University of Manitoba
Department of Mathematics, Faculty of Science

Course Number and Title: MATH 2132 Engineering Mathematical Analysis 2

Number of Credit Hours: 3

Pre-requisites: MATH 1210 or 1211, and one of MATH 1700, 1710, or 1711

Instructor information: D. Trim, Office MH522, Telephone 474-8760,
Email- Donald.Trim**@umanitoba.ca**

Web Page: The web page for the course can be found at home.cc.umanitoba.ca/~dtrim/

Follow the links to this course.

Office hours are posted on my office door.

Calendar Description of Course:

Infinite series, Taylor and Maclaurin series; ordinary differential equations, including Laplace transforms.

A more Detailed Description of the Course:

Infinite sequences and series of constants and functions, Maclaurin and Taylor series of functions and their applications to limits, approximations of functions by polynomials, and evaluation of integrals; separable first-order differential equations, linear first-order differential equations and integrating factors, simple second-order differential equations; homogeneous and nonhomogeneous linear differential equations of nth-order; Laplace transforms and their application to linear differential equations; unit pulse and Dirac-delta functions.

Goals: The course has five main goals:

1. determining whether sequences of constants and functions converge
2. finding and applying Maclaurin and Taylor series for functions
3. solving and applying separable, linear first-order, and simple second-order differential equations

4. solving and applying homogeneous and nonhomogeneous linear nth-order differential equations
5. using Laplace transforms to solve linear differential equations

Instructional Objectives: At the completion of the course, the student is expected to be able to:

1. use tests to determine whether sequences of constants and functions converge
2. understand the concept of convergence of Maclaurin and Taylor series
3. find the Maclaurin and Taylor series for a function
4. approximate a function by its truncated Maclaurin or Taylor series and determine the error in doing so
5. apply Maclaurin and Taylor series to the evaluation of limits and integrals
6. solve separable, linear first-order, and simple second-order differential equations
7. model various physical problems with first and second-order differential equations
8. solve homogeneous and nonhomogeneous linear nth-order differential equations using auxiliary equations and the method of undetermined coefficients
9. model and solve vibration problems with second-order linear differential equations
10. be able to calculate Laplace transforms and their inverses
11. solve linear differential equations with Laplace transforms
12. use unit pulse and Dirac-delta functions in the context of differential equations

Textbook and Notes:

1. Calculus for Engineers (fourth edition) by Donald Trim, (Prentice-Hall)
2. Notes on alternating series on the web page for the course
3. Notes and solutions on mass-spring systems on the web page for the course
4. Notes and solutions on Laplace transforms on the web page for the course

Not all sections of the text and notes are covered. Classes indicate which sections are required material.

Tutorials: Tutorials are posted on the web page for the course.

Evaluation: Two components contribute to the final grade in the course.

1. Two midterms counting 50% of the final grade will be held in the tutorials on October 12 and November 23 The better of the two will count 2/3 of the 50%, and the lesser will count 1/3 of the 50%. The first midterm will cover all material connected to sequences and series (provided we have covered this material in class). The second midterm will cover all material connected to differential equations (again, provided we have covered this material in class).
2. A final examination counts 50% of the final grade. The final will be 25% series, 25% differential equations, and 50% Laplace transforms.

If you miss a test, you will be assigned a mark of "zero" unless reasons and acceptable supporting evidence are provided. Make-up test will not be scheduled for missing tests. Other arrangements will be made.

Grading: The following can be used as a guide in changing numerical grades to letter grades. It is only a guide, however, as fluctuations in grade lines may occur.

Numerical Grade	Letter Grade
90-100	A+
80-89	A
75-79	B+
68 -74	B
61-67	C+
55-60	C
50-54	D
0-49	F

Voluntary Withdrawal Date: November 21, 2023

Academic Dishonesty:

The Department of Mathematics, the Faculty of Science and the University of Manitoba all regard acts of academic dishonesty in quizzes, tests, examinations or assignments as serious offences and may assess a variety of penalties depending on the nature of the offence.

Acts of academic dishonesty include bringing unauthorized materials into a test or exam, copying from another student, plagiarism and examination personation. Students are advised to read section 7 (Academic Integrity) and section 4.2.8 (Examinations: Personations) in the General Academic Regulations and Requirements of the current Undergraduate Calendar. Note, in particular, that cell phones and pagers are explicitly listed as unauthorized materials, and hence may not be present during tests or examinations.

Penalties for violation include being assigned a grade of zero on a test or assignment, being assigned a grade of "F" in a course, compulsory withdrawal from a course or program, suspension from a course/program/faculty or even expulsion from the University. For specific details about the nature of penalties that may be assessed upon conviction of an act of academic dishonesty, students are referred to University Policy 1202 (Student Discipline Bylaw) and to the Department of Mathematics policy concerning minimum penalties for acts of academic dishonesty.

All students are advised to familiarize themselves with the Student Discipline Bylaw, which is printed in its entirety in the Student Guide, and is also available on-line or through the Office of the University Secretary. Minimum penalties assessed by the Department of Mathematics for acts of academic dishonesty are available on the Department of Mathematics web-page.

This is what you can expect of me:

- Make every effort to plan the course and each class so that learning is maximized
- Arrive 5 minutes early and begin class at the appointed time
- Conduct classes, but not give lectures. I will explain the difference under my expectations of you
- Be patient when you struggle with ideas (struggling reveals that learning is taking place)
- Be open to suggestions (they can often lead to improvements in a course)
- Treat you as adult learners, with related respect
- Provide you with plenty of offices hours for consultations. I encourage you to see me as soon as you encounter difficulties. Do not delay.

This is what I expect of you

- Complete all requirements of the course.
- Use university-level, mathematical writing, legible and with correct format. There are many worked examples in the notes and solution manual; these should guide you on how to write solutions to problems on tests.
- Be honest. Tests and examination submissions must be your own work.
- Be punctual to classes and tutorials. The first few moments of a class are the most important. There is often a quick review of the main ideas from the last class and how they lead into the present class. General ideas and the "big picture" are often discussed in the first few minutes. You are doing yourself a disservice by missing these discussions (as well as perhaps disturbing the rest of the class by being tardy).
- Participate in class, which includes both speaking up and listening. Learning begins in class, but most of it takes place when you study. Learning will begin here only if you contribute to the class; what you put into a class is directly related to what you get out. I will ask you many questions during class and for many different reasons. Your learning is substantially enhanced if you offer an answer, or at least formulate one. Do not come to class for the sole purpose of taking notes; that does not contribute to your learning. In order to answer many of the questions that I pose, it is necessary for you to be familiar with what has transpired in recent classes. Try to keep up. Even better is to read ahead. If you pre-read material, you will get far more out of class. Here are the sections from the text, in the order that they will be covered. (10.1,2,9,3,4,5,6, Alternating series (web),7; 15.1,2,3,4,6,7,8,9, Mass-spring systems 5.1,2,3 (web); Laplace transforms 6.1,2,3,4,5 (web)
- Be courteous while others are speaking. Only one person should be speaking at any given time during class. If you have conversations with your neighbour while others are discussing course material, I will give you the icy stare. If you continue, I will ask you to leave.
- I have no objections to you recording lectures, but there should be no necessity for you to do so. You can find the lecture videos that I prepared for the course during covid19 at the URL below. Ignore the first video as it contains the course syllabus during the pandemic. These videos should

NOT be regarded as a replacement for attending classes. You derive much more benefit by attending classes than watching a video. Use the videos as backup material. If you have any difficulty accessing the videos, let me know.

https://www.youtube.com/playlist?list=PL24XvCfWzGEOGdr608NrZb7JJpDrVeoTV

The following resources may be of use to you.

Mathematics Academic Resources:

Governing Documents, student rights and responsibilities

A list of University governing documents pertaining to students can be found at http://umanitoba.ca/admin/governance/governing_documents/students/index.html

As a student of the University of Manitoba you have rights and responsibilities. It is important for you to know what you can expect from the University as a student and to understand what the University expects from you. Become familiar with the policies and procedures of the University and the regulations that are specific to your faculty, college or school.

Academic Calendar

http://umanitoba.ca/student/records/academiccalendar.html

Grade appeals

If you have questions about your grades, talk to your instructor. There is a process for term work and final grade appeals. Note that you have the right to access your final examination scripts. See the Registrar's Office website for more information including deadlines related to appeals and the appeal form: http://umanitoba.ca/registrar/

Student Advocacy

Contact Student Advocacy if you want to know more about your rights and responsibilities as a student, have questions about policies and procedures, and/or want support in dealing with academic or discipline concerns. http://umanitoba.ca/student/advocacy/

Science and Technology Library
http://libguides.lib.umanitoba.ca/science_library/sciencesandtechnologylibrary

Health & Mental Health Resources

For 24/7 mental health support, contact the Mobile Crisis Service at 204-940-1781.

Student Counselling Centre

Contact SCC if you are concerned about any aspect of your mental health, including anxiety, stress, or depression, or for help with relationships or other life concerns. SCC offers crisis services as well as individual, couple, and group counselling. Student Counselling Centre: http://umanitoba.ca/student/counselling/

Student Support Case Management

Contact the Student Support Case Management team if you are concerned about yourself or another student and don't know where to turn. SSCM helps connect students with on and off campus resources, provides safety planning, and offers other supports, including consultation, educational workshops, and referral to the STATIS threat assessment team. http://umanitoba.ca/student/case-manager/

University Health Service

Contact UHS for any medical concerns, including mental health problems. UHS offers a full range of medical services to students, including psychiatric consultation. http://umanitoba.ca/student/health/

Health and Wellness

Contact a Health and Wellness Educator if you are interested in information on a broad range of health topics, including physical and mental health concerns, alcohol and substance use harms, and sexual assault. http://umanitoba.ca/student/health-wellness/

Comprehensive Information

For comprehensive information about the full range of health and wellness resources available on campus, visit the Live Well @ UofM site: http://umanitoba.ca/student/livewell/

Department of Copyright and Intellectual Property Resources

Copyrights and intellectual property must be respected by all students. For more information, visit http://umanitoba.ca/copyright/

https://umanitoba.ca/admin/governance/governing_documents/community/235.html

Academic Integrity Resources

The Faculty of Science takes academic integrity very seriously. Any evidence of academic dishonesty on assignments, labs and/or tests will be forwarded to the appropriate authorities for potential disciplinary actions. Information from the Faculty of Science regarding Academic Integrity can be found at https://sci.umanitoba.ca/students/undergraduate-students/current-undergrads/

See also:

http://umanitoba.ca/student-supports/academic-supports/academic-integrity

The University Student Discipline By-Law may be accessed at:
http://umanitoba.ca/admin/governance/governing_documents/students/student_discipline.html.

Respectful Behaviour Resources

Students are expected to act in a respectful manner. Policies regarding respectful work and learning environment and sexual assault can be found here:
http://umanitoba.ca/admin/governance/governing_documents/community/230.html

Violent or Threatening Behaviour
http://umanitoba.ca/admin/governance/governing_documents/community/669.html

If you experience Sexual Assault or know a member of the University community who has, it is important to know there is a policy that provides information about the supports available to those who disclose and outlines a process for reporting. The Sexual Assault policy may be found at:
http://umanitoba.ca/admin/governance/governing_documents/community/230.html

More information and resources can be found by reviewing the Sexual Assault site:
http://umanitoba.ca/student/sexual-assault/

Final Examinations, Grades and Grade Appeals Resources

Information from the Faculty of Science regarding Exams and Appeals can be found at:
https://sci.umanitoba.ca/students/undergraduate-students/exams-and-appeals/

Final examination and grades policies at the University can be found here:
http://umanitoba.ca/admin/governance/governing_documents/academic/1299.html

Students intending to appeal their term work grade can do so through the Registrar's office. A fee is charged for each appeal. More information can be found here:
http://umanitoba.ca/student/records/grades/690.html

To view your final examination, please check with the department offering the course for policies. To appeal your final grade, you can initiate the process at the Registrar's office. A fee will be charged for each appeal. See the Registrar's office for more information: http://umanitoba.ca/student/records/