Math 528 Lab - Fall 2021
Laboratory for Methods for the Physical Sciences I

Instructor: Dylan Bruney
E-mail: bruney@live.unc.edu
Office Hours: TBD
Meeting Time: Monday 4:00-6:00 PM
Meeting Location: Phillips 228

Website: https://tarheels.live/bruney/math-528-lab/

Textbook/Resources Needed: No textbook required. Students will need a CCI-compatible computer with the MATLAB programming environment and the Wolfram "Mathematica" symbolic computing environment. MATLAB and Mathematica is available to students for free through UNC's Software Distribution.

Description: This course is an introduction to numerical methods as applied to ordinary differential equations (ODEs). We will mainly explore topics devoted to solving ODEs with additional topics as time allows. Class will be divided into two parts. First, a brief lecture with interactive elements to introduce the topic. Then the rest of the time will be an opportunity for you to work on the current assignments with my guidance and supervision.

Grades:
Assignments = 70%
Final Project = 30%

Assignments: Assignments will be given in every class and posted on the class website of which there will be approximately thirteen. I expect most of the assignments to be completed during the class and then submitted on Sakai in your drop box with the format "Assignment Number-Name". If the assignment is not completed during class, I expect the assignment to be turned in before the next class. Exceptions are made for extraordinary circumstances, just email me but be reasonable. Collaboration on assignments is allowed and encouraged; however, each student must submit separately. Assignments will be submitted in a format such that I need only press run (Matlab) or shift-enter (Mathematica) to render figures and images. Of course, these can be broken into sequential sections that are ran in order, but please include comments.

Final Project: In groups between 3-5 (this may change) you will present a project and provide a short write-up (no more than 3 pages) discussing any application of Mathematica and/or Matlab to differential equations in a physical system that you and your team find interesting. The topic or model does not need to be excessively complex. This can be an original topic, or a review of an existing application. To receive credit, the topic must first be approved by the course instructor via email. A digital copy of the write-up should be submitted to the course instructor by November 29th. Points will be awarded based on the technical discussion as well as overall creativity. Be sure to appropriately cite any references. Topics can include (but are not exclusive to) specific applications to: aerodynamics and fluid flow, astrophysics, biological system models, chemical reactions, classical mechanics, ecosystem models, epidemiology, sports, and transportation.

Attendance: Students are expected to attend **ALL** lectures.

Important Dates:

Labor Day: Monday, September 6th
Final Project Write Up Due: Sunday, November 28th
LDOC and Final Project Presentation Date: Monday, November 29th
Final Project Write Up Due: Monday, November 29th

Honor System: It is expected that each student in this class will conduct themself within the guidelines of the Honor System. All academic work should be done with the complete honesty and integrity that this University demands.

Syllabus Changes: The instructor reserves the right to make changes to the syllabus. These changes will be announced as early as possible.