class** (MA252-1F), **semester** (Spring 2020), and **assignment number** appears at the beginning of your report.

2. **Each question and part of question must be clearly numbered; the questions (and parts thereof) must appear in INCREASING order in your report.**

3. Add text commentary explaining each MAPLE step (or group of steps).

4. Use the MAPLE text editor to alternate text and MAPLE material. You can mix MAPLE and hand-written text by leaving a space in your MAPLE file for later insertion of hand-written material. **"MAPLE appendices"**, with MAPLE output from various questions (or parts thereof) lumped together, **are NOT permitted**. Your report should be a logical and continuous blend of explanatory text and MAPLE output.

5. Clearly label your answers and/or conclusions.

6. **Paper submission only – no email.**