Syllabus for Mathematics 242 Section 10
Fall 2020.

INSTRUCTOR: Ralph Howard OFFICE: LC 304 PHONE: 777-2913
OFFICE HOURS: Monday and Wednesday 3:00–4:00pm
WHEN AND WHERE: Tuesdays and Thursdays 2:50–4:05pm online via Blackboard Collaborate Ultra.
TEXT: *Notes on Diffy Qs: Differential Equations for Engineers.* by Jiří Lebl. A free pdf version can be found at `https://www.jirka.org/diffyqs/` and a physical version can be bought for $18.80 at Amazon: `https://smile.amazon.com/dp/1706230230`.

Grading: There will be three midterms of 100 points each. Homework will be collected and will count for 100 points. The Final will count for 150 points. This gives a total of 550 points and your grade will be based on your total out of 550.

Attendance: If you miss more than 15% of the class (which is 5 classes) the penalty will be have 10 points taken off of score on the final exam.

There will be no make up exams. If you miss a test, then your score on that exam is 80% of the average of your other test scores (including the final). If you miss a second exam then the score on it is zero. Likewise **no late homework will be accepted.**

As an example assume you get 95 on the first two midterms, miss the third one, and get 140/150 on the final. Then your score on the missed exam is

$$80\% \text{ of } \left(\frac{95+95+140}{3.5}\right) = 75.4$$

If you then had a 95 average on the homework the total would be

$$95+95+75.4+140+95 = 500.4$$

out of 550 which is 91% so you would get an A.

Suppose that instead of missing the third midterm you had a bad day and got a 65. Then you would have been better just skipping the test. In this case I will replace the 65 with the 80% of the average on the other exams (in our example this would replace it with 75.4). So there are cases where this system works to your advantage.

The exams will be on the following days

Test 1	Thursday, September 17
Test 2	Thursday, Tuesday October 20
Test 3	Thursday, Thursday November 19
Final	Tuesday, December 8, 4:00pm

Remarks:

- *Submitting and returning homework.* This can be done in several ways.
  (i) I will have a basket on my office (LeConte 304) door where physical papers can be submitted.
  (ii) If you have access to a scanner, then scanning your homework to a pdf document is fine and e-mailing it to me is fine. Make sure it is just one file and do not send each page separately.
  (iii) Anther preferred method is if you know the program LaTeX then use it to produce typeset pdf documents. (If you want to learn LaTeX there is an online LaTeX editor at the Overleaf site `https://www.overleaf.com/` where there is also a tutorial which includes a description of LaTeX and why you might want to learn it.)
  (iv) The least preferred method is to use your phone to take pictures of your papers. If you have to use this method, them change the pictures to pdf files and combine them into one document.
  (v) I will grade the pdf files you submit and e-mail you the graded files.
- *Tests.* I am not yet sure of a good way to do testing. Currently what I would like to do is have 50% of each test be take home and other half be a multiple choice / short answer format online.
- About partial credit. Some arithmetic errors do not bother me much. If your get in a hurry and get $7 \times 8 = 48$ it is not going to cost you much, provided you are doing every thing else correctly. However, there are certain mistakes (all involving misuse of high school algebra), that will not be tolerated. If you make these mistakes I will mark the entire problem wrong. Here are some examples:

$$\sqrt{x+y} = \sqrt{x} + \sqrt{y}, \quad (x+y)^2 = x^2 + y^2, \quad \frac{\sin(2x)}{2} = \sin(x),$$

$$\frac{2x+3y}{3z} = \frac{2x+\cancel{3}y}{\cancel{3}z} = \frac{2x+y}{z}$$

Learning outcomes:

Many of the models used in engineering and the sciences are based equations involving the derivatives of a function, that is differential equations. Examples of this are motion of a particle under forces, dissipation of heat, and wave motion (physics), population growth and spread of disease (biology), and mixing/combining of liquids or gasses (chemistry).

A student who successfully completes Elemental Differential Equations (MATH 242) will be able to master concepts and gain skills needed to accomplish the following:

- Solve iSolve initial value problems and find general or particular solutions to ordinary differential equations of the following types:
  – Separable

  - Exact
  - Homogeneous
  - Linear equations with constant coefficients
- Learn methods for solving differential equations by methods such as
  - Integrating factors
  - Sublation
  - Variation of parameters
  - Laplace transforms
  - Numerical approximations
- Apply differential equations to problems related to
  - Population models (unrestrained, logistic, harvesting)
  - Torricalli's Law
  - Motion under Newton's second law of motion
  - Mixing problems