LaGuardia Community College
The City University of New York

MAT 204 Elementary Differential Equations

Data æquatione quocunque fluentes quantitates involvente, fluxiones invenire; et vice versa.   Sir Isaac Newton

Textbook: C. Henry Edwards and David E. Penney, David T. Calvis, *Differential Equations and Boundary Value Problems*, fifth edition, ISBN 978-0-321-79698-1

Reference: William E. Boyce and Richard C. DiPrima, *Elementary Differential Equations and Boundary Value Problems*, tenth edition, Wiley, ISBN 978-0-470-45831-0.

Description:

This course will consider selected problems and mathematical models which generate ordinary differential equations. Both numerical and analytical methods will be used to obtain solutions for first and second order differential equations. Power series solutions will be discussed, and solutions utilizing computer methods will be explored.

Topics:

Differential equations and models; slope fields; separable equations; homogeneous linear equations; nonhomogeneous linear equations; substitution methods; exact equations; population models; numerical methods; second-order linear equations; mechanical vibrations; electrical circuits; eigenvalue problems; series solutions; linear systems; almost linear systems; competing species; Lotka-Volterra equations; stability and bifurcation; Laplace transform.

Suggested Grading System (subject to individual instructor's modification):
Examination 1……………… 15%
Examination 2……………… 20%
Examination 3……………… 20%
Project………………….....15%
Final Examination…………..30%

Note: This course will have three Exams and one cumulative Final Exam. Regardless of the teaching modality (hybrid, online), the Final Exam and at least one of the Instructor's Exams (preferably 2nd test) will be conducted in-person. When the course is offered in-person, all Exams and the Final Exam will be conducted in-person. The Final Exam will be conducted during the finals week in the assigned classroom during the class time.

Schedule and Assignments

	Topic	Reading	Suggested Homework Problems
1	Differential Equations and Mathematical Models	1.1 – 1.2	1.1: 10, 11, 12, 13, 15, 24, 26, 27–31 1.2: 2, 5, 6, 7, 10, 18
2	Geometrical Interpretation; Separable Equations	1.3 – 1.4	1.3: 1–10, 11–20, 26 1.4: 1, 7, 15, 19, 22, 26, 34
3	Linear First-Order Equations	1.5	1.5: 5, 9, 12, 21, 24, 29, 30, 33, 38, 41
4	Substitution; Exact Equations	1.6	1.6: 1, 9, 15, 26, 31, 34, 43, 45–49, 59
5	Numerical Methods	2.4	2.4: 5, 6, 9
6	Review		Chapter 1 Review Problems
7	Examination 1		
8	Second-Order Linear Equations with Constant Coefficients	3.1 – 3.3	3.1: 1, 5, 9, 15, 24, 26, 33, 38, 41, 45, 51–56 3.2: 1, 3, 13, 16, 21, 23, 24, 25, 26
9	Nonhomogeneous Equations and Undetermined Coefficients	3.5	3.3: 3, 4, 7, 12, 19, 23, 24, 26, 27, 33, 34
10	Variation of Parameters	3.5	3.5: 1, 10, 13, 14, 17, 22, 25, 37, 47, 53, 54
11	Mechanical Vibrations and Electrical Circuits	3.4, 3.6, 3.7	3.4: 10, 13, 14, 15, 18 3.6: 11–14. 3.7: 11, 13, 15
12	Endpoint Problems and Eigenvalues	3.8	3.8: 1–6, 14
13	Series Solutions Near Ordinary Points	8.1 – 8.2	8.1: 11, 13, 19, 20, 21, 22 8.2: 1, 3, 7, 14, 17
14	Series Solutions Near Singular Points	8.3 – 8.4	8.3: 2, 7, 17, 27 8.4: 9
15	Examination 2		
16	Review of Matrices	5.1	5.1: 3, 4, 11–20, 21–30, 31
17	Linear Systems (I)	5.2 – 5.3	5.2: 1, 3, 5, 9, 11, 13, 15, 17, 21, 26
18	Linear Systems (II)	5.4*, 5.6	5.6: 1, 5, 9, 11
19	Almost Linear Systems	6.1 – 6.2	6.1: 1–8, 13, 15, 16 6.2: 1, 3, 5, 6, 9, 12, 13, 19–32
20	Ecological Models	6.3	6.3: 1, 2, 4–7
21	Examination 3		
22	Laplace Transform	7.1 – 7.3	7.1: 2, 4, 5, 6, 8, 9, 16, 23, 26, 27, 29 7.2: 1, 5, 9, 13, 16 7.3: 1, 5, 11, 27
23	Convolution Integral	7.4	7.4: 1, 3, 4, 6, 7, 13, 14, 29
24	Periodic, Piecewise Continuous, and Impulse Functions	7.5 – 7.6	7.5: 11, 13, 16, 29, 36 7.6: 1, 2, 6, 18

Cumulative Final Examination will take place on _____