Syllabus for
MAT 211—Differential Equations
3 Credit Hours
Spring 2005

I. COURSE DESCRIPTION

A study of linear n^{th} order ordinary differential equations, existence and uniqueness of solutions, and various techniques for solving differential equations.
Prerequisite: MAT 202.
Academic technology fee: $45.

II. COURSE GOALS

This course is designed to assist the student in learning techniques for solving various differential equations with special attention placed on those equations, which arise in the physical sciences. Some of the major problems, which arise in the use of differential equations are discussed.

III. STUDENT LEARNING OUTCOMES FOR THIS COURSE

A. Terminal Objectives

Upon successful completion of this course the student will be able to do the following:

1. Use a differential equation to model relationships between variables in a physical phenomena.
2. Solve a differential equation using standard techniques.

B. Unit Objectives

Upon successful completion of all units, the student will be able to do the following.
Apply techniques for solving various differential equations and systems of linear differential equations including separation of variables, integrating factors and Laplace transforms.

IV. TEXTBOOKS

A. Required Textbook

Frank Giordano & Maurice Weir, Differential Equations - A Modeling Approach, Addison Wesley, Inc., 1991

B. Optional Textbook

Michael D. Greenberg, Advanced Engineering Mathematics – Second Edition, Prentice Hall, Inc., 1998

V. POLICIES AND PROCEDURES

A. University Policies and Procedures

1. Attendance at each class or laboratory is mandatory at Oral Roberts University.
2. Double cuts will be assessed for absences immediately preceding or following holidays.

3. Excessive absences can reduce a student's grade or deny credit for the course.
4. Students taking a late exam because of an unauthorized absence will be charged a late exam fee.
5. Students and faculty at Oral Roberts University adhere to all laws addressing the ethical use of others' materials, whether it is in the form of print, video, multimedia, or computer software.
6. Final exams cannot be given before their scheduled times. Students need to check the final exam schedule before planning return flights or other events at the end of the semester.

B. Computer Science and Mathematics Department Policies and Procedures

1. Each Student who uses the computer is given access to the appropriate computer resources. These limited resources and privileges are given to allow students to perform course assignments. Abuse of these privileges will result in their curtailment. Students should note that the contents of Computer directories are subject to review by instructors and the computer Administrative staff.
2. A fee of $10.00 will be assessed for all late exams.
   This policy applies to all exams taken without notifying the professor prior to the regularly scheduled exam time, and to all exams taken late without an administrative excuse.

C. Course Policies and Procedures

1. Evaluation Procedures:

3 in class exams	300 pts
1 in class final	200 pts
Homework, etc	100 pts
Project	100 pts
Total	**700 pts**

2. ePortfolio Requirements
   There may be an ePortfolio artifact associated with this course. Check your ePortfolio handbook for the requirements.
3. Other Policies and Procedures:
   No late homework will be accepted.
   Homework must be **stapled**.
   No late projects will be accepted.
   No late exams will be given. If you miss an exam then, those points will be added to the final exam or you will receive a zero.

VI. COURSE CALENDAR

LESSON	TOPIC	HOMEWORK ASSIGNMENTS	
Unit I			
1	Solutions of IVPs	pp. 12-13	# 1,4,7,10,13,16,19,22,25
2	Mathematical Modeling	p. 23	# 1,4,6,9,10
3	Modeling with 1st Order	pp. 42-44	# 3,7,9,10,15,20
4	DEs	pp. 54-55	# 3,6,9,12,15,18,21
5	Graphing 1st Order DEs	pp. 69-70	# 1,4,7,10,13,16,19,22,25,30,34,35
6	Separation of Variables	pp. 80-81	# 2,5,8,11,14,17,20,23
7	Linear Equations	pp. 90-91	# 2,5,8,11,14,17,20,23,26,29,32,35,36
8	Exact Equations	p. 99	# 1,4,7,10,13,16,19,22,25,28,34,37
9	Substitution Methods	p. 109	# 2,3,4
10	Euler's Method	p. 123	# 1,2,3,4,5
11	Runge-Kutta Methods	p. 141	# 1,2,3
12	Launching a Rocket Review		
	Examination I		
Unit II			
13		pp. 164-165	#1,3,4,6,9,11,12,13
14	Constant Coefficient Linear	pp. 174-176	# 1,6,11,16,21,26,31,36,41,46
15	Linear 2nd Order Equations	pp. 186	# 8,13,18,23,28,33,38,43,48,53,58,63
16	Homogeneous Linear	pp. 198-199	# 1,3,6,8,11,13,16,17,19
17	Vibrations Auto	pp. 211-212	# 3,5,8,9,12,15,18,20,21,22,24,27,30,
18	Suspensions	pp. 228-229	# 1,4,7,10,13,16,19,22,25,28,31,34,37
19	Higher-Order Linear	p. 238	# 2,5,8,11,14,17,20,23,26,29
20	Nonhomogeneous Linear	pp. 256-257	# 3,6,9,12,15,18,21,24,27,30,33
21	Undetermined Coefficients	pp. 267-269	# 1,4,7,10,13,16,19
22	Variation of Parameters	p. 280	# 3,6,9,12
23	Vibrations Auto		
24	Suspensions		
	Numerical Solutions		
Unit III	Review		
25	**Examination II**	p. 292	# 1,4,7,10,13,16,19,22
26		p. 304	# 1,4,5,8,11,15,24,25,27,29
27		pp. 312-313	# 2,5,8,11,14,17,20,23,26,29,32,35,38
28	Laplace Transforms Intro	pp. 320-321	# 1,4,7,10,13,16,19,22,25,28,31,34,37
29	Laplace Trans. Properties	pp. 333-335	# 3,6,9,12,15,18,21,24,27,30,33,36,39
30	Inverse Laplace Transform	pp. 346-347	# 1,4,7,10,13,16,19,22,25,28,31,34,40
31	Transform of Derivatives	p. 357	# 2,5,8,11,14,15,17
32	Piecewise Continuous	pp. 367-369	# 1,4,7,10,13,16,17
33	Forces	pp. 373-374	# 1,4,7,10,11,12
34	Periodic Forcing Functions		
35	Impulse Forcing Functions		
36	Convolution Integral		
	Control System Application		
Unit IV	Review	pp. 387-389	# 1,2,3,4,7,10
37	**Examination III**	p. 401	# 2,5,8,11,14,17
38		pp. 415-416	# 1,4,7,10,13,16,19,22,25,28
39	Multi-Variable Modeling	p. 430	# 3,6,9,12,15,18,21,24,27,30
40	Systems of Diff Equations	pp. 441-442	# 1,4,7,10,13,16,19,22,25
41	Homogeneous Systems	p. 446	# 1,3,5,6
42	Distinct Eigenvalues	pp. 454-455	# 1,2,3,5
43	Repeated Eigenvalues		
44	A Nonlinear System		
	A Predator-Prey Model		
	Review		
	Review		

Course Inventory for ORU's Student Learning Outcomes

MAT 211 – Differential Equations
Spring 2005

This course contributes to the ORU student learning outcomes as indicated below:
Significant Contribution – Addresses the outcome directly and includes targeted assessment.
Moderate Contribution – Addresses the outcome directly or indirectly and includes some assessment.
Minimal Contribution – Addresses the outcome indirectly and includes little or no assessment.
No Contribution – Does not address the outcome.

The Student Learning Glossary at http://ir.oru.edu/doc/glossary.pdf defines each outcome and each of the proficiencies/capacities.

OUTCOMES & Proficiencies/Capacities	Significant Contribution	Moderate Contribution	Minimal Contribution	No Contribution
1	**Outcome #1 – Spiritually Alive** Proficiencies/Capacities				
1A	Biblical knowledge			X	
1B	Sensitivity to the Holy Spirit			X	
1C	Evangelistic capability			X	
1D	Ethical behavior		X		
2	**Outcome #2 – Intellectually Alert** Proficiencies/Capacities				
2A	Critical thinking	X			
2B	Information literacy	X			
2C	Global & historical perspectives			X	
2D	Aesthetic appreciation			X	
2E	Intellectual creativity		X		
3	**Outcome #3 – Physically Disciplined** Proficiencies/Capacities				
3A	Healthy lifestyle			X	
3B	Physically disciplined lifestyle			X	
4	**Outcome #4 – Socially Adept** Proficiencies/Capacities				
4A	Communication skills			X	
4B	Interpersonal skills			X	
4C	Appreciation of cultural & linguistic differences				X
4D	Responsible citizenship				X
4E	Leadership capacity				X