Course Syllabus
MA305: Differential Equations II
Department of Mathematics, Faculty of Science, Waterloo Campus
Fall | 2017

Instructor Information
Roderick Melnik | LH-3075
Contact Information: tel. 3662, email: rmelnik@wlu.ca
Weekly Office Hours**:** Tuesday, Thursday 14:30 - 15:30 or By Appointment

Course Information

Calendar description : Numerical solutions of differential equations and boundary value problems; linear systems of differential and difference equations including their solution by matrix methods and their stability; introduction to dynamical systems. Numerical methods will be illustrated by exercises requiring the use of a computer

Pre-requisites : MA122, MA104 or MA200, MA205 and either a 0.5 credit in computer programming or permission of the department.

Exclusions: MA308.

Course location, meeting times and days: Classroom 1-101A DAWB, Tuesday and Thursday 13:00 - 14:20

Course Overview and Approach
Course form: Lectures, homework assignments, and tests.

Course outline: The course consists of two lectures a week, two assignments, one test during the term, and the final examination.

In this course, you will study some of the most fundamental methodologies for solving differential equations, which should give you a good background for more advanced study in applied mathematics.

During the term you will be introduced to *a selection* of the following topics:
- Basic concepts. Differential equations and boundary value problems. Mathematical models based on differential equations and their applications.
- Euler's methods for numerical solutions of differential equations.
- Explicit and implicit numerical methods. Predictor-corrector methodologies.
- Numerical methods based on Taylor and Runge-Kutta formulae.
- Solving systems of differential equations. Higher order equations.

- Introduction to dynamical systems and methods of their analysis.
- Systems of linear differential equations, their solution and stability, introduction to computational algebra.
- Methods for solving boundary value problems.

Course Learning Outcomes

After studying this course, you should be able to:

- understand basic definitions and terminology associated with both initial value and boundary value differential equations and their solutions;
- solve initial value problems for first order differential equations with explicit and implicit numerical methods, as well as with predictor-corrector methodologies;
- solve higher order equations, as well as boundary value problems for ordinary differential equations.

Course Tools and Learning Materials

All necessary handouts will be given to you during the course when applicable. Some lectures in this course will follow the text:
- Nagle, Saff, and Snider, *Fundamentals of Differential Equations and Boundary Value Problems*, 7/E, Addison-Wesley, 2017.

The above book is a good introductory book to the subject. It covers a substantial number of the topics that will be discussed in the class (in particular, in Chapters 3, 5, 9, and 11). However, it is not compulsory to buy this book. Your lecture notes should be sufficient. Some of auxiliary materials may be posted to the course website at this link, including some software links for those who would like to master the subject at a higher level. In addition to these materials and lecture notes, there is a wealth of literature for this course and you can find a number of texts that may be useful for the course and for your own future work. Although the use of additional literature is not required for this course, it is highly encouraged.

Student Evaluation

The assessment in this course will consist of two assignments given to you during the term, one test (October 31, 2017, in class, 13:00--14:20), and the final examination (2.5 hours). During your examination calculators, including programmable ones, are permitted. The final mark will be converted to a letter grade in accordance with the conversion table given in the current University Calendar.

Assessment	Weighting	Due Date
Assignment 1	10%	TBA in the class
Assignment 2	10%	TBA in the class
Mid Term Test	20%	October 31
Final Exam	60%	TBA
Total	**100%**	

 In the event of a question regarding a test mark or the final grade, it is the responsibility of the student retain and present graded materials that have been returned to the student during the term. Students have one week from the day marked material is returned in class to appeal their grade. No marks will be changed after that time.

Policy statement

Your attendance and promptness are quite important for this class.

- For general University rules see the current Laurier Calendar (highlights are given in the end of this statement).
- You are encouraged to collaborate on different aspects of this course with your fellow students. However, your final examination, assignments and the test submitted for grading must be written independently.
- Exercises/problems will be distributed in the class on a regular basis. Some of these problems you will be required to submit as your homework assignments. Which particular problems you will need to submit as part of your assignments, along with assignment due dates, will be announced in the class. The assignments will be collected at the beginning of class the day they are due. After this date, no assignments will be accepted under no circumstances. Graded assignments will be returned to you as soon as possible.
- Even though written presentations of all problems are not required, students are urged to attempt all given problems. Note that during the test and the final exam, your skills in solving problems such as those given to you in the class are essential. Success in this course usually depends on your regular practice.

Students are expected to be aware of and abide by all University regulations and policies, as outlined in the current Academic Calendar. In particular,

1. **Final Examinations**
Students must reserve the examination period of **December 9-22, 2017.** If you are considering registering for a special examination or event, you should select a time outside the examination period. Consult Academic Regulations in the Academic Calendar for special circumstances for examination deferment.

2. **Special Needs**
Students with disabilities or special needs are advised to contact Laurier's Accessible Learning Centre for information regarding its services and resources. Students are encouraged to review the *Undergraduate Academic Calendar* for information regarding all services available on campus.

3. **Academic Integrity/Misconduct** (cheating, plagiarism)
The University has a defined policy with respect to Academic Misconduct; penalties are severe and enforced at all times. You are responsible for familiarizing yourself with the academic misconduct policy and penalty guidelines, and are cautioned that, in addition to failure in a course, students may be suspended or expelled from the University for academic misconduct, and the offence may appear on their transcripts. The relevant policy can be found at Laurier's academic integrity website along with resources to educate and support you in upholding a culture of integrity; see https://students.wlu.ca/academics/academic-integrity/index.html. **Ignorance of Laurier's academic misconduct policy is not a defence**.

Academic Misconduct includes transmission or reception of information, or possession of unauthorized information, during laboratories, quizzes, tests, or examinations. Academic Misconduct also includes plagiarism. Wilfrid Laurier University uses software that can check for plagiarism, and students may be required to submit their written work in electronic form for a plagiarism check. The *Student Code of Conduct and Discipline* and the procedures for investigating and determining appropriate disciplinary measures for breaches of this *Code* are given in the Academic Calendar.

4. **Classroom Use of Electronic Devices**
The use of electronic devices in the classroom is governed by WLU Policy 9.3: *Policy on the Classroom Use of Electronic Devices*. Details of this Policy and the consequences of breaches are stated in the Academic Calendar.

Mobile devices such as laptops and tablets may be used in class only for educational (learning) purposes directly related to the course. At times, the instructor may explicitly permit students to use a mobile device to complete an activity or task, at other times, the instructor may ask students to close laptops and turn off tablets in order to focus attention on other course-related tasks. Students who fail to comply may be asked to stow their devices at the front of the classroom, or to leave the classroom.

Course Drop Dates Fall 2017

September 13: Last day to drop/withdraw from 12-week course(s) at no tuition charge (provided the student remains registered in at least one course).

September 20: Last day to drop/withdraw from 12-week and full-year courses at 10% tuition charge (assessed at course rate).

November 8: Last day to drop/withdraw without failure and for possible tuition adjustment (tuition charge assessed at 55% of the course rate).

FOOT **PATROL**   519.886.3668 (FOOT)
Foot Patrol is a volunteer operated safe walk-home service, available daily during evening hours. Teams of two radio-dispatched volunteers are available on request to escort students to and from campus as well as to off-campus destinations. Foot Patrol operates both a walk and van service, and can be found in the office on the ground floor of the Fred Nichols Campus Centre.

PEER **CONNECT**   1.866.281.7337 (PEER)
Peer Connect is a committee that addresses mental health by promoting a balanced lifestyle for all students. We promote a confidential phone service run by students for students as a resource for any information and support. We run campaigns of mental health, stress relief and healthy body care. We provide programming such as access to athletic equipment, movies, board games and volunteers through booking to dons, icebreakers, campus clubs and campus committees.

EMERGENCY **RESPONSE** TEAM   519.885.3333
The Emergency Response Team provides on-call medical assistance to students on campus. ERT operates Monday through Thursday 3pm-3am and Friday to Sunday 24 hours. ERT can also be booked for on site event support be filling out the online booking request form at ert.yourstudentsunion.ca. Operating on the Waterloo campus only.

STUDENT **RIGHTS** ADVISORY COMMITTEE   studentrights@mylaurier.ca
The Student Rights Advisory Committee exists to provide you with information about your rights when it comes to landlord-tenant issues or academic appeals. While in no way legal representation, it can help to inform you about your options in order to make difficult situations easier to navigate.

FOOD **BANK**   foodbank.yourstudentsunion.ca
Food Bank provides food parcels in order to cater to the nutritional and dietary needs of students. All students are eligible to use this service, regardless of circumstance or financial situation. Request a package at foodbank.yourstudentsunion.ca. Food Bank also carries out various initiatives throughout and during the year such as the weekly on-campus Farmers' Market and monthly Pancake Tuesdays.

For more information visit www.yourstudentsunion.ca