



**College of Arts and Sciences**  
**Department of Mathematics and Statistics**

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**MTH 205 Course Policy and Syllabus – summer 2010**

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**Course Description (catalog):**

Covers mathematical formulation of ordinary differential equations, methods of solution and applications of first order and second order differential equations, power series solutions, solutions by Laplace transforms and solutions of first order linear systems.

**Prerequisite(s):** MTH 104 (Calculus II)

**Textbook(s) and/or Other Required Materials:**

**Primary:** Zill D.G., A First Course in Differential Equations with Modeling Applications, 9<sup>th</sup> Edition, 2009, U.S.A.

**Old exams quizzes will be available on I-Learn as well as on my personal web page** [www.ayman-badawi.com](http://www.ayman-badawi.com)

**Course Objectives:** This course is designed to help the student:

- Classify a given differential equation and check the existence of a unique solution of Initial Value Problems (IVP).
- Solve different types of first-order differential equations.
- Utilize different techniques to solve higher order differential equations.
- Solve appropriate applied problems in engineering and sciences as first-order or higher order differential equations.
- Find power series solutions of linear differential equations.
- Use the Laplace transform to solve differential equations.
- Solve systems of linear first-order differential equations.

**Course Outcomes:** This course requires the student to demonstrate the following:

1. Classify a given differential equation as ordinary or partial, and determine its order and whether or not it is linear.
2. Use the existence and uniqueness theorem to ensure the existence of a unique solution for a given IVP.
3. Solve first-order linear ordinary differential equations.
4. Formulate and solve appropriate applied problems involving exponential growth/decay and Newton's law of cooling and series circuits and other engineering applications.
5. Use reduction of order to find a second linearly independent solution for a homogenous differential equation, given one solution.
6. Find real valued linearly dependent solutions to homogenous ordinary differential equations with constant coefficients.

7. Apply variation of parameters and method of undetermined coefficients to find a particular solution.
8. Solve applied problems from electrical and mechanical engineering as second order differential equations.
9. Obtain power-series solutions to certain differential equations with variable coefficients.
10. Recognize Cauchy-Euler ordinary differential equations and find there general solution.
11. Use the Laplace transform to solve a given Initial-Value problem.
12. Use the convolution theorem to find the inverse transform of the product of two known transforms.
13. Solve systems of linear differential equations by Laplace Transform and eigenvalue methods.

### Topics Covered and Schedule in Weeks:

Introduction to Differential Equations	1
First-Order Differential Equations	2
Modeling with First-Order Differential Equations	1
Higher-Order Differential Equations	3
Modeling with Higher-Order Differential Equations	2
Series Solutions of Linear Equations	1
The Laplace Transform	3
Systems of Linear First-Order Differential Equations	1
Review and evaluations	2

### Instructor Information

Section	Instructors	Office Hours	Room	Ext.	E-mail
12:30-1:45	Ayman Badawi	11:20-12:20, Su, M, Tu, W	Nab262	2573	abadawi@aus.edu

Grading	%	Dates	Time
Test one	65/3%	Sunday, June 13	In Class
Test Two	130/3%	Sun, June 27	In class
Test Three		Wed, July 7	In class
Final Exam	35%	TBA	2 hours

## Remarks and Rules

1. **Missing quizzes or exams:** Quizzes cannot be made up.
2. **Academic integrity:** You are expected to submit your own work. Copying, cheating or plagiarism, if detected, will result in a WF grade in the course **for all who are involved** (i.e. it does not matter, if somebody copied your homework, project etc., you are guilty as well).
3. **Getting Help:** Students are encouraged to consult their instructor during his office hours or by appointment.
4. **The Math Learning Center (MLC)** located in **NAB239A** provides **free tutoring services by appointment** to all students who experience difficulties with their MTH 205 course. For any question, concern or appointment, please send an e-mail to [cas-mlc@aus.edu](mailto:cas-mlc@aus.edu).

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### Math 205 Suggested Problems

**TEXT:** *A First Course in Differential Equations with Modeling Application,*  
by Dennis G. Zill, 9th Edition.

Section	Page	Exercises
1.1	10	1-10, 12, 15, 19, 25, 27, 32
1.2	17	4, 8, 14, 17, 18, 23, 24, 25, 27
1.3	27	1, 5, 13, 14, 17
2.1	41	1, 9, 21, 22, 25, 27
2.2	50	3, 6, 7, 8, 13, 14, 17, 25, 27, 30(a), 32(a)
2.3	60	5, 9, 12, 13, 17, 23, 24, 25, 28, 29, 31
2.4	68	2, 3, 6, 8, 12, 16, 24, 32, 35, 37
2.5	74	3, 5, 8, 11, 15, 18, 22, 23, 25, 28
3.1	89	1, 3, 6, 7, 14, 15, 23, 26, 27
4.1	128	1, 3, 15, 17, 19, 23, 26, 31
4.2	132	2, 3, 9, 11, 17
4.3	138	3, 5, 11, 15, 16, 22, 23, 24, 31, 33
4.4	148	1, 5, 8, 11, 13, 15, 19, 20, 24, 26, 29, 32
4.6	161	1, 3, 9, 15, 19
4.7	168	1, 3, 4, 5, 6, 11, 14, 15, 17, 19, 29
5.1	294	1, 2, 4, 5, 9, 11, 21, 23, 29, 31, 45, 47
6.1	230	2, 3, 9, 19, 20, 23, 25, 29
7.1	261	4, 13, 15, 18, 21, 25, 29, 31, 33, 37
7.2	269	2, 3, 7, 9, 11, 15, 19, 24, 33, 34, 36, 39
7.3	278	1, 3, 6, 7, 15, 22, 23, 26, 29, 37, 39, 43, 45, 47, 55, 63, 65
7.4	289	1, 5, 7, 8, 11, 23, 25, 27, 29, 37, 39, 41, 45, 49, 51
7.5	295	1, 3, 6, 10
7.6	299	1, 3, 6, 7, 9, 12
8.1	310	1, 5, 7, 9, 11, 18, 22
8.2	324	1, 3, 5, 7, 11, 13