

MAP2302: ELEMENTARY DIFFERENTIAL EQUATIONS, Fall 2018

Course, class meetings and instructor's information

Term	Fall 2018
Course	MAP2302
Section	4985
Credits	3
Days	Monday, Wednesday, Friday
Period	3
Time	09:35 - 10:25
Venue	LIT 235

Instructor	Calistus Ngonghala
Telephone	(352) 294-2335
Email	<i>calistusnn@ufl.edu</i>
Office	LIT 468
Office hours	1) Monday: 10:40-11:30 (4th period) 2) Wednesday: 10:40-11:30 (4th period) 3) Friday: 10:40-11:30 (4th period) 4) By appointment

Course webpage: https://people.clas.ufl.edu/calistusnn/courses/map2302_sections_4985_6541/

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.*

Textbook: R. Kent Nagle, Edward B. Saff and Authur David Snider. Fundamentals of differential equations and boundary value problems. Seventh Edition. (*Pearson*) (2018).

Each student is required to have a copy of this textbook.

Pre-requisite(s): A grade of C or better in MAC2312, MAC2512 or MAC3473.

Course Description: MAP2302 is a 3 credit hours course in differential equations that covers topics such as: first order linear, separable, exact, homogeneous, and Bernoulli equations, second order homogeneous and non-homogeneous ordinary differential equations with constant and variable coefficients, the Laplace transform and its applications, power series solutions of ordinary differential equations, and applications of differential equations.

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, Finance, etc., can be formulated as differential equations. Hence, it is essential for students in engineering, the physical, biological, and social sciences, etc., to be familiar with differential equations.

The major objective of MAP2302 is to introduce students to the basic concepts and applications of ordinary differential equations. Students will 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 basic concepts and methods to fully understand and appreciate the theory and practice of differential equations.

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

- classify differential equations and investigate the existence and uniqueness of solutions to the equations;
- solve first order ordinary differential equations (separable, linear, exact, homogeneous, Bernoulli) using appropriate techniques;
- solve linear second order ordinary differential equations (homogeneous, nonhomogeneous, constant coefficients, variable coefficients, etc.) using appropriate techniques;
- model simple phenomena (population biology, tank flow, mechanical and electrical vibration, etc.), with first ordinary differential equations;
- define and use Laplace transforms to solve initial value problems;
- use power series to solve ordinary differential equations.

Course outline and detailed course schedule

Date			Topic	Homework
	Chapter	Section		
08/22/2018	0	0	Discuss syllabus and agree on office hours	
			Introduction	
		1.1	Background	P5: 1-16
08/24/2018	1	1.2	Solutions and initial value problems	P13: 1, 2, 4, 7, 9, 11, 12, 15, 21, 22, 23, 25, 27
08/27/2018		1.3	Direction Fields	P21: 1, 3, 5, 7
		1.4	Euler's approximation method	P28: 1, 3, 6
			<i>Quiz 1</i>	
			First Order Differential Equations	
08/29/2018		2.1	Motion of falling body	
08/31/2018		2.2	Separable equations	P46: 1-6, 7, 8, 9, 11, 12, 13, 16, 17, 19, 20, 21, 22, 24, 25, 29, 33, 37, 38
09/05/2018		2.3	Linear equations	P54: 1-6, 7, 8, 13, 17, 18, 19, 20, 21, 35
09/07/2018	2	2.4	Exact equations	P64: 1-8, 9, 10, 11, 13, 14, 17, 18, 19, 21, 23, 24, 30.
			<i>Quiz 2</i>	
09/10/2018		2.5	Special integrating factor	P69: 1-6, 7, 8, 11, 12, 13, 20.
09/12/2018		2.6	Homogeneous and Bernoulli equations	P76: 1-89, 10, 12, 13, 15, 21, 23, 25, 30, 45
09/14/2018		2.6	Bernoulli equations	P76: 1-89, 10, 12, 13, 15, 21, 23, 25, 30, 45
09/17/2018	1, 2		Exam 1	
			Mathematical modeling with first order ordinary differential equations	
09/19/2018		3.1	Introduction	
		3.2	Compartmental analysis	P100: 1, 2, 3, 5, 7, 9, 11, 13, 14, 15, 19, 21, 23, 25.
09/21/2018	3	3.3	Heating and cooling of buildings	P107: 1, 2, 3, 5, 6, 11, 15.
09/24/2018		3.4	Newtonian mechanics	P115: 1, 2, 5, 6, 7, 12, 13, 25.
09/26/2018		3.5	Electrical circuits	P121: 1, 2, 3, 5, 7.
			<i>Quiz 3</i>	
09/28/2018	3		Exam 2	
			Linear second order equations	
10/01/2018		4.1	Mass-spring oscillator	P156: 1 2, 3, 5, 7, 8.
10/03/2018		4.2	Homogeneous linear equations	P164: 1-5, 7, 12, 13, 14, 15, 23, 27, 28, 29, 31, 35, 38, 43.
10/05/2018		4.3	Auxiliary equations with complex roots	P172: 2, 3, 7, 9, 12, 10, 18, 21, 24, 26, 29, 31, 33, 37.
10/08/2018		4.4	Method of undetermined coefficients	P180: 1, 2, 3, 5, 9, 10, 13, 24, 27, 28, 29.
	4		<i>Quiz 4</i>	
10/10/2018		4.5	Superposition principle	P185: 1, 3, 5, 7, 10, 11, 17, 19, 25, 31, 34, 36, 39, 43.
10/12/2018		4.6	Variation of parameters.	P191: 3-5, 7, 9, 13, 16

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Date			Topic	Homework
	Chapter	Section		
10/15/2018	4	4.7	Equations with variable coefficients	P199: 1-3, 5, 6, 9, 13, 15, 17, 19, 32, 33, 38, 39, 42, 45, 49.
10/17/2018		4.9	Free vibrations	P220: 1-4, 7, 11.
10/19/2018		4.10	Forced vibrations	P227: 3, 4, 9, 11, 13.
10/22/2018			Exam 3	
10/24/2018	7		Laplace transforms	
		7.1-7.2	Definition of the Laplace transform	P360: 2, 3, 5, 6, 9, 11, 14, 15, 19, 29.
10/26/2018		7.3	Properties of Laplace transforms	P365: 1, 2, 5, 7, 12, 21, 25, 29, 30, 33, 35.
10/29/2018		7.4	Inverse Laplace transform	P374: 1, 2, 7, 9, 10, 11, 13, 15, 21, 23, 25, 35.
			<i>Quiz 5</i>	
10/31/2018		7.5	Solving initial value problems	P382: 1-5, 7, 9, 13, 21, 23, 25, 31, 32, 35.
11/05/2018		7.6-7.7	Discontinuous and periodic functions	P390: 3, 5, 7, 9, 11, 13, 15, 17, 21, 25, 27, 29, 33, 35, 39. P396: 2, 4, 5, 8, 16, 22.
11/07/2018		7.8	Convolution	P404: 1, 3, 5, 9, 13, 19, 23, 25.
11/09/2018	7		Exam 4	
11/12/2018	8		Series solutions of differential equations	
		8.1	The Taylor polynomial	P425: 1-3, 5, 7, 13, 15.
11/14/2018		8.2	Review of power series	P433: 1-3, 5, 9, 11, 13, 19, 21, 23, 25, 27, 31, 33.
11/16/2018		8.3	Power series solution	P443: 1-3, 5, 7, 9, 11, 12, 17, 19, 23, 25, 27, 33, 35.
			<i>Quiz 6</i>	
11/19/2018	8	8.3	Power series solution	P445: 1-3, 5, 7, 9, 11, 12, 17, 19, 23, 25, 27.
11/26/2018		8.4	Equations with analytic coefficients	P449: 1-3, 5, 7, 9, 13, 15, 19, 21, 23, 25, 19.
11/28/2018	8		Exam 5	
11/30/2018			Discussion of Exam 5 and final exam syllabus	
12/03/2018			Make-up exam	
11/05/2018			Review for final exam	
12/12/2018			Final exam (Comprehensive): 12:30-14:30	

Student Responsibilities/Expectations: Students are advised to keep pace with the course material as it is being presented. Consequently, students should endeavor to attend all class meetings, be early for class, and spend sufficient time working on assigned homework problems. If for any reason a student misses a class, he/she should endeavor to obtain the notes and learn the missed material before the next class meeting. I will be glad to go over the material covered in class with the student during one of my office hours or during a scheduled appointment. Students should not hesitate to ask questions or seek additional assistance to ensure that they are staying on pace with the class. Students will be expected to come to class prepared and ready to participate actively. Please, turn off your cell phones and put aside any unrelated material before class begins. Also, students exhibit a great sense of responsibility and respect towards fellow students. Late-coming to class or early departure from class meetings will not be allowed.

Course Policies/Procedures

Announcements: Announcements will be made in class and through canvas. It is the student's responsibility not to miss any announcement made in class and to check his/her canvass account regularly. Unless otherwise stated, exam, quiz and homework grades will be posted on canvas not later than the second class period after the due date.

Examinations: There will be five exams administered during the normal 50 minutes class period and one cumulative (comprehensive) final exam. Each exam will consist of a multiple choice and a problem (free-response) section. The problems section will contain problems to solve and possibly definitions, brief explanations of concepts, and simple proofs. The final exam shall be administered according to the University's schedule.

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.

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 advised 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.

Class Attendance and Missed Exams, Assignments, and Quizzes: Requirements for class attendance and make-up exams, assignments, quizzes, and other work in this course are consistent with university policies that can be found at: <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>.

Grading and Grade Scale: Your final grade will be based on the cumulative total of points acquired through exams, quizzes, homework, and class attendance/participation as follows:

<u>Assessment item</u>	<u>Points</u>
Final Exam	100
50-Minute Exams	300
Quizzes	50
Homeworks	40
Attendance/Participation	10
Total	500

<u>Grade</u>	<u>Range</u>	<u>Grade</u>	<u>Range</u>
A	465-500	C	375-387
A-	450-464	C-	350-374
B+	438-449	D+	338-349
B	425-437	D	325-337
B-	400-424	D-	300-324
C+	388-399	E	000-299

See <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx> for information on current UF grading policies for assigning grade points.

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.

Student Evaluation: Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results/>.

In addition to the final evaluation, I encourage students to furnish me with feedback, either in person, by voice mail, by email, through a note left under my office door (LIT 468), etc., throughout the semester. I look forward to reading your constructive and objective comments.

Special Accommodations: Students requesting classroom accommodations or special arrangements during examinations must first register with the Dean of Students Office (352-392-8565, www.dso.ufl.edu/drc/). The Dean of Students Office will provide documentation. The student must then make arrangements with the instructor to meet the requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

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.