

## SYLLABUS

**MA 313 Differential Equations (3) Fall 1999**

MWF 1:00 - 1:50 P.M. Room H 39A

(August 30, 1999 - December 16, 1999)

**Instructor : Mi-Soo B Smith**

**Office Hour Information:** Henry Hall 015  
or by appointment (call Ext 581 or (H)528-1978)

**Textbook:** Differential Equations, an Introduction (1991)  
by Daniel A. Marcus. Wm. C. Brown Publishers ISBN 0-697-05957-X

**Course Description:** Study of ordinary differential equations leading to solutions by series. Introduction to partial differential equations  
**Prerequisites:** MA211 Calculus II or consent of instructor

**Objectives:** The main objective of this course is to introduce general theories and methods to solve first order and higher order ordinary differential equations. Major topics include Linear Differential Equations (focused on the first and the second order) and Laplace Transformations. The course will prepare for partial differential equations, transform methods, and boundary value problems. **Prerequisites:** MA211 (Calculus II)

**Course Evaluation:** Quizzes and Mid-Terms (30%)  
Homework & Attendance (30%)      **Final Examination (40%)**

### Course Outline

This is a tentative one, as the course progresses, we may need to adjust

#### **The First Order Differential Equations ( Chapters 1 and 2) (5 weeks)**

**Chapter 1** First order Differential equations. The methods Based on Separation of Variables [ Read and report \$1.2, skip \$1.4]

**Chapter 2** Additional Methods for First-Order Equations [Skip \$2.5]  
Separable equations. Homogeneous and non-homogeneous equations.  
Exact DE, Integrating factors, Bernoulli Equation, Riccati Equation,  
sketching solutions, orthogonal and oblique trajectories

#### **The Higher Order Differential Equations (4 weeks)**

**Chapter 3** Homogeneous Linear Equations [ May skip \$3.5]

**Chapter 4** Nonhomogeneous Linear Equations. Existence and Uniqueness of Solutions, general solutions of Linear Homogeneous and Non-homogeneous Second Order Differential Equations, Finding Particular solutions, Reduction of Order, Cauchy Euler's Differential Equations, Variation of Parameters, the Method of Undetermined Coefficients, Applications to RLC Circuits and Forced Damped Spring or Oscillation.

#### **Laplace transforms ( 4 weeks)**

**Chapter 6** Laplace transforms

Calculating Laplace Transformations, Shifts and Inverse Laplace Transforms  
Laplace Transforms of derivatives and integrals, the Unit Step Function  
Dirac's symbol, Convolution, and Laplace Transform of Periodic Functions

#### **Further Topics ( for the remaining weeks)**

Selected Topics from Power Series Methods (Chapters 7) and  
Introduction to Partial Differential Equations (Chapter 9)

## Homework Assignments and Exam dates plan

### Chapter 1

§1.1 pp.9-10 #1, 3, 5, 7, 9, 11, 13, 15, 17, 21, 23, 25.  
#18, 19, 20, 27, 29, 32

§1.3 pp.37-39 #1,3,5, 7,9, 11, 13, 15, 17, 18,  
#22 - 31 (Only indicate the methods that can be applied)  
#39, 47, 49, 51

Do chapter review (During the week end of January 24)

Quiz1 (on §1.1) 9/3 Quiz2 (on §1.3) 1/10

### Chapter 2

§2.1 pp.61-62 #1, 3, 5, 7, 9, 11, 13, 15, 17, [19, 20, 21, 23]

§2.2 p.72 #1, 3, 5, 7, 9, 11, 19, [25]

§2.3 pp.83-85 #1 - #9 (which DE is linear? Indicate the answer only)  
#11, 13, 15, 17, 19, 21, 23, 27, #33, 37, 41, 43, 47, 49, 71, 73

§2.4 pp.93-94 #1, 7, 11, 13, #19-26(Identify linear, Bernoulli, Riccati or neither)  
27,29, 45

§2.5 pp. 102 # 13, 15, 17, 31, 35, 37  
Quiz3 (on §2.1-§2.3)

### Chapter 3

§3.1 pp.124-126 #1, 2, 3, 4, 5, #7, 9, #11, 13, 15, 17, 21, 27

§3.2 pp.141-142 #1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 23, 32, 37

§3.3 (Read)

§3.4 pp. pp.169-170 #1, 3, 5, 7, 9, 11, 13, 17

§3.5 pp. 174-175 #1, 3, 5, 7

Midterm Examination 1 (On Chapters 1, 2, 3)

### Chapter 4

§4.1 pp. 185-186 #1, 3, 5, 7, 9, 11, 13, 15, 19, 21,[23,24,25,26]

§4.2 p.196 #1, 3, 5, 7, 9, 11, 13, 15, 17, 21, 23, 29

§4.3 p.209 #1, 3, 5, 7, 9, 13, 15, 21, 23, 25

§4.4 pp.224-225 #1, 3, 5, 7, 9, 11, 21, 25, 31, 33, 35, 37

§4.5 pp.233-234 #1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 27, 31, 33, 35, 39, 41

Midterm Examination 2 (On Chapters 3 and 4)

### Chapter 6

§6.1 pp. 363-364 #1, 3, 5, 7, 11, 13, 15, 17, 19, 21, 23, 25, 27,  
29, 31, 33, 35, 37, 41, 43

§6.2 p. 374 # 1, 3, 5, 7, 9, 13, 15, 17, 19, 21, 23, 27, 29, 31, 33, 35, 37, 39, 41, 43

§6.3 pp.386-388 #1, 2, 7, 9, 11, 15, 25, 35, 49, 63, 65

§6.4 pp.397-399 #1, 5, 7, 9, 11, 13, 19, 21, 31, 45, 51

§6.5 pp.409-410 # 1, 3, 5, 7, 8, 13, 15, 17, 19, 21, 23, 25, 29, 31, 37

§6.6 p.422 #1, 3, 5, 7, 9, 11, 17

§6.7 p.430 # 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 29, 31, 35

Quiz4 (on §6.1-§6.3)

Final Comprehensive Examination