Beijing Jiaotong University

2020 Summer Session

MATH 200 Linear Algebra and Differential Equations

Course Outline

Term: July 13 – August 7, 2020

Class Hours: 16:00-17:50 (Monday through Friday)

Course Code: MATH 200

Instructor: Mentor Stafa

Home Institution: Tulane University

Office Hours: TBA and by appointment

Email: mstafa@tulane.edu

Credit: 4

Class Hours: This course will have 52 class hours, including 32 lecture hours, 8 professor office hours, 8 TA discussion session hours, and 4 review session hours.

Course Description: Differential equations are used to model phenomena for example in basic sciences, engineering and economics. This course will cover basic techniques for solving differential equations. Main topics are integrating factors, undetermined coefficients, variation of parameter, Laplace transform. More than half of the course will be on systems of linear differential equations, whose study relies on linear algebra. After learning basic techniques in linear algebra, we will use them to solve systems of differential equations.

Textbook: Calculus: Differential Equations with Boundary Value Problems, Polking, Boggess and Arnold, 2nd Edition, Pearson

Prerequisite: You should have already completed two semesters of single variable calculus that cover derivatives and integrals, that is Calculus I and II.

Course Outline: The course covers materials in Chapters 12-16 of the text. The following is a tentative schedule, which may be subject to change, which will be announced in class.

Week 1
Chapter 2: First-order linear differential equations: separable differential equations, first order linear differential equations, integrating factor, homogeneous differential equations, exact differential equations, Bernoulli equation, existence, uniqueness and continuous dependence on initial conditions of solutions, autonomous equations and stability.

Week 2
Chapters 4 & 5: Second order differential equations: characteristic equation, method of undetermined coefficients, variation of parameters, harmonic motion, Laplace transform, inverse Laplace transform, Heaviside function, Delta function

Week 3
Chapters 7: Matrix algebra, row-echelon reduction, Gauss-Jordan elimination, invertible matrices, determinants, cofactors, Cramer's rule, eigenvalues and eigenvectors.

Week 4.
Chapter 9 & 10: First-order linear systems of differential equations, homogeneous differential equations: non-defective matrices, homogeneous differential equations: defective matrices; Systems of nonlinear differential equations: phase plane portrait, linearization, stability of equilibrium points, long-time behavior of solutions.

Exams: There will be three midterm exams, and one final exam as follows:

- Midterm Exam 1 – July 17, 2020
- Midterm Exam 2 – July 24, 2020
- Midterm Exam 3 – July 31, 2020
- Final exam – August 7, 2020

Midterm exams will be 60 minutes long, and the final exam will be 120 minutes long. All the tests will take place during the discussion period and in the regular classroom. If a student must miss an exam because of a university-approved conflict, please contact me as soon as possible, and no later than one week before the exam. Apart from these conflicts missing an exam or arriving late for an exam may result in the immediate failure (zero) of that exam.

Homework: Look at the at the end of this syllabus for the homework assignments. Homework will not be collected, due to the intensive labor required for grading homework. However, you are strongly encouraged to solve all the homework problems to help you prepare for tests.

Grading Policy: Students must show all their correct work toward a correct answer to receive all the credit for a question. The weight of the midterm exams and the final exam are as follows:

- Midterms. = 20% each
- Final Exam = 40%

Letter Grades: The following table will be used for letter grades. It provides the minimum percentages for the grades. Eventually, if necessary, an average grading (curving) will be used for the grades.

Percentage	90%	80%	70%	60%	<60%
Letter grade	A	B	C	D	F

Office Hours: Please meet me during office hours or before and after class. Don't wait too long before seek help if you think you are falling behind. The pace of this class is very fast.

Academic Integrity: When completing an assignment for this course, students are expected to do original work for the assignment and to not reuse work they may have done in previous courses or other settings unless specific prior approval. Cheating is defined as the giving or receiving of aid (written, oral, or otherwise) in order for a student to receive undeserved credit on class work, homework, tests or any other assignment that is his or her own responsibility. Plagiarism violates the central core of education philosophy. It involves stealing another person's work and claiming it as one's own. It occurs whenever one directly copies another person's intellectual effort and integrates it into his/her class work without giving proper credit to the author. Paraphrasing is defined as "a restatement of a text or passage giving the meaning in another form" (Webster's New Universal Unabridged Dictionary, 1996). When one paraphrases but intentionally omits authorship of the work, this, too is a serious violation of academic honesty. All students have an individual responsibility to understand what cheating, plagiarism, and paraphrasing are. The student must also be aware that the consequences for doing the above listed offences are severe. Whenever you have doubt about what constitutes cheating, plagiarism, or paraphrasing, contact me.

Homework Assignment:

2.2 -- 2, 3, 9, 14, 17, 35
2.4 -- 2, 3, 10, 13, 18, 19, 29
2.5 -- 1, 3, 5, 8
2.7 -- 1, 2, 3, 7, 9, 21
2.9 -- 7, 8, 9, 10, 11, 16, 17, 18, 19, 21, 23, 27
4.1 -- 1, 2, 5, 6, 9, 15, 16, 17, 22
4.2 -- 1, 3, 5
4.3 -- 1, 3, 9, 11, 12, 17, 18, 20, 25, 28, 30, 38
4.4 -- 1, 4, 7, 8, 11, 13, 14
4.5 -- 1, 2, 5, 7, 10, 11, 14, 18, 24, 25, 31, 32, 40, 41, 45
4.6 -- 1, 2, 7, 9, 11
5.1 -- 1, 3, 5, 15, 17, 19, 21, 23, 29

5.2 -- 1, 2, 3, 5, 19, 23, 27, 29, 31, 35, 37, 41
5.3 -- 1, 3, 4, 5, 7, 9, 15, 17, 19, 21, 23
5.4 -- 1, 3, 11, 13, 15, 19 4
5.5 -- 1, 3, 5, 7, 11, 12, 13, 17, 19, 21, 23, 25, 29
5.6 -- 2, 3, 4, 8.
7.1 -- 11, 14, 16, 17, 31, 33, 37, 41, 49, 53, 54;
7.3 -- 1, 23, 25, 29
7.4 -- 3, 11, 19, 23, 27.
7.6 -- 14, 16, 21, 22, 28, 30;
7.7 -- 23, 25, 27, 31, 37
9.1 -- 1—12, 16—27
9.2 -- 1, 3, 5, 7, 9, 11, 17, 19, 21, 29, 31, 33, 41, 43, 45, 47
9.5 -- 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31
9.6 -- 35, 36, 37, 38
9.7 -- 1, 3, 5, 7, 9, 11, 13, 15
10.1 -- 1, 3, 5, 9, 11, 13
10.2 -- 1, 7, 9, 11, 14