Western University
Course Outline Applied Mathematics 3413a
Fall 2019, Applied Mathematics for Mechanical Engineers

Instructor: Greg Reid   **Office:** MC 281

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Course Web Site: http://owl.uwo.ca   **Instructor Office Hour:** TBA

It is your responsibility to regularly check the course web site for emails, grades, announcements, assignments, important dates etc (at least several times a week). Note however that some announcements will be made only in class. Always include AM3413 in the subject line of emails.

Lectures: M–W–F (12:30 pm – 1:30 pm) SEB 2200

Required Text: *Advanced Engineering Mathematics* and associated student solutions manual, by Zill (Jones and Bartlett, 6th Edition 2018, Jones & Bartlett, ISBN: 978-1-284-12454-5). Most of you should already have this from a previous course. We won't be using the 5-th edition.

Official Description: Topics include: introduction to complex analysis; complex integration; Fourier series, integrals and transforms; boundary value problems; separation of variables; transform methods of solution for PDE's; applications to mechanical engineering.

Prerequisites: AM 2270A/B and AM 2276A/B, or the former AM 2413. **Antirequisite**: AM 3415A/B.

Contents of course: Material will be taken from the following Chapters of Zill:

- Complex variables (Chapters 17 and 18)

- Orthogonal functions and Fourier series (Chapter 12)

- Boundary value problems for PDE (Chapters 13 and 16)

- Fourier Transforms (Chapter 15)

This course is designed to fill gaps in mathematical material needed at the advanced undergraduate engineering level. Attention should be paid to material from lectures, text and web site, to gain a complete view of expectations for course. Our goal is find an understandable path through the material. So some material will be omitted from the text and some material and methods when more efficient, will be given from outside the text. Over-reliance on one source is unwise. For example some material will be covered in the lectures that is not in the text, and in particular in a manner sometimes different to the text.

Course level learning outcomes: The student is be able to accurately execute computation with complex numbers and functions. In addition students should be able to correctly compute and apply orthogonal functions and Fourier series methods (including complex Fourier series), and Fourier Integral Transforms. The student is expected to correctly apply the techniques acquired in the course, and interpret the results. Applications will be made to PDE boundary value problems and also an introduction to the exact separation of variables will be made. Being able to execute computations, is necessary but not sufficient training in Engineering and do well in the course. A required skill which will be tested during the course, is an Engineer's theoretical ability in the derivation of core methods. Knowing these derivations, helps the Engineer to identify key weaknesses and strengths of the methods. This is in contrast ot just learning a list of methods by rote. Such approaches lead to unphysical (and potentially catastrophic approximations) of the systems that occur in real engineering applications. To gain a fuller appreciation of the role of approximation, the major driver of applications in engineering, we will introduce some simple numerical methods for nonlinear PDE.

Computers and calculators: No use of calculators on quizzes, midterm or final. Some use of the computer package Maple will be made via myvlab for assigned problems and some quizzes (see `http://myvlab.uwo.ca`).

Prerequisites: Applied Mathematics 2413; **Antirequisites**: Applied Mathematics 3415

See information on Evaluation and other inportant information on Page 2.

Evaluation:

25% – 6 quizzes (drop lowest), 1 every 2 weeks on Wed in class (18 Sep, 2 Oct, 16 Oct, 30 Oct, 13 Nov, 27 Nov

25% – Midterm: Friday October 25, 7 - 10 pm (location TBA)

50% – Final Exam

Graded quizzes will all be equally weighted. There will be no make-ups on missed quizzes. However, you will be able to drop your lowest score. There is no makeup on the midterm.

A makeup is only offered for the final exam and only with the appropriate documentation and approvals. For consideration of a prorated grade, notification of valid reasons, together with appropriate documentation, for missed quizzes or assignments or midterm should be given at the time of the event. If approval is granted based on the documentation, then the grade will be calculated as:

final grade = 70% final exam + 30% quiz & assignment (in case of dropped midterm)

final grade = 70% final exam + 30% midterm (in case of dropped quiz & assignment)

Addendum to all Applied Mathematics Course Outlines

The UWO Senate Academic Handbook has specified that the following points should be added to all course outlines:

1. Plagiarism: Students must write their essays and assignments in their own words. Whenever students take an idea, or a passage from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. Plagiarism is a major academic offence (see Scholastic Offence Policy in the Western Academic Calendar).

2. Plagiarism Checking: The University of Western Ontario uses software for plagiarism checking. Students may be required to submit their written work and programs in electronic form for plagiarism checking.

3. Prerequisites for a course: Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you will 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.

4. If computer-marked multiple-choice tests and/or exams are given: Use may be made of software to check for unusual coincidences in answer patterns that may indicate cheating.

5. If you are unable to meet a course requirement due to illness or other serious circumstances, you must provide valid medical or other supporting documentation to your faculty Dean's Office as soon as possible and contact your instructor immediately. It is the student's responsibility to make alternative arrangements with their instructor once the accommodation has been approved and the instructor has been informed. In the event of a missed final exam, a "Recommendation of Special Examination" form must be obtained from your faculty Dean's Office immediately. For further information please see: Link for Medical Appeals Also see the Link to policy on Accommodation Consideration for Student Absences

A student requiring academic accommodation due to illness, should use the Student Medical Certificate when visiting an off-campus medical facility or request a Records Release Form (located in the Dean's Office) for visits to Student Health Services. The form can be found here: Online Form for Medical accomodation .

6. Please contact the course instructor if you require the material in an alternate format or for other arrangements to make this course more accessible for you. You may also contact services for students with disabilities at X 82147.

7. Statement on Accessiblity: 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 Services for Students with Disabilities (SSD) at 661-2111 ext. 82147 if you have questions regarding accommodation. Also see the link Registrarial Services.