

MAP2302: (SECTION 0100) ELEMENTARY DIFFERENTIAL EQUATIONS, Fall 2019

Course webpage: https://people.clas.ufl.edu/calistusnn/courses/map2302_section_0100_fall_2019/

Course, meetings, Instructor, and Assistant's information

Term	Fall 2019
Course	MAP2302
Section	0100
Credits	3
Days	Monday, Wednesday, Friday
Period	6
Time	12:50 - 13:40
Venue	LIT 121

Instructor	Calistus N. Ngonghala
Office	LIT 468
Contact	Tel.: (352) 294-2335, Email: calistusnn@ufl.edu
Office hours	1) Monday, Friday: 15:00-15:50 (8th period) Wednesday: 13:55-14:45 (7th period) 2) By appointment
Assistant	Mahya Aghaee
Office	LIT 463

Remark: *Don't feel constrained by the scheduled office hours. You are drop in or contact me 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) (2019).

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	Chapter	Section	Topic	Homework	
08/21/2019	0	0	Syllabus, Office hours, and background		
			Introduction		
08/23/2019	1	1.1	Background	<i>P5</i> : 1 - 16.	
		1.2	Solutions and initial value problems	<i>P13</i> : 2, 4, 7, 9, 15, 21, 22, 25.	
08/26/2019		1.3	Direction Fields	<i>P21</i> : 1, 3, 5, 7.	
			<i>Quiz 1</i>		
			First Order Differential Equations		
08/28/2019	2	2.1	Motion of falling body		
08/30/2019		2.2	Separable equations	<i>P46</i> :1-9, 11, 12, 13, 16, 17, 19, 20, 21, 22, 24, 29, 33, 37, 38.	
09/04/2019		2.3	Linear equations	<i>P54</i> : 1-8, 13, 17, 18, 19, 20, 21.	
09/06/2019		2.4	Exact equations	<i>P64</i> : 1-19, 21, 23, 24, 30.	
				<i>Quiz 2</i>	
09/09/2019		2.5	Special integrating factor	<i>P69</i> : 1-8, 11, 12, 13, 20.	
09/11/2019		2.6	Homogeneous and Bernoulli equations	<i>P76</i> : 1-15, 21, 23, 25, 30, 45	
09/13/2019		2.6	Bernoulli equations	<i>P76</i> : 1-15, 21, 23, 25, 30, 45.	
09/16/2019	1, 2		Exam 1		
			Mathematical modeling with first order ordinary differential equations		
09/18/2019	3	3.1	Introduction		
		3.2	Compartmental analysis	<i>P100</i> : 1-9, 11 - 15, 19, 21, 23.	
09/20/2019		3.3	Heating and cooling of buildings	<i>P107</i> : 1, 2, 3, 5, 6, 11, 15.	
09/23/2019		3.4	Newtonian mechanics	<i>P115</i> : 1, 2, 5, 6, 7, 12, 13, 25.	
09/25/2019		3.5	Electrical circuits	<i>P121</i> : 1, 2, 3, 5, 7.	
			<i>Quiz 3</i>		
09/27/2019	3		Exam 2		
			Linear second order equations		
09/30/2019	4	4.1	Mass-spring oscillator	<i>P156</i> : 12, 3, 5, 7, 8.	
10/02/2019		4.2	Homogeneous linear equations	<i>P164</i> : 1-7, 12-15, 23, 27-32, 43.	
10/07/2019		4.3	Auxiliary equations with complex roots	<i>P172</i> : 1, -12, 21-26, 29, 31, 37.	
10/09/2019		4.4	Method of undetermined coefficients	<i>P180</i> : 1-5, 9-13, 24, 27, 28, 29.	
				<i>Quiz 4</i>	
10/11/2019		4.5	Superposition principle	<i>P185</i> :1-7, 10, 11, 17, 19, 25, 31, 34, 36, 39, 43.	
10/14/2019		4.6	Variation of parameters.	<i>P191</i> : 3-5, 7, 9, 13, 16.	
10/16/2019		4.7	Equations with variable coefficients	<i>P199</i> :1-6, 9, 13, 15, 17, 19, 32, 33, 38, 39, 42, 45, 49.	
10/18/2019		4.9	Free vibrations	<i>P220</i> : 1-4, 7, 11.	
10/21/2019		4.10	Forced vibrations	<i>P227</i> : 3, 4, 9, 11, 13.	
10/23/2019	4		Exam 3		
			Laplace transforms		
10/25/2019	7	7.1-7.2	Definition of the Laplace transform	<i>P360</i> :1-6, 9, 11, 14, 15, 19, 29.	
10/28/2019		7.3	Properties of Laplace transforms	<i>P365</i> : 1-7, 12, 21, 25, 29, 30, 35.	
10/30/2019		7.4	Inverse Laplace transform	<i>P374</i> :1, 2, 7, 9, 10, 11, 13, 15, 21, 23, 25, 35.	
			<i>Quiz 5</i>		

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Date	Chapter	Section	Topic	Homework
11/01/2019	7	7.5	Solving initial value problems	P382: 1-13, 21, 23, 31, 32, 35.
11/04/2019		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.
11/06/2019		7.8	Convolution	P404: 1, 3, 5, 9, 13, 19, 23, 25.
11/08/2019	7		Exam 4	
			Series solutions of differential equations	
11/13/2019	8	8.1	The Taylor polynomial	P425: 1-3, 5, 7, 13, 15.
11/15/2019		8.2	Review of power series	P433:1-5, 9-13, 19-27, 31, 33.
11/18/2019		8.3	Power series solution	P445:1-12, 17, 19, 23-27, 33, 35.
			<i>Quiz 6</i>	
11/20/2019		8.3	Power series solution	P445:1-12, 17, 19, 23-27, 33, 35.
11/22/2019		8.4	Equations with analytic coefficients	P450:1-9, 13, 15, 19, 21, 23, 25.
11/25/2019	8		Exam 5	
12/02/2019			Make-up exam	Practice problems
12/04/2019			Review for final exam	Practice problems
12/11/2019	1-4, 7, 8		Final exam: 12:30 a.m. - 02:30 p.m.	

Student responsibilities and 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 and 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 canvas account regularly. Unless otherwise stated, exam, quiz and homework grades will be posted on canvas as soon as they are graded.

Examinations: There will be five exams administered during the normal 50 minutes class period (but only the best four will count towards the final grade.) There will also be one cumulative (comprehensive) final exam that will count towards the final grade. The final exam shall be administered according to the University's schedule. 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.

Make-up exams: The purpose of the one dropped 50-minute exam. is to cater for any missed exam. However, any student with a duly justified and documented reason for missing an exam, will be offered another chance to make-up for the exam during the class period of 12/02/2019. A student will be able to make-up only one exam during this period. Students must provide justification and indicate their intention to take the make-up exam in advance.

Quizzes: A total of six 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. Because there will be no make-up quiz, only the best five quizzes will count towards the final grade.

Homework: The purpose of homework 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. Assigned and selected problems from homework 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>. Attendance will be taken during each class and this will count towards the final grade.

Grading and Grade Scale: Your final grade will be based on the cumulative total of points acquired through exams, quizzes, homework, class participation and attendance. For information on current UF grading policies for assigning grade points, see <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>.

Assessment item	Points	Letter grade	Point range	Letter grade	Point range
Final Exam	100	A	465 - 500	C	350 - 374
50-minute Exams (4)	300	A–	450 - 464	C–	465 - 500
Quizzes (5)	50	B+	438 - 449	D+	450 - 464
Homework (6)	40	B	400 - 424	D	438 - 449
Attendance	10	B–	388 - 399	D–	400 - 424
Total	500	C+	375 - 387	E	388 - 399

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.