Math*3100 – Differential Equations II

Fall 2017

Instructional Support

Professor:
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Teaching Assistant:
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Meeting Times

Lectures:
Tuesdays and Thursdays, 11:30 – 12:50 pm, ALEX 218

Labs:
Mondays, 10:30 – 11:20 am, MCKN 115

Office Hours:
"One-on-One" Office Hours: Mondays, 3:45 – 5:15 pm, MACN 543
"Group" Office Hours: Tuesdays, 10:00 – 11:15 am, MACN 434

Learning Resources

Course Website:
Course materials, news, announcements, new assignments, weekly practice problems, and grades are posted regularly on the Courselink website. It is your responsibility for keeping up-to-date with it. Check it every day.

Required Text:
There is no required text for this course. The primary resource for this class will be the notes that we create every day together in class.

Recommended Text:
Elementary Differential Equations and Boundary Value Problems – 11th Edition, by William E. Boyce and Richard C. DiPrima. If you find an older version for cheaper, that will work just fine. This text will be used for extra background reading and practice problems for certain topics, though we will go "off-track" at a few points.

Communication and Email Policy:
Please feel free to ask any questions during or just after lectures. Be an active part of every class discussion if you can!

If you can't ask me a question during or after class, there are still options for help:

- Come to my posted office hours or take advantage of the TA's. Don't be intimidated – they are there to help you out, even if you are behind.
- Use the discussion forums available to you on Courselink; it's possible that a classmate will know the solution and will be able to help you.
- Send me an email (mdemers@uoguelph.ca). If you do this, it would be extremely helpful for you to *include a picture of the work you have done*, so I can easily see where you might be stuck and be able to help you more quickly.

Assessment

Lab Assignments:
Most weeks*, there will be a short assignment given in your lab tutorial, from the material of the week before. You may work individually, or in groups of up to three. You may submit your completed assignment either within the lab, or to me the next day (Tuesday) during office hours or at the scheduled lectures. Assignments will not be accepted after the end of Tuesday classes.

*NOTE: NO Lab Assignment will be given in the first full week (September 11) or the week of Thanksgiving Day (October 9). In the first week, the TA will organize the tutorial as a review session.

Tests:
There will be two tests during the semester. Tests will be held during class time (location to be determined) and be 75 minutes in duration.

The tests will be held Tuesday, October 17, 11:30 am – 12:50 pm and Tuesday, November 14, 11:30 am – 12:50 pm

Final Exam:
The final exam will be held Wednesday, December 6, 2:30 – 4:30 pm. More details about the final exam and the location will be shared in class and on Courselink toward the end of the semester.

Distribution:
Lab Assignments: 2% apiece up to a maximum of 20%**
Test 1: 20%
Test 2: 20%
Final Exam: 40% (**+2% for each missed lab assignment)

Course Grading Policies

Academic Consideration:
When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise me in writing, with your name, Student ID number, and email contact. See the academic calendar for information on regulations and procedures for Academic Consideration.

Accommodation of Religious Obligations:
If you are unable to meet an in-course requirement due to religious obligations, please email the course instructor at the start of the semester to make alternate arrangements. See the undergraduate calendar for information on regulations and procedures for Academic Accommodation of Religious Obligations.

Missed assignments:
The weight of any missed lab assignments will be automatically transferred to the final exam. Late assignments will not be accepted.

Missed midterm tests:
Missed tests will receive a grade of 0% unless academic consideration can be granted. If accommodation is granted, the weight of the missed test will be added to the final exam. There will be no makeup tests.

Passing grade:
In order to pass the course, you must receive a final grade of at least **50%**.

Calendar Description

This course continues the study of differential equations. Power series solutions around regular singular points including Bessel equations are presented. First order linear systems and their general solution by matrix methods are thoroughly covered. Nonlinear systems are introduced along with the concepts of linearization, stability of equilibria, phase plane analysis, Lyapunov's method, periodic solutions and limit cycles. Two-point boundary value problems are discussed and an introduction to linear partial differential equations and their solution by separation of variables and Fourier series is given.

Learning Outcomes

At the successful completion of this course, the student will have demonstrated the ability to:

1. Use power series to solve differential equations with variable coefficients (about ordinary and regular singular points)
2. Determine solutions for Cauchy-Euler equations.
3. Define and/or derive certain special functions, including the Gamma Function and Bessel Functions.
4. Find the solutions to linear systems of ODEs
5. Illustrate the flow of solution trajectories for various systems of ODEs using phase portraits.
6. Determine the stability of equilibria of systems of ODEs.
7. Formulate solutions to linear systems using the matrix exponential.
8. Draw conclusions for qualitative behaviour of nonlinear systems based on local behaviour of equilibria.
9. Utilize Lyapunov’s second method for determining stability of equilibria.
10. Identify limit cycles of certain systems and determine their stability.
11. Use the method of separation of variables and Fourier Series to help find classical solutions to simple PDEs.

Lecture Schedule

(Please note that the timing may vary slightly)

Lecture #	Topic	Outcomes
1	Review of Power Series	-
1-2	Power Series Solutions to ODEs about Ordinary Points	1
3	Cauchy-Euler Equations	2
4-6	Power Series Solutions to ODEs about Regular Singular Points	1,3
7-9	Introduction to Linear Systems of DEs, depicting solutions using phase portraits, equilibria, and stability	4,5,6
10	Test 1	-
11-12	Complex Eigenvalues and Spiral trajectories	4,5,6
13-14	Repeated Eigenvalues and Jordan nodes	4,5,6
15	The Matrix Exponential	4,7
16	Solving Nonhomogeneous Systems	4
17,19	Nonlinear Systems and Phase Portraits	5,6,8
18	Test 2	-
20	Lyapunov's Second Method	9
21	Limit Cycles	8,10
22-24	Introduction to Fourier Series and PDEs	11

Important Dates

Thursday, September 7: First day of classes
Monday, October 9: Thanksgiving Day (no classes scheduled)
Tuesday, October 10: Fall Study Break Day (no classes are scheduled)
Friday, November 3: 40th class day; this is the last day you may drop courses
Thursday, November 30: Tuesday class schedule is in effect
Friday, December 1: Last day of classes; Monday class schedule is in effect

Other Information

E-mail Communication
As per university regulations, all students are required to check their e-mail account regularly: e-mail is the official route of communication between the University and its students.

When You Cannot Meet a Course Requirement
When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. See the undergraduate calendar for information on regulations and procedures for Academic Consideration.

Drop Date
Courses that are one semester long must be dropped by the end of the fortieth class day; twosemester courses must be dropped by the last day of the add period in the second semester. The regulations and procedures for Dropping Courses are available in the Undergraduate Calendar.

Copies of out-of-class assignments
Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

Accessibility
The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required, however, interim accommodations may be possible while that process is underway. Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability. Use of the SAS Exam Centre requires students to book their exams at least 7 days in advance, and not later than the 40th Class Day. More information: www.uoguelph.ca/sas

Academic Misconduct
The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community – faculty, staff, and students – to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages

misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor. The Academic Misconduct Policy is detailed in the Undergraduate Calendar.

Recording of Materials
Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, a classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

Resources
The Academic Calendars are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs.