

Department of Mathematics, University of Toronto
MAT267H1S - Advanced Ordinary Differential Equations
Syllabus—Winter 2020
January 30, 2019

This is an introductory course in differential equations designed for second-year MAT157-stream Specialists in the Faculty of Arts & Science (Math & Physics, Math & Philosophy, Applied Math, and Math).

The prerequisites are MAT157Y1 and MAT247H1. MAT257Y1 is a co-requisite. You need to fill out a prerequisite waiver if you do not already have course credit for both MAT157Y1 and MAT247H1 or if you're not currently enrolled in MAT257Y1 (and don't already have course credit for it). Go to <http://www.math.toronto.edu/cms/undergraduate-program/current-students-ug/forms/> for more information. You're encouraged to attend lectures and tutorials until your prerequisite application has been decided upon.

Lecture Information

Time & Room	Professor	Office	email address
Tue 1:10-2 (LM161), Thu 1:10-3, MP 102	Mary Pugh	BA 6268	mpugh@math.utoronto.ca

Webpage, Email Information, Piazza

The course website is http://www.math.utoronto.ca/mpugh/Teaching/MAT267_20/mat267.html. All announcements and handouts will be posted there. Please go there regularly.

From time to time, I may contact you by via email. It is crucial that your email on ROSI be a utoronto.ca email address — otherwise you may miss course emails. If you want to email me, you must do so from your utoronto.ca email address; this is a UofT policy.

The course's piazza page is <http://piazza.com/utoronto.ca/winter2020/mat267>. You should be able to enrol by going to this URL. (Please let me know if you have problems.) If you have math questions, please post them there so that your classmates can offer you hints and suggestions. And please feel free to reciprocate. At least one of the TAs and I will also be checking in every now and then to help (if needed). You're not required to use piazza.

Textbook and Additional Material

The textbook is the third edition of *Differential Equations, Dynamical Systems, and an Introduction to Chaos* by Morris Hirsch, Stephen Smale, and Robert Devaney. It should be available in the UofT bookstore.

The textbook is a more introductory version of the Hirsch & Smale classic *Differential Equations, Dynamical Systems, and Linear Algebra*. It provides the viewpoint needed to enter into the arena of nonlinear dynamics and dynamical systems. That said, it does not contain some of the analytical material that you will need in subsequent courses in geometry, analysis, and PDE. For this reason, additional material will be provided when needed.

Drop-in Hours

I will hold weekly drop-in hours where you can come with your questions, ideas, suggestions, etc. Sometimes I need to reschedule or cancel a drop-in hour; in this case I'll make a quercus announcement. If you can't make these drop-in hours you can try my MAT187 drop-in hours: Wednesdays 2:10-4 in PG 003. But you'll be competing with MAT187 students for my attention.

Drop-in hour	Time & Room
Tuesday	2:10-3, BA 6268
Wednesday	1:10-2, BA 6268

Tutorials

This is a fast-paced course, and regular attendance in your tutorial is an **essential** component of this course. Every student needs to register in a tutorial section. Tutorials begin on January 10 (the 1st week of classes). During tutorials your TA will answer your questions about the course material and discuss questions about the homework and webwork problems and related material. To get the most out of your tutorial you must keep up to date with the material/homework/webwork and come prepared to ask questions, should you have any.

Section	Time & Room
TUT0101	Fri 1:10-2, SS 1070
TUT0201	Fri 3:10-4, SS 1072

Homework and WebWork

There will be 5 homework assignments and 11 WebWork assignments. Homework assignments will be due at 11:59pm on Saturdays (feel free to complete them sooner) and will be submitted and graded using Crowdmark. WebWork assignments will be due at 11:59 on Wednesdays (feel free to complete them sooner).

If you are a student who feels that the mechanics of the material are not to be taken seriously (e.g. that it's sufficient to know what an eigenvalue is, rather than finding, using, and studying it) then you will dislike some aspects of this course. My experience is that every research mathematician's office has a) a blue bin full of scratch work, b) notebooks full of scratch work, or c) computer directories full of photos of blackboard scratch work. I don't know of any mathematics that doesn't require scratch work, computations, and worked examples. It's not all abstract thought and "Aha!" moments. In this direction, there will be material that I expect you to teach yourselves; material that is only lightly touched upon in class. There are certain things that are best learnt by doing. I strongly encourage you to work through Paul Dawkin's online notes on ODEs <http://tutorial.math.lamar.edu/Classes/DE/DE.aspx> in parallel with the course material. The WebWork assignments are there to keep you on track with the material and will be testing your foundational/mechanical/computational skills. The homework assignments will be more theoretical. Both skill sets will be tested in the exams.

The drop date, March 15, is after both midterm exams. If you don't need MAT267H1 for your program of study, bear in mind that there are three sections of MAT244H1 being offered this semester. The deadline to add yourself to that course is January 19.

Homework Due Dates
Jan 25, Feb 8, Feb 29, March 14, and March 28 at 11:59pm

WebWork Due Dates Jan 15, 22, 29, Feb 5, 12, 26, March 4, 11, 18, 25, and April 1 at 11:59pm

Midterm Exams

There will be two 110-minute exams. Either you start at 5:10 (and finish by 7pm) or you start at 5:40pm (and finish by 7:30pm) or you start at 6:10pm (and finish by 8pm). You can choose which sitting suits you best — this is an experiment to try and make things easier for your schedule. If all the coming and going turns out to be too disruptive in the first exam then there will be only one sitting for the second exam. *No-one will be allowed to arrive after 6:20pm. And, obviously, no-one may leave the exam room before 6:20pm.*

If you have any conflicts with either exam, please tell me sooner rather than later. Certainly tell me at least seven days before the exam.

	Date & Time	Location
Exam 1	February 3, 5:10-7pm/5:40-7:30pm/6:10-8pm	BA1130
Exam 2	March 9, 5:10-7pm/5:40-7:30pm/6:10-8pm	EX300

Communication and In-class Participation

Being able to speak and write easily and clearly is a vital life skill. Thriving in math classes relies on your creative problem-solving skills and your analytical abilities. These are eternally valuable (and somewhat rare) but are of little use if you can't explain your thinking, your process, and your solution! On occasion, I will ask for student volunteers to come to the blackboard and present their ideas or work. If you're avoiding volunteering because you're nervous speaking in public, you've got company. If you're nervous because you don't feel confident enough about your English, consider checking out the Communication Cafe <https://www.artsci.utoronto.ca/current/academic-advising-and-support/english-language-learning>. If you're happy with your grammar but worry about being articulate or how to best present your ideas, consider joining a local Toastmaster's group. <https://www.toastmasters60.com/find-a-club/>. This is a legitimate, nearly-century-old organization¹ https://en.wikipedia.org/wiki/Toastmasters_International.

Crowdmark

We will be using crowdmark to mark the homework, midterm exams, and the final exam. This means that your exams will scanned and the resulting pdf file will be uploaded onto the crowdmark servers. Crowdmark is not out-sourcing grading — your quizzes and exams will be graded by the TAs and me.

Remarking Procedure

Should you feel that your homework or exams have been misgraded, then you must submit a request for regrading (with written justification) within 7 days of when the item in question was returned. Your TAs will handle homework regrading and I will handle exam regrading. If you find that you are not satisfied by the outcome of a homework remarking request then you can make a follow-up request to me. **In all cases, bear in mind that a remarking request can lead to an increase, decrease, or not change in the mark.**

¹When Rotman, CAMH, Engineering, Sick Kids, and Queens Park all have toastmaster clubs, you should know there's a there there. Unless you're intrigued by other groups, or want one close to where you live, consider one of the two engineering ones? Or just choose one that's open and has a meeting time that works for you.

Missed Term Work

If you miss a homework or a WebWork assignment, so be it. This is precisely why the marking scheme has some wiggle room in it (not every assignment is used). Late homework will have an automatic deduction of 10% per late day — whatever mark you earn will be decreased by $n \times 10\%$ where n is the number of days late.

If you miss an exam for a legitimate and serious reason, you or someone who speaks for you must email me within twenty-four hours of the exam. In addition, you must submit a hard copy the standard documentation to me within one week of the exam. Go to <https://fas.calendar.utoronto.ca/term-work-tests-and-final-exams> for instructions and more information.

Collaboration

Working together on course material, including homework, is a useful and mathematically healthy practice. I strongly encourage you to find some study buddies! (That said, the process of being comfortable with not-knowing and wandering around in confusion while you try different ideas and approaches to homework problems is key to your learning of the material. And to life.)

However, you need to make sure that you fully understand the material. If you're working with others and you solve a HW problem as a team then you should step back and return to the problem in a few hours. *Without looking at your notes* solve the problem again and write up the solution. If you can't do this you've discovered two things: 1) you haven't understood the material sufficiently well to be able to generate the solution on your own and 2) if you were to look at the notes and use them to write up a solution and submit that for a mark, you would be submitting someone else's work in your name. This is an academic offense!

As you become more advanced in mathematics, or any academic research, you will be expected to be able to identify who provided what ideas/techniques and you'll be allowed to submit work with multiple authors. But for this course the standard is: you should be using your own words and it should be your own work in that you were able to write it up without looking at/speaking to other sources.

"Academic Integrity in the Faculty of Arts & Science endorses the International Center for Academic Integrity's definition of academic integrity as acting in all academic matters with honesty, trust, fairness, respect, responsibility and courage. Academic Integrity applies to every member of the University, and acting with academic integrity helps preserve a community where²

- Competition is fair and honest work is rewarded;
- Students are developing the personal and professional skills needed for success, like time management, effective research/writing, independent thinking and ethical judgement;
- Intellectual property is respected;
- Our degrees continue to receive the respect and recognition they deserve."

The vast majority of students are honest and hard-working. But sometimes even honest people make bad decisions and accidents sometimes happen. Even if you think you know the rules, double-check. The consequences of not knowing the rules can be severe, and include failed courses, suspension, and in very serious cases permanent expulsion." For more information, please read <https://www.academicintegrity.utoronto.ca/perils-and-pitfalls/>.

I take academic integrity very seriously. If you have any questions at any time, about this course or any other, please ask!

²<https://www.artsci.utoronto.ca/current/academic-advising-and-support/student-academic-integrity>.

Life can be complicated

Everyone is different. Each of us has our own strengths, weaknesses, gifts, and needs. If there are accommodations that would help you achieve academic success in this course, please feel free to approach me or Accessibility Services <https://www.studentlife.utoronto.ca/as> , if you haven't already done so.

"Students can connect with a learning strategist for individualized support to³:

- Learn to manage time and stress, and address procrastination issues
- Develop new strategies including active studying, reading and note-taking, and exam preparation
- Improve research, assignment completion and presentation skills
- Navigate the University's academic systems and services"

You can make an appointment to see a learning strategist at the Student Success Centre. They're also at a variety of locations around campus including First Nations House and all seven colleges. see <https://www.studentlife.utoronto.ca/asc/hours> for more information.

If you are experiencing challenges that are having an impact on your academic work, please seek support sooner rather than later. Your college registrar should be able to help. For some quick resources re: academic/financial/housing/mental health distress or sexual assault/safety, see <https://studentlife.utoronto.ca/feeling-distressed>.

Marking Scheme

Your course mark will be the maximum of the following two blends:

	best 4 out of 5 homeworks	15%
	best 9 out of 11 WebWorks	10%
<u>Blend 1:</u>	best midterm exam	25%
	worst midterm exam	15%
	final exam	35%

	best 4 out of 5 homeworks	15%
	best midterm exam	25%
<u>Blend 2:</u>	worst midterm exam	20%
	final exam	40%

³From <https://www.studentlife.utoronto.ca/asc/hours>

MAT267 – Winter 2020 – Schedule

Jan 5	Jan 6	Jan 7 First class	Jan 8	Jan 9	Jan 10 Tutorials start	Jan 11
Jan 12	Jan 13	Jan 14	Jan 15 WebWork	Jan 16	Jan 17	Jan 18
Jan 19	Jan 20	Jan 21	Jan 22 WebWork	Jan 23	Jan 24	Jan 25 homework
Jan 26	Jan 27	Jan 28	Jan 29 WebWork	Jan 30	Jan 31	Feb 1
Feb 2	Feb 3 Test 1	Feb 4	Feb 5 WebWork	Feb 6	Feb 7	Feb 8 homework
Feb 9	Feb 10	Feb 11	Feb 12 WebWork	Feb 13	Feb 14	Feb 15
Feb 16	Feb 17 Reading week	Feb 18	Feb 19	Feb 20	Feb 21	Feb 22
Feb 23	Feb 24	Feb 25	Feb 26 WebWork	Feb 27	Feb 28	Feb 29 homework
Mar 1	Mar 2	Mar 3	Mar 4 WebWork	Mar 5	Mar 6	Mar 7
Mar 8	Mar 9 Test 2	Mar 10	Mar 11 WebWork	Mar 12	Mar 13	Mar 14 homework
Mar 15	Mar 16	Mar 17	Mar 18 WebWork	Mar 19	Mar 20	Mar 21
Mar 22	Mar 23	Mar 24	Mar 25 WebWork	Mar 26	Mar 27 Last tutorial	Mar 28 homework
Mar 29	Mar 30	Mar 31	Apr 1 WebWork	Apr 2 Last class	Apr 3	Apr 4