

# Math2214: Introduction to differential equations

Michal Outrata, Spring 2023

E-mail: [michaloutrata@vt.edu](mailto:michaloutrata@vt.edu)

Web: [course](#) & [personal](#)

Class Hours: MW 2:30 – 3:45pm

Office Hours: MW 3:45-4:15pm (or appointment)

Class Room: McBryde 329

Office: McBryde 554

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## Basic Info

- Course content: The important areas covered are *first order differential equations, second order differential equations, linear systems of ordinary differential equations, modeling and numerical methods* and they are covered in Chapters 1–4 and 6 of the course book.
- Course book: *Elementary Differential Equations with Boundary Value Problems*, Kohler and Johnson, 2<sup>nd</sup> Edition, 2006
- Prerequisites: Math 2114 or 1114 **and** Math 1226 or 1206

## Course Structure

### Lecture

We will meet twice a week in most cases and based on the schedule I will try to have the Monday lecture to be more focused on explanation of concepts and the Wednesday lecture to be more hands on, hopefully with time where you can work on your own and get help if you get stuck.

### Assignments & assessments

- **Final exam (FE)** – 7:9pm Monday 8th of May 2023. The goal is to asses your overall level of knowledge and understanding of the key course concepts. Includes multiple choice questions as well as open questions and will be administered in two parts (1 hour each, both written only).
- **Midterm exams (ME)** – The goal is to asses your level knowledge and understanding of the key concepts after finishing an important section of the course. Includes multiple choice questions as well as open questions and will take place during class hours. Tentatively, it should take place during weeks 5, 10 and 14.

- **Homework (HW)** – The goal is to let you practice the methods and consider in more depth the concepts you have seen during each week of the semester. Revisiting both of these on your own time and phase is (imho) **the** most important step in learning and understanding new material in general and should a) give you confidence for the next lecture because you refreshed the important terms and b) good check point to return to when studying for either of the exams. There should be 13–14 homework assignments during the semester. To accommodate for illnesses etc., I will consider only your best 12 scores. The homework assignments will be posted each Wednesday and collected before the next Monday’s lecture (4.5 – 5 days to work on these).
- **Emporium quizzes (EQ, optional)** – The goal is to encourage you to practice multiple-choice questions of the kind that will likely appear in the first part of the final exam in May.
- **Pathway quizzes & Canvas quizzes (PCQ)** – The goal is identical to the emporium quizzes above. There will be 5 quizzes over the semester – 3 pathway quizzes for Chapters 1 and 2, Chapter 3, Chapters 4 and 6 and 2 canvas quizzes at the end of semester – with the tentative weeks given in the syllabus.
- **Canvas project (CP)** – The goal is to familiarize yourself with a particular application of the tools and skills we have learned in Chapter 6 (and throughout the previous chapters as well), including using numerical methods in either MATLAB (or other appropriate numerical software, e.g., python, jupyter, julia, octave or others) or in Microsoft Excel (if preferred by the student). The canvas project will be detailed after we finish Chapter 2.
- **Self-study projects (SSP, optional)** – The goal is to give you incentives to peek a little bit further than what you’ve seen in the course – in any direction you find interesting. The options include (but are not limited to) writing or using computer solvers for the problems you have seen in lecture and/or properly (i.e., using math) analyzing these **or** relating what we have learned to other courses you have completed in mathematics **or** self-studying some additional materials that expand on what we have seen during the lecture and demonstrating you’ve understood it properly **or** self-studying some related fields/topics and presenting (in some form) you’ve grasped their basic concepts **or** working out rigorous mathematical proofs and definitions for some of the topics we have gone over during the lecture. Everyone is encouraged to come and see me for further consultations if they would be interested in working on their own project during the semester. The output of the project will usually include some summary of the new material the student learned (written in the student’s own words) together with some required outputs, e.g., solutions to exercises, graphs/plots/figures of the experiments or proper mathematical definitions and proofs. The timeline of each project can differ.

## Grading

Each of the above assignments and assessments will be graded on the scale 0–100%. The contribution of this percentage toward the final grade is given below.

FE	ME	HW	EQ	PCQ	CP	SSP
32%	33%	24%	0%	5%	6%	see below

The final score from this class will be on the scale 0–100% and the grades will be (tentatively) given as follows (the “+” or “-” are given based on my judgment only).

A-	B-	C-	D-
90%	80%	70%	60%

For FE, ME, HW and PCQ the final score is the average of all the scores within that group over the semester. For example, if you get from your three midterms 10%, 20% and 30% respectively, your midterm score is  $(0.1 + 0.2 + 0.3)/3 = 0.2 = 20\%$  and thus you will obtain  $0.33 \times 0.2 = 6.6\%$  from your midterms toward your final grade (analogously for others).

Regarding the self-study projects, the goal truly is to reward your extra interest in the subject of differential equations and the grading of these projects will reflect that, i.e., I want to see that you genuinely tried to learn something new on your own and to what degree you’ve succeeded. The goal *is not* to give you an easy fix for neglecting your preparations during the semester. The grading could differ depending on the project and in general may be “converging”, i.e., if I will think that the project is lacking in some areas, I will give it back to the student to improve on these areas, until, eventually, we converge to a project solution we are both happy with (which also generally means good marks for the students).

Each student can attempt at most 2 projects per semester – improving either the midterm score or the homework score or both. In the homework case, the project can replace the worst three of your 12 considered homeworks. That is, you first take your best 12 homework scores and only then replace the 3 worst homework scores among these with the your SSP score (thus your SSP score will be counted three times toward your HW score). In the midterm cases, the project can average the worst midterm score out of the three, e.g., if you get from your three midterms 10%, 30% and 40% respectively and finish a self-study project with 90%, then you will obtain  $(\frac{0.1+0.9}{2} + 0.3 + 0.4)/3 \times 0.33 = 13.2\%$ .

## Course Policies

### Grading appeals

Specific grading disputes (points totaled incorrectly, asking for higher score, etc) should be brought up within 1 week of return of the assignment. Coming to me within this period does not guarantee a change, only the consideration. Appeals outside of this timeframe might not be considered.

### Attendance

Each lecture you are required to verify your attendance in the class by putting your initials on the "attendance sheet" available in the classroom. Your attendance is not counted in any way towards your grade. Important announcements regarding tests, grades, scheduling and others might be made during class and it is the student's responsibility to be informed of these.

### Classroom behavior

From *Section V – Class Attendance and Classroom Conduct* of the Student Life Policy: "The professor has the authority to determine acceptable classroom conduct for his or her students as long as those decisions do not infringe on the students' rights. Disruptive classroom conduct may be considered disorderly conduct; i.e., behavior that disturbs the peace, disrupts or interferes with the orderly functioning of the university, or interferes with the performance of the duties of university personnel. When considered in violation of this policy, you will be asked to leave the classroom."

### Accommodations for Disabilities

If you need adaptations or accommodations because of a documented disability, if you have emergency medical information to share with me, or if you need special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible but no later than in the first two weeks of the course.

### Honor Policy

All assignments and tests submitted will be considered graded work and must be completed individually. No consultation is permitted on tests and quizzes. Homework may be discussed with other students as well as with the instructor. However, in writing up an assignment to be handed in, each student works alone and certifies that what is written accurately represents the student's own understanding of the material expressed in the student's own words. The Undergraduate Honor Code pledge that each member of the university community agrees to abide by the following: "As a Hokie, I will conduct myself with honor and integrity at all times. I will not lie, cheat, or steal, nor will I accept the actions of those who do."

The Virginia Tech honor code pledge for assignments states: "I have neither given nor received unauthorized assistance on this assignment." The pledge is to be written out on all graded assignments at the university and signed by the student. The honor pledge represents both an expression of the student's support of the honor code and an unambiguous acknowledgment

that the student has, on the assignment in question, abided by the obligation that the Honor Code entails. In the absence of a written honor pledge, the Honor Code still applies to an assignment. Students enrolled in this course are responsible for abiding by the Honor Code. A student who has doubts about how the Honor Code applies to any assignment is responsible for obtaining specific guidance from the course instructor before submitting the assignment for evaluation. Ignorance of the rules does not exclude any member of the University community from the requirements and expectations of the Honor Code.