Mathematics 2111: Differential Equations

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Fall 2011-2012

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PREREQUISITES: Math 1160, Math 1180 or equivalent

INSTRUCTOR: T. Miao **OFFICE**: RB 2013 **PHONE**: 346-7722
E-MAIL: tmiao@lakeheadu.ca

LECTURES: 3 hours per week
Tuesday and Thursday   11:30 am - 1:00 pm   UC 0050

TEXT: **Differential Equations with Boundary-Value Problems**
by Zill/Cullen (**Seventh Edition**)

COURSE OUTLINE: The topics to be covered are, tentatively, the following:
(1) All of Chapter 1.
(2) Sections 2.2, 2.3, 2.4, and 2.5 of Chapter 2.
(3) Sections 3.1, and 3.2 of Chapter 3.
(4) All of Chapter 4, except Sections 4.8 and 4.9.
(5) All of Chapter 5, except Sections 5.3.
(6) All of Chapter 6, if time permits.
(7) Section 12.3, if time permits.

OFFICE HOURS: Monday and Friday 11:30 am - 12:30 noon.
If these hours do not fit your schedule you are welcome to consult with me
whenever you find me in my office. You may also make appointments through
the Secretary of the Department of Mathematical Sciences in RB 2012; the phone
number is 343-8469.

MARK DISTRIBUTION:
Your mark for the course will be calculated according to the following formula:
(a) 10% from homework assignments.
(b) 30% from the mid-term test and 60% from the final exam, OR, 90%
from the final exam, whichever is the best. The mid-term test will be on Thursday,
October 27, 2011. The final exam may cover both the first half and the second half
of the course. **Note this date is subject to change.**

HOMEWORK ASSIGNMENTS:
Homework assignments are given as topics are covered in class. Some of the
questions are required to be handed in for marking; others are there for you to
practise. The assignments are to be deposited into the assignment box marked
Math 2111 on the second floor foyer of the Ryan Building. **No late assignments
will be accepted**.

Overview of the Course

(1) Three methods of solving first order de.
- separable equations
- exact equations
- linear equations

(2) Applications of first order de.

(3) Solution of higher order linear de, particularly with constant coefficients and second order.

(a) Solution of a non-homogeneous equation.
- Complementary solution;
- Particular solution.

(b) Solution of the associated homogeneous equation to get the complementary solution.
- linearly independent of solutions and the Wronskian;
- how to find the fundamental set;
- reduction of order to find additional solution;
- convert solution to phase-angle form.

(c) Equations of order higher than 2.

(d) Methods of finding particular solutions.
- annihilator method;
- variation of parameters.

(e) Cauchy-Euler equation.

(4) Application of second order linear de.
- vibrating spring;
- RLC-circuit.

(5) Series solutions of linear equations
- solution about ordinary points;
- solution about singular points;
- Bessel's equation;
- Legendre's equation.

(6) Boundary-value problems
- Sturm-Liouville problems;
- Fourier series;
- diffusion equation.