

University of Western Ontario  
**Applied Mathematics 3815a** (*formerly 315a*)  
**Partial Differential Equations**  
Fall 2010  
Course Outline

**Instructor:**

**Prof. Greg Reid**

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**Lectures:**

SEB 1200: Monday, Wednesday 1:30 - 2:30 pm

SH 3307: Friday 1:30 - 2:30 pm

**Text:**

*Applied Partial Differential Equations* by Logan, J. David

Series: Undergraduate Texts in Mathematics, 2nd ed., 2004, XII, 212 p. 40 illus., Soft-cover, ISBN: 0-387-20953-0

Note that second (2004) edition is recommended since there have been quite a few changes since the first edition (1998). It's now available in the Book Store. A major goal of the course is to give a balanced introductory treatment of the area of PDE so that a student appreciates the power of PDE modeling; and is aware of major techniques for their solution. The focus of the course is on analytical techniques for the classical linear PDE of physics and engineering (heat, wave and Laplace equations), and their frequent occurrence in applications. However we do just enough non-linear PDE, and numerical techniques, to place these methods in context. Computer methods (especially Maple) are used throughout the course to visualize, and sometimes determine solutions. Prior knowledge of Maple is not assumed, and only occasional programming will be used (programming experience is not assumed). Students are expected to develop their ability to write solutions and this will be a component of assessment (i.e. English description, rather than just formulae).

**Topics:**

- Derivation of PDE from models (Chapter 1)  
*models, conservation laws, diffusion, vibrations, heat transfer*
- Brief introduction to numerical solution of PDE (Section 4.8) and the use of computer algebra packages (Section 2.8)
- PDE on unbounded domains (Chapter 2)  
*integral reps for solutions of heat and wave equations, Laplace and Fourier Transforms*
- Orthogonal Expansions (Chapter 3)  
*Orthogonal Expansions, Fourier Series & Sturm-Liouville Problems*

**Topics (cont'd):**

- PDE on bounded domains (Chapter 4)  
*Separation of variables, flux and radiation BC applied to heat, wave and diffusion type PDE, polar and spherical coordinates, sources, parameter identification (if time)*
- PDE in the Life Sciences (Chapter 5, depending on time)  
*Age-Structured Models, Travelling Wave Solutions, Equilibria and Stability*

<b>Evaluation:</b>
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- **Assignments & Quiz (25%)**
- **1 Midterm (25%)**
- **Final Exam (50%)**

Graded assignments and quizzes will all be equally weighted. There will be no make-ups on missed quizzes or assignments. However, you will be able to drop your lowest two scores (e.g. if these were an assignment, and a quiz score then you would drop those two). Please let me know *at the time*, of legitimate reasons for missing quiz/assignments – as some allowance via redistribution of assessment can be later made for 3 or more such events provided appropriate documentation is given *at the time* they occur. Occasionally quizzes can be taken earlier. Some Maple related questions can occur on quiz/tests/assigns – a quiz later in the semester will be devoted to Maple.

Bonus problems in hand-in assignments will be given (to a max of 3% on top of your total other assessment). Unless otherwise announced, quizzes and hand in assignments will alternate on every Friday. They cover all material given in class (and also in the text) up to and including the previous Friday unless otherwise indicated. **Quiz 1 will be on September 24, in class.**

Plagiarism and Cheating are serious offenses and students should read the UWO policy on this matter, which we adopt: <http://www.orcca.on.ca/~reid/Courses/PlagiarismUWOPolicy.html>

<b>Addendum to all Applied Mathematics Course Outlines</b>
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**Accessibility Statement:** Please contact the course instructor if you require material in an alternate format or if you require any other arrangements to make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661-2111 x 82147 for any specific question regarding an accommodation.

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's 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's Dean's Office immediately. For further information please see: <http://www.uwo.ca/univsec/handbook/appeals/medical.pdf>

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: [https://studentservices.uwo.ca/secure/medical\\_document.pdf](https://studentservices.uwo.ca/secure/medical_document.pdf)