A	Course Title & Number	**Differential Equations - MTH 205**					
B	Pre/Co-requisite(s)	MTH 104					
C	Number of credits	3-0-3					
D	Faculty Name	Ayman Badawi					
E	Term/ Year	Spring 2022					
F	Sections	CRN	Sec	Days	From	To	Location	Instructor
		20398	03	MW	2:00 pm	3:15 pm	Nab 07, first 2 weeks on line	Ayman Badawi

G	Instructor Information
	Office Hours: 12:30 -- 13:40, MW (by appointment for the first two weeks)

Instructor	Office	Telephone	Email
Ayman Badawi	NAB262	--------	abadawi@aus.edu

H	Course Description from Catalog	Covers mathematical formulation of ordinary differential equations, methods of solution and applications of first order and second order differential equations, power series solutions, solutions by Laplace transforms and solutions of first order linear systems.

I	Course Learning Outcomes	Learning Outcomes Upon completion of this course, students will be able to:	Assessment Instruments
		1. Explain basic definitions, concepts, vocabulary, and mathematical notation of differential equations.	Exam 1, Final Exam
		2. Demonstrate the necessary manipulative skills required to solve equations of first order and higher-order constant-coefficient linear differential equations.	Exam 1, Exam 2, Final Exam
		3. Demonstrate the necessary manipulative skills required to find particular solutions of second order differential equations.	Exam 2, Final Exam
		4. Apply Laplace transform to solve IVPs and systems of linear differential equations.	First Exam
		5. Understand the fundamental properties of power series, and how to use them to solve linear differential equations with variable coefficients.	Exam 2, Final Exam
		6. Formulate and solve applied physical problems arising in science and engineering.	Exam 1, Exam 2, and the Final Exam

J	Textbook and other Instructional Material and Resources	**Essential and crucial:** Class Notes, Examples and Questions solved in the class. Materials on I-learn. My personal course webpage (old exams, quizzes, solutions…)
		http://ayman-badawi.com/MTH%20205.html
		(**Optional**) Zill D.G., **A First Course in Differential Equations with Modeling and Applications**, 11th edition, 2018, Cengage learning (any version will do).
		The course textbook can be purchased through the AUS eTextbook-shop. Please click on the link below for a guide on how to purchase books from eTextbook-shop. Student Guide: https://itfaq.aus.edu/sites/default/files/attachments/faq/586/student-guide-purchasing-and-accessing-etextbooks-etextbook-shopcompressed.pdf
		Math Learning Center: The Department of Mathematics and Statistics offers a Math Learning Center in NAB239. The goal of this free of charge tutoring service is to provide students with a supportive atmosphere where they have access to assistance and resources outside the classroom. No need to make an appointment-just walk in. Your questions or concerns are welcome to cas-mlc@aus.edu.
K	Teaching and Learning Methodologies	This is a traditional lecture based course. Students are tested and given feedback throughout the semester via regular homework, quizzes, and exams.
L	Grading Scale, Grading Distribution, and Due Dates	

Grading Distribution:

Assessment	Weight	Date
Quizzes	15%	Every Wednesday (no quizzes for the first 2 weeks)
Exam 1	25%	Wednesday March 9, 2022 in class
Exam 2	25%	Wednesday April 27, 2022 in class
Final Exam	35%	TBA
Total	100%	

Grading Scale:

Cut-off (%)	Grade Points		Cut-off (%)	Grade Points
92 ≤ A ≤ 100	4.0		72 ≤ C+ < 76.99	2.3
89 ≤ A- < 91.99	3.7		66 ≤ C < 71.99	2.0
85 ≤ B+ < 88.99	3.3		62 ≤ C- < 65.99	1.7
81 ≤ B < 84.99	3.0		50 ≤ D < 61.99	1.0
77 ≤ B- < 80.99	2.7		F < 49.99	0

M	Explanation of Assessments	*All Quizzes and Exams will be offered face to face. There will be no online option for taking exams and quizzes.* Missed work (Exams, Quizzes, Homework, etc.) due to approved reasons (including Covid isolation) will be treated as *excused* and handled accordingly *Quizzes:* There will be in-class quizzes. *Midterm Exams:* There will be two midterm exams. Exam dates are already set. The timings will be during class period. *Final Exam:* • The final exam will be comprehensive. The date and time of the final exam will be scheduled by the registrar's office.
N	Student Academic Integrity Code Statement	Students must adhere to the Academic Integrity code stated in the 2021-2022 undergraduate catalog
O	Attendance Policy	Regular attendance of all classes is expected. Students in this course are required to follow the AUS Attendance Policy as outlined in the *AUS Undergraduate Catalog* 2021-2022 (p. 27). *During the face to face component of the course, a student should be present on campus.* *During the online component of the course, a student should be present online.*

Rules and Remarks:

• Quizzes will be pre-announced at least one lecture in advance.

• No make-up quizzes will be given. However, the lowest quiz grade will not be counted toward your final grade.

• With a valid written excuse and making immediate arrangements with the instructor, a missed exam might be replaced with the grade of the final exam and/or the average grade of all exams.

Please turn off your cellphone before the class

SCHEDULE, but not in order

*Note: **Tests and other graded assignments due dates are set.** No addendum, make-up exams, or extra assignments to improve grades will be given.*

WEEK	CHAPTER	NOTES	
1	1: Introduction to DE	1.1 Definitions and Terminology 1.2 Initial-Value Problems	
2	1: Continued 2: First-Order DE	1.3 Differential Equations as Mathematical Models 2.1 Solution Curves Without the Solution	
3	2: Continued	2.2 Separable Equations 2.3 Linear Equations	
4	2: Continued	2.4 Exact Equations 2.5 Solutions by Substitutions	
5	3: Modeling with First-Order DE	3.1: Applications of First order linear ODE	
6	4: Higher-Order DE	4.1 Preliminary Theory: Linear Equations 4.3 Homogeneous Linear Equations with Constant Coefficients	
7	4: Continued	4.4 Undetermined Coefficients – Superposition Approach	
8	4: Continued	4.6 Variation of Parameters 4.2: Reduction of Order	
9	4: Continued 5: Modeling with Higher-Order DE	4.7 Cauchy-Euler Equation 5.1 Linear Models: Initial-Value Problems 5.1 Spring/Mass System and Series Circuit	
10	6: Series Solutions of LDE	6.1 Review of Power Series 6.2 Solutions about Ordinary Points	

11	7: The Laplace Transform	7.1 Definition of the Laplace Transform 7.2 Inverse Transforms and Transforms of Derivative	
12	7: Continued	Some useful tricks, class notes	
13	7: Continued	7.3 Translations on the s-Axis and the t-Axis	
14	7: Continued 7: Continued	7.4 Derivatives of Transform, Transforms of integrals and Periodic Functions 7.5 The Dirac Delta Function	
15	7: Continued	7.6 Systems of Linear Equations	
16		**Final Exam (Comprehensive)**	

Math 205 Suggested Problems if you decided to use the text book

TEXT: *A First Course in Differential Equations with Modeling Application, by D.G. Zill, 11th Edition.*

Section	Page	Exercises
1.1	12	1-8, 12, 15, 19, 27, 32
1.2	19	4, 8, 14, 17, 18, 23, 24, 25, 27
1.3	30	1, 5, 13, 14, 17
2.1	44	1, 9, 13, 21, 22, 25, 27, 29
2.2	52	3, 6, 7, 8, 13, 14, 17, 25, 27, 30, 36(a)
2.3	62	5, 9, 12, 13, 17, 23, 24, 25, 28, 29, 31
2.4	70	2, 3, 6, 8, 12, 16, 24, 32, 35, 37
2.5	75	3, 5, 8, 11, 15, 18, 22, 23, 25, 28

3.1	91	1, 3, 6, 7, 14, 15, 23, 26, 27
4.1	130	1, 3, 5, 6, 9, 13, 15, 17, 19, 23, 26, 31, 36, 38, 40
4.2	134	2, 3, 9, 11, 17
4.3	140	3, 5, 11, 15, 16, 22, 23, 24, 31, 33, 43-48, 56, 57, 59
4.4	150	1, 5, 8, 11, 13, 15, 19, 20, 24, 26, 29, 32, 45
4.6	165	1, 3, 9, 15, 19, 25
4.7	171	1, 3, 4, 5, 6, 11, 14, 15, 17, 19, 29, 45
5.1	209	1,3,4,5,9,11,21-24, 26,, 30, 33, and 35
6.1	242	23, 24, 25, 27, 29, 31,33
6.2	251	1, 2, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21
7.1	285	4, 13, 15, 18, 21, 25, 29, 31,33, 37
7.2	293	2, 3, 7, 9, 11, 15, 19, 24, 33, 34, 36, 39
7.3	303	1, 3, 6, 7, 15, 22, 23, 26, 29, 37, 39, 43, 45, 47, 49, 51, 54, 55, 58 63, 65
7.4	315	1, 5, 7, 8, 11, 23, 25, 27, 29, 37, 39, 41, 45, 49, 51
7.5	321	1, 3, 6, 10
7.6	325	1, 3, 6, 7, 9, 12