

NMM2270B Applied Mathematics for Engineering I

Course Outline Fall 2024

1. Course Information

This (half) course is designed to provide all second-year engineering students with an introduction to the field of differential equations, with special emphasis on methods and applications that are most useful in the engineering sciences.

Prerequisites: Numerical and Mathematical Methods 1411A/B or the former Applied Mathematics 1411A/B, Numerical and Mathematical Methods 1414A/B or the former Applied Mathematics 1413A/B

Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

2. Instructor Information

Dr. Najeh Zarir, njisrawi@uwo.ca

Please use your western email (@uwo.ca) only when contacting the instructional staff.

Component	Lecture 001	Time
Lecture	LEC 001	
Office Hours		TBA
Office hour	On Zoom	Link TBA

3. Course Syllabus, Schedule, Delivery Mode

Course Description

Topics include first order ODE's of various types, higher order ODE's and methods of solving them, initial and boundary value problems, applications to mass-spring systems and electrical RLC circuits, Laplace transforms and their use for solving differential equations, systems of linear ODE's, orthogonal functions and Fourier.

Learning Outcomes

Upon completion of this course, students will:

- be able to solve first order differential equations via several methods.
- be able to solve homogeneous and inhomogeneous second order linear differential equations via several methods.

- understand where differential equations arise in engineering and know which techniques to apply in solving these problems.
- be able to solve initial value problems (including systems of linear ordinary differential equations) by using Laplace transforms.
- represent functions by Fourier series.
- understand both the theory and applications of ordinary differential equations taught in the course.

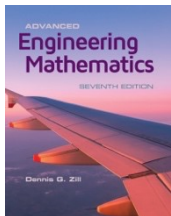
Key Dates

Date	Description
September 5, 2024	Classes begin
October 12-20, 2024	Fall Reading Week [including Thanksgiving, Oct. 14]
December 2, 2024	Last day to withdraw from a first-term half course or full-year course without academic penalty (extended from Sat. Nov. 30)
December 6, 2024	Last day of classes
December 7-8, 2024	Study Days
December 9-22, 2024	Final Examination Period

4. Course Materials

Textbook

Advanced Engineering Mathematics 7th Edition, Author(s): Dennis G. Zill



- Publisher: Jones & Bartlett Learning
- eText ISBN 9781284231861, 1284231860
- Edition: 7th
- Copyright: 2022

Lectures will follow the textbook very closely and it is highly recommended that you read the material in advance of the lectures. Many (but not all) suggested problems will be from the textbook. Students can purchase this book from the [bookstore at this link: https://bookstore.uwo.ca/textbook-search?campus=UWO&term=W2024A&courses%5B0%5D=001_UW/NMM2270A](https://bookstore.uwo.ca/textbook-search?campus=UWO&term=W2024A&courses%5B0%5D=001_UW/NMM2270A)

No physical clickers are required. Instead, iclicker (from <https://student.iclicker.com/#/login>) will be used in class. A link and the instructions as to how to download the app and use it will be linked via the owl course site.

The OWL Course Site

All course material will be posted to OWL: <https://westernu.brightspace.com/>.

Students are responsible for checking the course OWL site (<https://westernu.brightspace.com/>) regularly for news and updates. This is the primary method by which information will be disseminated to all students in the class.

If students need assistance with the course OWL site, they can seek support on the [OWL Brightspace Help](#) page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

Technical Requirements

It is highly recommended that students have access to a functioning computer with an internet connection with a working webcam and microphone. It is highly recommended (but not required) that students have Matlab installed on their computers or have access to Matlab.

5. Methods of Evaluation

Component	Weight	
Assignments	30 %	Equally weighted assignments.
Midterm	30 %	
Final Exam	40 %	Set by Exam Central. During final exam period.

The Department of Physics and Astronomy may adjust the final course marks in order to conform to Departmental policy.

Midterm Exam

Academic consideration for the Midterm Exam requires the submission of formal supporting documentation to your Home Faculty Academic Counselling Office.

Final Examination

The Final Examination will be cumulative. The date and time of the final exam will be announced by the Registrar's Office. **Students seeking a make-up exam for any reason must secure approval from the appropriate Faculty Counseling Office.**

Homework Assignments

There will be an assignment every other week administered through OWL-Brightspace, for a total number of 6 assignments. The best 5 out of the 6 assignments will count toward your “Homework Assignment” grade. Each assignment will be available for 2 weeks with unlimited submissions. Only the last submission will be graded. No extensions or makeups of missed assignments will be allowed.

More details will be coming through the course Owl page.

Course Policy vis-à-vis Generative AI

Western University has published a [Role-based guide](#) for using generative AI.

<https://ai.uwo.ca/Guidance/Guidance-by-Role.html>

Students are expected to follow the guide. In this course, you are encouraged to use any tools you deem useful to study and prepare for your assessments. Rules of academic integrity must be followed at all times.

Accommodation Policies

Students with disabilities work with Accessible Education (formerly SSD) which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The accommodation policy can be found here: [Academic Accommodation for Students with Disabilities](#).

Academic Consideration for Student Absence

Please read carefully all the details of the Western policy on Academic Consideration:

https://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=1&SelectedCalendar=Live&ArchiveID=#SubHeading_400

Religious Accommodation

https://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=1&SelectedCalendar=Live&ArchiveID=#Page_16

Students should consult the University's list of recognized religious holidays, and should give reasonable notice in writing, prior to the holiday, to the Instructor and an Academic Counsellor if their course requirements will be affected by a religious observance. **Please note that this notice should be given at least two weeks before a final exam, and at least a week ahead of a midterm exam.** Additional information is given in the [Western Multicultural Calendar](#).

Academic Policies

The website for the Registrar's Office is <http://www.registrar.uwo.ca>.

In accordance with policy, <http://www.uwo.ca/its/identity/activatenonstudent.html>,

the centrally administered e-mail account provided to students will be considered the individual's official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at his/her official university address is attended to in a timely manner.

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site:
http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf.

Support Services

Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Student Accessibility Services (SAS) at 661-2147 if you have any questions regarding accommodations.

The policy on Accommodation for Students with Disabilities can be found here:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic%20Accommodation_disabilities.pdf

The policy on Accommodation for Religious Holidays can be found here:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_religious.pdf

Learning-skills counsellors at the Student Development Centre (<http://www.sdc.uwo.ca>) are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Individual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round through individual counselling.

Students who are in emotional/mental distress should refer to Mental Health@Western (http://www.health.uwo.ca/mental_health) for a complete list of options about how to obtain help.

Additional student-run support services are offered by the USC, <https://westernusc.ca/services/>.

Tentative Schedule Fall 2024

Lecture Schedule:

Lecture	Material	Date	Textbook Section
Lecture 0	Welcome and Course Overview	Sep. 06	
Lecture 1	Basic Definitions and Examples	Sep. 09	1.1
Lecture 2	ODE Solutions & Initial Value Problems	Sep. 11	1.1, 1.2
Lecture 3	Separable Equations	Sep. 13	2.2
Lecture 4	First-Order Linear ODEs	Sep. 16	2.3
Lecture 5	Exact Equations	Sep. 18	2.4
Lecture 6	Solutions by Substitution	Sep. 20	2.5
Lecture 7	Applications: First-Order Linear Models	Sep. 25	2.7
Lecture 8	Applications: First-Order Nonlinear Models	Sep. 27	2.8
Lecture 9	Intro to Higher-Order Linear ODEs	Sep. 30	3.1
Lecture 10	More on Higher-Order Linear ODEs & Reduction of Order	Oct. 01	3.1, 3.2
Lecture 11	Homogeneous Linear ODEs - Constant Coefficients Part I	Oct. 02	3.3
Lecture 12	Homogeneous Linear ODEs - Constant Coefficients Part II	Oct. 04	3.3
Lecture 13	Homogeneous Linear ODEs - Constant Coefficients Part III	Oct. 07	3.3
Lecture 14	The Method of Undetermined Coefficients	Oct. 09	3.4
Midterm covering up to Section 3.3 Tentatively Scheduled for Oct. 10			
Fall Reading Week: Feb. 12 – 20			
Lecture 15	Variation of Parameters	Oct. 21	3.5
Lecture 16	Variation of Parameters Part II & Cauchy-Euler Equations	Oct. 23	3.5, 3.6
Lecture 17	Cauchy-Euler Equations Part II	Oct. 25	3.6
Lecture 18	Applications of Higher-Order Linear ODEs	Oct. 28	3.8
Lecture 19	Laplace Transforms	Oct. 30	4.1
Lecture 20	Inverse Laplace Transforms	Nov. 01	4.1, 4.2
Lecture 21	Inverse Laplace Transforms Part II	Nov. 04	4.2
Lecture 22	Translation Theorems Part I	Nov. 06	4.3
Lecture 23	Translation Theorems Part II	Nov. 08	4.3
Lecture 24	More Properties of the Laplace Transform	Nov. 11	4.4
Lecture 25	The Dirac Delta Function and Some Applications	Nov. 13	4.5
Lecture 26	Systems of Linear Differential Equations	Nov. 15	4.6
Lecture 27	Orthogonal Functions	Nov. 18	12.1
Lecture 28	Fourier Series	Nov. 20	12.2
Lecture 29	Fourier Series Part II	Nov. 22	12.2
Lecture 30	Fourier Cosine and Sine Series	Nov. 25	12.3
Lecture 31	Fourier Cosine and Sine Series Part II	Nov. 29	12.3
General and Final Exam Review: Dec. 2-6			
Final Exam Period: Specific Date Set by Exam Central			

Tentative Schedule Fall 2024

Tutorial Schedule:

Tutorial	Material	Week of
Tutorial 1	Differential and Integral Calculus Review (Optional)	
Tutorial 2	Problem Solving Session: Lectures 1 to 3	Sep. 16
Tutorial 3	Problem Solving Session: Lectures 4 to 6	Sep. 23
Tutorial 4	Problem Solving Session: Lectures 7 to 9	Sep. 30
Tutorial 5	Problem Solving Session: Lectures 10 to 12	Oct. 07
Tutorial 6	Problem Solving Session: Lectures 13 to 15	Oct. 21
Tutorial 7	Problem Solving Session: Lectures 16 to 18	Oct. 28
Tutorial 8	Problem Solving Session: Lectures 19 to 21	Nov. 04
Tutorial 9	Problem Solving Session: Lectures 22 to 24	Nov. 11
Tutorial 10	Problem Solving Session: Lectures 25 to 27	Nov. 18
Tutorial 11	Problem Solving Session: Lectures 28 to 30	Nov. 25