MATH*3100
Differential Equations II
Winter 2019

UNIVERSITY of GUELPH

(Revision 0: January 2nd, 2019)

1 Instructional Support

1.1 Instructor

Kimberly M. Levere, Ph.D.
Office: MacN 539, ext. 56908
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Office hours: Monday 10:00am-11:00am, Thursday 1:00pm – 2:00pm in MACN*539

1.2 Teaching Assistants

Harry Gaebler

2 Learning Resources

2.1 Course Website

Course material, news, announcements, and grades will be regularly posted to the MATH*3100 Courselink website. You are responsible for keeping up-to-date on this site.

2.2 Required Resources

1. The course manual MATH**3100 – Differential Equations II - Course Manual 1st Edition)*, is available at the MacNaughton Bookstore. This is the primary resource for the course and will be completed in class as the course progresses.
2. *Elementary Differential Equations and Boundary Value Problems* by Boyce, DiPrima & Meade. Any edition is fine; the newest is the 11th.

2.3 Recommended Resources

none

Lecture Information:

It is strongly recommended that you attend every class. We will complete the course manual together during lectures so please bring it to every class.

2.4 Communication & Email Policy

Please use office hours and Courselink discussion forums as your main opportunity to ask questions about the course. Major announcements will be posted to the course website. **It is your responsibility to check the course website regularly.** As per university regulations, all students are required to check their <uoguelph.ca> e-mail account regularly: e-mail is the official route of communication between the University and its students.

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3 ASSESSMENT

3.1 Dates and Distribution

Your grade will be determined using the following grading scheme:

Assessment	Date	Weight
10 Lab Assignments (for each missed lab assignment, the 2% weight will shift to the final exam)	Given weekly in Wednesday labs Due on Fridays no later than 1:30pm	2% each up to a maximum of 20%**
Term Test 1	Wednesday, February 6th 5:30-6:50pm	20%
Term Test 2	Wednesday, March 13th 5:30-6:50pm	20%
Final Exam	Wednesday, April 17th 7:00-9:00pm	40% (+2% for each missed lab assignment)

**You must receive at least 50% of the marks available, in total, on the term tests and final exam that are used to calculate your final grade. That is,

(Total marks earned on all tests and exam) ÷ (Total marks available on all tests and exam) ≥ 50%

If you do not achieve this, your maximum possible final grade will be 48%, *no matter what grade you receive on the lab assignment component*. Considerations may be made according to the policies listed in Section 3.2.

Lab Assignments: In each lab (with the exception of term test weeks; Weeks 5 and 9) you will be given a short lab assignment. Depending on the week, the TA may spend time doing extra examples or teaching additional concepts to help you with the assignment, or they may just devote the lab time to helping you directly with your assignment. Lab assignments will be due in the same week on Fridays no later than 1:30pm. There will be no lab assignments in term test weeks. The weight of any missed lab assignments will be automatically transferred to the final exam. Late assignments will not be accepted.

Term Tests: There will be two term tests during the semester. Both will be held **in your regular weekly lab**, although **I have extended the time slot until 6:50pm** to give you more time to complete your tests. Specific details of what will be covered on each test will be announced in class and on Courselink. Dates, locations and times are listed below.

Term Test 1: Wednesday, February 6th, 2019 - 5:30-**6:50**pm (Week 5)
(1 hour and 20 minutes to write)
Location: in your lab, MCKN*121

Term Test 2: Wednesday, March 13th, 2019 - 5:30-**6:50**pm (Week 9)
(1 hour and 20 minutes to write)
Location: in your lab, MCKN*121

Final Exam:

Final Exam: Wednesday, April 17th, 2019, 7:00pm-9:00pm
(2 hours to write)
Location: TBA

3.2 Course Grading Policies

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

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: http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-accomrelig.shtml

Missed term tests: Missed term tests will receive a grade of 0%, unless they are missed due to any of the above reasons, in which case the weight of the missed test will be added to the final exam. There will be no makeup term tests.

Passing grade: In order to pass the course, you must receive a final grade of at least **50%**. Additionally, in order to pass this course, you must receive at least 50% of the marks available, in total, on the term tests and final exam that are used to calculate your final grade. If you do not achieve this, your maximum possible final grade will be 48%.

Copies of lab assignments: Keep paper and/or other reliable back-up copies of all lab assignments. You may be asked to re-submit this work at any time.

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4 AIMS AND OBJECTIVES

4.1 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.

Credit Weight: 0.5 **Department:** Mathematics & Statistics **College:** CEPS **Campus:** Guelph

Prerequisite: (1 of MATH*1160, MATH*2150, MATH*2160), (MATH*2170 or MATH*2270)

4.2 Course Aims

This course utilizes the concepts from your first differential equations course in order to extend these concepts. The main goals of the course are (1) the extension of power series solutions to discuss irregular singular points, (2) the extension of single differential equations to systems of linear differential equations and phase portraits, (3) a study of nonlinear differential equations, linearization, and Lyapunov functions, (4) the possibility of periodic solutions and limit cycles and (5) an introduction to partial differential equations. The objective of the course is to give you a strong background in ordinary differential equations that you will require as you progress through your degree (and beyond), as well as to introduce you to partial differential equations and their role in mathematics.

4.3 Learning Objectives

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

1. Identify ordinary, regular and irregular singular points and find power series solutions where possible.
2. Solve linear homogeneous systems of ODEs, draw their phase portraits, and analyze their stability.
3. Solve linear non-homogeneous systems of ODEs.
4. Solve first-order autonomous nonlinear systems of ODEs via linearization, draw local and global phase portraits and classify local stability.
5. Utilize Lyapunov functions to classify global stability of equilibria.
6. Identify the existence or non-existence of periodic solutions and limit cycles.
7. Solve the heat equation via separation of variables.
8. Present small theoretical proofs regarding existence and uniqueness and other relevant properties.
9. Have a strong understanding not only of HOW to solve a problem, but why the technique works and how it was developed.

4.4 Instructor's Role and Responsibility to Students

As your instructor, I must:

1. Develop and deliver course material in a professional way that facilitates learning for a variety of students and learning styles;
2. Attend all lectures, filling in the course notes as we proceed in each lecture.
3. Respond to you. This includes, as time permits, questions in lectures, after classes, during office hours, or through email (where I reserve the right to reply within a timeframe of 1-2 days). You are more than welcome to contact me at any time through these means if you have questions or concerns about the course or the course material.
4. Evaluate you fairly, and fairly as compared to your peers, providing prompt feedback on your performance and justification for your grade. I must provide academic consideration, where appropriate, as described in Section 3.

4.5 Students' Learning Responsibilities

As a member of this class, you are expected to:

1. Take advantage of the learning opportunities provided during lectures and on assignments;
2. Treat others with respect and dignity whenever you address them, in-class or online.
3. Genuinely attempt assignment questions, and complete an appropriate number of practice problems from the textbook in a timely manner, including assignments, on your own time;
4. Seek help if you have tried the assignment questions and/or textbook exercises and are still having difficulty with the course content. This means contacting me (*not* just at the last minute!) and possibly considering other resources as I recommend them to you;
5. Check all grades against tests that have been returned to you, once they are posted to the Course website, to verify that the correct mark has been recorded.
6. Notify me, as described in Section 3, in the case that there are missed tests or academic conflicts that are known in advance. If illness, work, or extra-curricular activities are causing you to struggle, you are advised to keep me up-to-date on your progress, so that I can be more helpful to you.

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5 TEACHING AND LEARNING ACTIVITIES

5.1 Timetable

Lectures:

Monday	1:30 pm – 2:20 pm	CRSC*117
Wednesday	1:30 pm – 2:20 pm	CRSC*117
Friday	1:30 pm – 2:20 pm	CRSC*117

5.2 Lecture Schedule

(schedule is approximate and subject to change depending on time constraints)

Lecture Topics	**References**
Power Series Solutions	Chapter 1
Systems of First-Order Linear ODEs	Chapter 2
Systems of First-Order Autonomous Nonlinear ODEs	Chapter 3
Periodic Solutions and Limit Cycles	Chapter 4
Introduction to Partial Differential Equations	Chapter 5

5.3 Lab Schedule

Weekly labs will held in MCKN*121 from 5:30-6:20pm on Wednesdays. You will be given an assignment in each lab (with the exception of Weeks 5 and 9 when you will have term tests during your lab time) and the TA will either teach a short lesson regarding its content, present related examples, or perhaps just provide one-on-one help with the problems. Lab assignments will be submitted in the same week on Friday by the beginning of class, 1:30pm. No late assignments will be accepted.

5.4 Other Important Dates

First day of classes: Monday, January 7th, 2019.
Reading Week: Monday, February 18th, 2019 to Friday, February 22nd, 2019. (no classes)
40th Class Day: Friday, March 8th, 2019.
Last day of classes: Friday, April 5th, 2019.
Good Friday: Friday, April 19th, 2019. (no exams scheduled)

Drop Date: Courses that are one semester long must be dropped by the end of the fortieth class day (**Friday, March 8th, 2019)**; two-semester 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.
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml

Course Evaluation Information: Near the end of the term, you will be given the opportunity to evaluate your instructor and provide comments regarding your experience. The evaluations for this class will be done in-class. Your instructor will inform you of when these are to take place.

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6 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.

6.1 Resources

The Academic Misconduct Policy is detailed in the Undergraduate Calendar:
http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml

A tutorial on Academic Misconduct produced by the Learning Commons can be found at:
http://www.academicintegrity.uoguelph.ca/

7 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

8 RECORDING OF MATERIALS

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

9 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.
http://www.uoguelph.ca/registrar/calendars/index.cfm?index