MAP 2302: ELEMENTARY DIFFERENTIAL EQUATIONS
FALL 2016 SYLLABUS

1 Instructor, course information, and class meetings

Instructor	*Calistus Ngonghala*
Section	*6554*
Credits	*3*
Days	*MWF*
Time	4.05 - 4.555 pm (9$^{\text{th}}$ period)
Venue	LIT 101

2 Office Information

Office	*468 Little Hall*
Office hours	1) Monday: 10.40-11.40 am 2) Wednesday: 3-4 pm 3) Friday: 10.40-11.40 am 4) By appointment
Telephone	(352) 294-2335
Email	*calistusnn@ufl.edu*

Remark: *Don't feel constrained by the scheduled office hours. You are welcome to drop in or contact me by phone or e-mail for an appointment.*

3 Textbook

R. Kent Nagle, Edward B. Saff and Authur David Snider. Fundamentals of differential equations. Eighth Edition. (*Addison-Wesley*) (2012).
Each student is required to have a copy of this textbook.

4 Pre-requisites

A grade of C or better in MAC 2312, MAC 2512 or MAC 3473.

5 Course Description

MAP 2302 (Elementary Differential Equations) is a 3 credit hours course in differential equations that covers topics such as: first order ordinary differential equations, theory of linear ordinary differential equations, solutions of linear ordinary differential equations with constant coefficients, the Laplace transform and its application to solving linear ordinary equations.

6 Course Objectives

Differential equations constitute a language through which the laws of nature are expressed. Many of the fundamental laws of applied Mathematics, Physics, Chemistry, Biology, Engineering, Economics and Finance can be formulated as differential equations. Hence, it is essential for students in the physical sciences, biological sciences, engineering, social sciences, etc., to be familiar with differential equations.

The major objective of MAP 2302 is to introduce students to the basic concepts and applications of differential equations. Students would be expected to understand the basic concepts of differential equations well enough to be able to decide when, how, and why to apply them to real-world phenomena and to be able to interpret and communicate the results. This course is designed to help students progress in developing analytical thinking, critical reasoning, problem-solving, and communication skills. The goal is to obtain a useful mastery of concepts and methods basic to fully understand and appreciate the theory and practice of differential equations.

Upon **SUCCESSFUL** completion of this course, students should be able to:

1. classify differential equations and investigate the existence and uniqueness of solutions to the equations;

2. solve first order ordinary differential equations (separable, linear, exact, homogeneous, Bernoulli) using appropriate techniques;

3. solve linear second order ordinary differential equations (homogeneous, nonhomogeneous, constant coefficients, variable coefficients, etc.) using appropriate techniques;

4. model simple phenomena (population biology, tank flow, mechanical and electrical vibration, etc.), with first ordinary differential equations;

5. define and use Laplace transforms to solve initial value problems;

6. use power series to solve ordinary differential equations.

7 Course outline and detailed course schedule

Date	Chapter	Section	Topic	Homework
08/22/2016	0	0	Discuss syllabus and agree on office hours	
			Introduction	
		1.1	Background	P5: 1-17
08/24/2016	1	1.2	Solutions and initial value problems	P13: 1b, 2b, 4, 7, 9, 11, 12, 15, 21, 22, 23, 25, 27
08/26/2016		1.3	Direction Fields	P21: 1, 3, 5, 7
		1.4	Euler's approximation method	P28: 1, 3, 6
			Quiz 1	
			First Order Differential Equations	
08/29/2016		2.1	Motion of falling body	
08/31/2016		2.2	Separable equations	P43: 1-6, 7, 8, 9,11, 12, 13, 16, 17, 19, 20, 21, 22, 24, 25, 29, 33, 37, 38
09/02/2016		2.3	Linear equations	P51: 1-6, 7, 8, 13, 17, 18, 19, 20, 21, 35
09/07/2016	2	2.4	Exact equations	P61: 1-8, 9, 10, 11, 13, 14, 17, 18, 19, 21, 23, 24, 30.
			Quiz 2	
09/09/2016		2.5	Special integrating factor	P67: 1-6, 7, 8, 11, 12, 13, 20.
09/12/2016		2.6	Homogeneous and Bernoulli equations	P74: 1-89, 10, 12, 13, 15, 21, 23, 25, 30, 45
09/14/2016	1, 2		**Exam 1**	

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Date	Chapter	Section	Topic	Homework
			Mathematical modeling with first order ordinary differential equations	
09/16/2016		3.1	Introduction	
		3.2	Compartmental analysis	P99: 1, 2, 3, 5, 7, 9, 11, 13, 14, 15, 19, 21, 23, 25.
09/19/2016	3	3.3	Heating and cooling of buildings	P107: 1, 2, 3, 5, 6, 11, 15.
09/21/2016		3.4	Newtonian mechanics	P114: 1, 2, 5, 6, 7, 12, 13, 25.
09/23/2016		3.5	Electrical circuits	P121: 1, 2, 3, 5, 7.
			Quiz 3	
			Linear second order equations	
09/26/2016		4.1	Mass-spring oscillator	P157: 1 2, 3, 5, 7, 8.
09/28/2016		4.2	Homogeneous linear equations	P165: 1-5, 7, 12, 13, 14, 15, 23, 27, 28, 29, 31, 35, 38, 43.
09/30/2016		4.3	Auxiliary equations with complex roots	P173: 2, 3, 7, 9, 1210, 18, 21, 24, 26, 29, 31, 33, 37.
10/03/2016		4.4	Method of undetermined coefficients	P182: 1, 2, 3, 5, 9, 10, 13, 24, 27, 28, 29.
	4		*Quiz 4*	
10/05/2016		4.5	Superposition principle	P187: 1, 3, 5, 7, 10, 11, 17, 19, 25, 31, 34, 36, 39, 43.
10/07/2016		4.6	Variation of parameters.	P193: 3-5, 7, 9, 13, 16
10/10/2016		4.7	Equations with variable coefficients	P200: 1-3, 5, 6, 9, 13, 15, 17, 19, 32, 33, 38, 39, 42, 45, 49.
10/12/2016		4.9	Free vibrations	P222: 1-4, 7, 11.
10/17/2016		4.10	Forced vibrations	P230: 3, 4, 9, 11, 13.
10/19/2016	3, 4		**Exam 2**	
			Introduction to systems of equations	
10/21/2016		5.1	Interconnected fluid tanks	
10/24/2016	5	5.2	Differential operators and elimination methods for systems of differential equations	P250: 3, 7, 13, 19, 21, 23, 31.
10/26/2016		5.7	Electrical circuits	P296: 1-3, 7, 11, 13.
			Quiz 5	
			Laplace transforms	
10/28/2016		7.1-7.2	Definition of the Laplace transform	P360: 2, 3, 5, 6, 9, 11, 14, 15, 19, 29.
10/31/2016		7.3	Properties of Laplace transforms	P365: 1, 2, 5, 7, 12, 21, 25, 29, 30, 33, 35.
11/02/2016		7.4	Inverse Laplace transform	P374: 1, 2, 7, 9, 10, 11, 13, 15, 21, 23, 25, 35.
			Quiz 6	
11/04/2016	7	7.5	Solving initial value problems	P382: 1-5, 7, 9, 13, 21, 23, 25, 31, 32, 35.
11/07/2016		7.6	Discontinuous and periodic functions	P393: 3, 5, 7, 9, 11, 13, 15, 17, 21, 25, 27, 29, 33, 35, 39, 45.

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Date	Chapter	Section	Topic	Homework
11/09/2016		7.7	Convolution	P403: 1-3, 5, 7, 9, 11, 13, 19, 23, 25.
11/14/2016	5,7		**Exam 3**	
			Series solutions of differential equations	
11/16/2016		8.1	The Taylor polynomial	P426: 1-3, 5, 7, 13, 15.
11/18/2016		8.2	Review of power series	P434: 1-3, 5, 9, 11, 13, 19, 21, 23, 25, 27, 31, 33.
11/21/2016		8.3	Power series solution	P445: 1-3, 5, 7, 9, 11, 12, 17, 19, 23, 25, 27, 33, 35.
11/28/2016	8	8.3	Power series solution	P445: 1-3, 5, 7, 9, 11, 12, 17, 19, 23, 25, 27.
11/30/2016		8.4	Equations with analytic coefficients	P450: 1-3, 5, 7, 9, 13, 15, 19, 21, 23, 25, 19.
12/02/2016		8.5	Cauchy-Euler equations	P454: 1-3, 5, 7, 11, 13, 15.
12/05/2016			*Quiz 7*	
12/07/2016			Review for final exam	
12/14/2016			**Final exam (Comprehensive): 15:00-17:00**	

8 Student Responsibilities/Expectations

In a bit to understand the material, it will be essential that students keep pace with the material as it is being presented. Consequently, you will be expected to attend all class meetings, be early for class meetings, as well as spend some time working on assigned homework problems. Please, do not hesitate to ask questions or seek additional assistance to ensure that you are staying on pace with the class. You will be expected to come to class prepared and ready to actively participate. Please, turn off your cell phones before class begins and do exhibit a great sense of responsibility and respect towards fellow students.

9 Course Policies/Procedures

9.1 Examinations

There will be three exams administered during the normal 50 minutes class period and one cumulative (comprehensive) final exam. The final exam shall be administered according to the University's schedule. Each exam will consist of a multiple choice and a problem section. The problems section will contain questions that require detailed solutions and possibly definitions and brief explanations of concepts and will be graded on a partial credit basis. Only the best two 50-minute exams will count towards the final grade.

9.2 Quizzes

Quizzes will be administered periodically throughout the semester. Quizzes are meant to test the understanding of the topics that have been covered, giving a benchmark prior to the exams.

9.3 Homework

The purpose of homeworks is to develop more skills in the material covered. It will be the student's responsibility to solve the assigned homework problems in a timely manner. Selected problems from homeworks will be graded and these will count towards the final grade. Students who intend to do well in the course are adviced to solve the homework problems. Students should feel free to approach the instructor with difficulties from homework problems. Problems in which students encounter difficulties may also be discussed in class.

9.4 Grading and Grade Scale

Assessment item	Points		Grade	Range
Best two hour exams	200		A	360-400
Final exam	100		B	320-359
Quizzes	60		C	280-319
Homeworks	40		D	240-279
Total	**400**		E	000-239

10 Academic Honesty

Students should familiarize themselves with the University's Code of Conduct (https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/) and the university's policy on academic honesty, which may be found in the University of Florida Rules, 6C1-4.

11 Student Evaluation

I look forward to reading your constructive and objective comments. These comments will be helpful in my subsequent teaching of this course. I encourage students to furnish me with feedback, either in person, by voice mail, by email, through a note left under my office door, etc., throughout the semester.

12 Special Accommodations

Students requesting classroom accommodations or special arrangements during examinations must first register with the Dean of Students Office. The Dean of Students Office will provide documentation. The student must then make arrangements with the instructor to meet the requesting accommodation.

13 U Matter We Care

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu, so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 911.