Syllabus for Math 3600, Differential Equations I

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1 Essential Information

We begin with a list of the essential (and mandatory) details for the course:

Course Instructor

Dr. Sean Fitzpatrick
Contact: via email (sean.fitzpatrick@uleth.ca)
Office: UH C540
Student hours:

- Drop-in: Monday 1:00 – 2:00 pm; Tuesday and Thursday 1:00 – 3:00 pm
- By appointment (calendly.com/dr-sean-fitzpatrick): Tuesday and Thursday 10:00 am – 12:00 pm

Any exceptions to this schedule will be announced on Moodle.

Course Website:

via Moodle (moodle.uleth.ca)

Course Textbook

Our primary textbook will be *Notes on Diffy Qs: Differential Equations for Engineers*, by Jiří Lebl. There are a few relevant links:

- Textbook home page (jirka.org/diffyqs/)
- HTML textbook (jirka.org/diffyqs/html/)
- Trefor Bazett's UVic version (web.uvic.ca/~tbazett/diffyqs/) (with videos)

An additional reference is *The ODEs Project* (judsonbooks.org/odeproject/odeproject-html/), by Tom Judson. In particular, we will make use of some of his project pages for the assignments.

Class Meetings

Monday and Wednesday at 9:00 am in SA6212.
First day of class is Monday, September 8th.

Course Description

(As per the Academic Calendar. See Section 3, p. 2 for a more useful description.)

> First order ordinary differential equations. Second and higher order ordinary differential equations. Linear systems of ordinary differential equations. Qualitative theory of ordinary differential equations. Applications. Series solutions. Singular point expansions. Elementary linear difference equations.

2 Introduction to Math 3600

Oki, and welcome to the University of Lethbridge. Our University's Blackfoot name is Iniskim, meaning Sacred Buffalo Stone. The University of Lethbridge acknowledges and deeply appreciates the Siksikaitsitapii peoples' connection to their traditional territory. We, as people living and benefiting from Blackfoot Confederacy traditional territory, honour the traditions of people who have cared for this land since time immemorial. We recognize the diverse population of Indigenous Peoples who attend the University of Lethbridge and the contributions these Indigenous Peoples have made in shaping and strengthening the University community in the past, present, and in the future.

Most of your courses, including this one, will be facilitated using the Moodle (`moodle.uleth.ca`) learning management system. You'll want to spend time as soon as you can familiarizing yourself with your course Moodle pages, and plan to check each one on a daily basis.

Don't hesitate to reach out if you have questions. If you have questions that are not related to the course, you can ask those too, and we'll try to answer, or to direct you to someone who can.

3 Course description

Math 3600 is a first course in differential equations. Differential equations arise throughout science and engineering; any time something is changing, there is probably a differential equation involved. This course is very closely related to calculus, and will rely in particular on skills like evaluating integrals and manipulating power series.

In this course, we focus on different types of **ordinary** differential equations; that is, differential equations involving on independent variable and one dependent variable, or systems of such equations. (Differential equations with several independent variables are called **partial** differential equations; you meet these in Math 3650.)

We will cover analytic methods for solving common types of first- and second-order differential equations, as well as systems of differential equations. Traditionally, differential equations was a bit of an engineering-style "cookbook" course, with a laundry list of different types of equations, and methods for solving them. However, most people who need to solve differential equations on the job these days are doing so numerically, not analytically. Although numerical methods are not officially part of Math 3600, we will take some time to consider numerical and qualitative methods that are part of a modern course in differential equations.

I will try to demonstrate use of technology for solving differential equations where appropriate, but it won't be a primary focus of the course.

4 Assessment and grading

Since this is my first run with Math 3600, we'll stick with a fairly routine grading scheme: homework, quizzes, assignments, and an exam. Details are as follows:

Homework (20%)	There will be weekly online homework assignments, delivered via WeBWorK. Homework will be due on Thursday.
Assignments (20%)	There will be three written assignments, based on the projects in Tom Judson's book. Assignments can be done in groups. The assignments will be due on the last Friday of each month (September, October, and November).
Quizzes (30%)	Every other week, we will do a short quiz in class (about 30 minutes). Quizzes will take place on Wednesdays.
Final exam (30%)	It's a final exam.

Each of the grade components above will be assigned a numerical score. These will be added to get a score out of 100. Your score out of 100 is converted into a letter grade according to the following table.

Table 4.1 Conversion of percentage scores to letter grades in Math 1560

A+	96-100
A	90-95
A-	87-89
B+	84-86
B	79-83
B-	76-78
C+	73-75
C	68-72
C-	65-67
D+	60-64
D	50-59
F	0-49

Other grading policies.

- *Due dates.*

  Homework due dates are flexible, and provided primarily for your benefit, to help with planning. (A course without deadlines can be a disaster for those who procrastinate.) Online homework will be set up with a *reduced scoring period*. Problems completed before the due date receive full credit. Problems completed during the reduced scoring period get a 5% [1] penalty.

  Unless you have made arrangements with me due to exceptional circumstances, work that is more than one week late will not be graded.

- *Dropping lowest grades.*

  I will drop your lowest quiz grade (so your best five out of six will count). Generally, if you miss a quiz, it will count as the one that gets dropped. I will also drop one assignment, and one homework set.

5 Course policies (an FAQ)

This section deals with questions about accommodations, missed tests, and other exceptional (yet common) cases.

1. *This week is super busy and I don't think I can finish the homework on time. Can I have an extension?*

   Yes.

[1] Why 5%, you ask? Because it is the smallest penalty that WeBWorK will let me assign.

2. *What happens if I get sick?*

   First and foremost, do not come to class and make everyone else sick! I'll do my best to be accommodating of any illness that interrupts your studies. There is no need to provide details of the illness. If you miss a week or more of work, please get in touch to make a plan for catching up. One of the biggest challenges in math is that once you fall behind, it's difficult to catch up on your own.

   If you're staying home to avoid spreading illness to others (thank you!), but well enough to attend class, I'll try to provide you with a video link via Teams or Zoom.

3. *What exactly does academic honesty mean?*

   In short, that any work you represent as your own, is your own. Much of your work can be done in groups, but not all of it. I will assume that you have access to a calculator, including online software that gives you step-by-step solutions.

   Use of these tools while practicing is acceptable, but take care that you are not overly reliant on them. What is not acceptable is having someone else do your work for you. This includes tutors, classmates, friends, family members, online "homework help" sites. If you submit work that somebody else did for you, you are committing an academic offence.

   If you have someone else write a test or exam for you, not only have you committed an academic offense, but the person impersonating you is at risk of criminal fraud charges under Canadian law.

   Penalties for academic dishonesty are outlined in the New student code of conduct (`www.ulethbridge.ca/policy/resources/new-student-code-conduct-policy`). Depending on the severity of the offence, penalties for a first offence can range from a grade of zero on an assessment, to an F in the course. Academic offences are also reported to the Dean of Arts & Sciences. They keep a record of each offence, and students with multiple offences can be subject to supplementary discipline.

4. *Do "acceptable online tools" include the use of AI?*

   If you are just doing extra practice and nobody better is around to talk to, you can use AI to check your work. If you use AI to do your homework (for marks) you're committing an academic offence.

   In either case, you're mostly cheating yourself. One thing researchers learned about AI is that it is very effective at circumventing critical thinking, and reducing learning.

   The point of everything you do in a university class is the process, not the outcome. The process is where learning takes place. If you hand it off to someone (or something) else, you're depriving yourself of that learning opportunity.

5. *Does that mean I'm not allowed to get help with my homework?*

   Not at all! Working with classmates on your homework is a great way to learn. But keep in mind that your course instructors will be available for help, free of charge. (OK, maybe not free of charge, but you've already paid for it with your tuition.) We will be responding on the discussion forum regularly, There will be time to ask questions in every class, and there will be online office hours. The Student Success Centre will also be running free help sessions (details TBA).

   Some of you may still decide to pay for tutoring, and that's fine. But you have a duty to disclose sources of help on an assignment, and the individual tests are still tests, even if you won't have someone watching over your shoulder.

   You should probably avoid the various paid "homework help" websites. Most of these don't offer help. They offer worked solutions for a price. Getting those solutions won't help with your understanding. More importantly, the people working for these sites are paid (poorly) per solution, and they often provide incorrect and/or badly written work. ChatGPT is not much better (at least, not yet).

6. *I missed a quiz! What do I do? Do I get a zero?*

   First, contact us as soon as possible for any missed test. There are *four* tests, and I only count your best *three* towards your grade. As long as you only miss one test, there is no penalty. This is true regardless of your reason for missing the test.

7. *What if I really wanted to write that quiz?*

   Inform us of this when you contact us to explain your absence. There's no guarantee that we can schedule a makeup test, but we'll try. You're more likely to get a makeup test if you've contacted us in advance.

8. *What about the final exam?*

   If you are unable to write the final exam, you will need to contact Academic Advising. They are responsible for authorizing rescheduling of exams. Usually if you miss an exam due to illness, an incomplete grade is recorded. You will write a makeup exam at a later date, at which point your grade will be updated.

9. *Do I need a doctor's note?*

   No. This wastes health care resources and your time. (That was my answer before the pandemic, and it's doubly so now.) Just email me to say you were sick. However, if you miss more than one test due to illness, we'll need to meet to discuss how to adjust your grade.

10. *I receive learning accommodations. What arrangements can I make?*

    First, make sure that you have registered with the University's Accessible Learning Centre (`www.ulethbridge.ca/accessible-learning-centre`). No need to let me know: they notify me of every student with accommodations.

    If there are any adjustments I can make to facilitate your learning, please do not hesitate to get in touch with me. All students deserve an equal opportunity to learn. Note that the HTML textbook is designed with accessibility in mind, and should work with screen readers.

11. *Life intervened and I can't keep up this week. What do I do?*

    Send me an email, and I'll help you out as best I can. Book an appointment with me as soon as you feel like you're falling behind and I'll do my best to get you up to speed.

6 Course schedule

We will follow the schedule below as closely as possible. Some variations will inevitably occur; see Moodle for the most up-to-date information.

Table 6.1 Schedule for Fall 2025

Date	Topic	Readings in Lebl	Readings in Judson
Sept. 8	Introduction	0.1-0.3	1.1
Sept. 10	Review	1.1, 1.3, 1.4	1.3, 1.5
Sept. 15	Exact & Bernouli eq'ns	1.5, 1.8	N/A
Sept. 17	Quiz 1, slope fields	1.2	1.3
Sept. 22	Autonomous eq'ns	1.6	1.7
Sept. 24	Existence and uniqueness	1.2	1.6
Sept. 29	Second-order equations	2.1,2.2	4.1
Oct. 1	Quiz 2, forcing	2.4, 2.5	4.2, 4.3
Oct. 6	Resonance	2.6	4.4
Oct. 8	Higher-order equations	2.3	N/A
Oct. 13	Intro to systems	3.1	2.1
Oct. 15	Quiz 3, Direction fields	3.1	2.2
Oct. 20	Linear systems	3.2, 3.3	3.1
Oct. 22	Eigenvalues	3.4	3.2, 3.3
Oct. 27	More eigenvalues	3.5 - 3.7	3.4, 3.5
Oct. 29	Quiz 4, matrix exponential	3.8	3.9
Nov. 3	Power series	7.1	N/A
Nov. 5	Series solutions	7.2	N/A
Nov. 17	More series	7.2	N/A
Nov. 19	Quiz 5, singular points	7.3	N/A
Nov. 24	Euler's method	1.7	1.4
Nov. 26	Linear difference eq'ns	N/A	N/A
Dec. 3	TBD	N/A	N/A
Dec. 5	TBD	N/A	N/A
Dec. 8	Review		