Course Title: Math 208 (Introduction to Differential Equations and Linear Algebra)

Credits: 3-0-3


Objectives: The course introduces elementary differential equations and linear algebra to students of Computer Science, Computer Engineering, System Engineering and Earth Science

Learning Outcomes:

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

- Solve systems of linear algebraic equations by elimination of variables.
- Write systems of linear equations in the form of matrices and solve them by performing elementary row operations.
- Find inverse and eigenvalues & eigenvectors of matrices.
- Clearly understand vector spaces, subspaces, bases and their dimensions.
- Apply eigenvalues and eigenvectors to diagonalize matrices and construct block diagonal and Jordan forms for matrices where eigenvalues have incomplete multiplicity.
- Recognize and solve linear first order, separable and exact differential equations and apply them to, growth and decay problems.
- Solve homogeneous differential equations with constant coefficients.
- Apply Wronskian to determine linear independence/dependence of solutions of differential equations.
- Apply methods of undetermined coefficients and variation of parameters to solve non-homogeneous differential equations.
- Write systems of differential equations in matrix form and solve them by applying method of eigenvalues and eigenvectors.
Week | Date | Section | Topic | Suggested Homework
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1 | June 9 – 13, 2019 | 1.1 | Differential Eqs. & Math. Models (Decay & Growth Only) | 3, 5, 10, 14, 20, 35, 38
1.2 | Integrals as General & Particular Solutions | 2, 4, 6, 8, 11, 17
1.4 | Separable Equations (Without Applications) | 3, 8, 10, 24, 26, 34, 40
1.5 | Linear First Order Eqs. | 3, 8, 10, 21, 28, 32
1.6 | Substitution Methods & Exact Eqs. - Only Exact Eqs. | 32, 36, 40, 42

2 | June 16 – 20, 2019 | 3.1 – 3.6 | Review only | Sec 3.1: 4, 13, 18, 24, 28
Linear Systems, Matrices & Gaussian Elimination, Reduced Row-Echelon Form, Matrix Operations, Inverse Matrices, Determinants | Sec 3.2: 2, 6, 10, 26, 28
Sec 3.3: 1, 10, 14, 25
Sec 3.5: 3, 8, 23
Sec 3.6: 2, 7, 17, 21, 33, 38

Major Exam 1: June 25, 2019 | Time: - 07:00-08:30 pm; | Place:-Building 54

3 | June 23 – 27, 2019 | 4.1 | The Vector Space R³ | 2, 4, 6, 8, 10, 16, 19, 20
4.2 | The Vector Space Rⁿ & Subspaces | 1, 8, 12, 14, 17, 26
4.3 | Linear Combination & Independence of vectors | 1, 6, 12, 17, 25
4.4 | Bases & Dimension for vector spaces | 1, 9, 12, 13, 16, 23
4.5 | Row & Column Spaces - Rank of Matrices only | 2, 4, 8, 12, 14, 16

4 | July 30 – July 4, 2019 | 5.1 | Introduction: Second Order Linear Equations | 1, 10, 15, 19, 26, 28, 43
5.2 | General solutions of Linear Eqs. | 2, 9, 14, 22, 26
5.3 | Homogeneous Eqs. with Constant Coefficients | 1, 4, 14, 19, 22, 28, 31, 33, 39
5.5 | Nonhomogeneous Eqs. & Undetermined Coefficients | 2, 4, 8, 16, 21, 27, 42, 44

Major Exam 2: July 8, 2019 | Time: - 05:00-06:30 pm; | Place:-Building 54

5 | July 7 – 11, 2019 | 5.5 | Method of Variation of Parameters | 48, 52, 57, 58, 62
7.1 | First Order Systems & Applications | 2, 3, 8, 14, 20, 21
7.2 | Matrices & Linear Systems | 2, 6, 12, 16, 20, 24
6.1 | Introduction to Eigenvalues | 2, 7, 14, 25, 31

6 | July 14 – 18, 2019 | 7.3 | The Eigenvalue Method for Linear Systems | 1, 3, 9, 18, 25, 26
6.2 | Diagonalization of Matrices | 2, 10, 15, 18, 27
6.3 | Only: The Cayley Hamilton Theorem | 2, 15, 18, 22

7 | July 21 – 25, 2019 | 7.5 | Multiple Eigenvalue Solutions | 4, 9, 13, 16, 25, 28, 31
7.5 | Jordan Normal Form | 38, 40, 43
8.1 | Matrix Exponentials & Linear Systems | 2, 6, 10, 24, 26
8.2 | Nonhomogeneous Linear Systems - Variation of Parameters Method only | 17, 19, 26, 32

8 | July 28 - 29, 2019 | 8.2 | Continued - Nonhomogeneous Linear Systems - Variation of Parameters Method only | Catch-up and Review

FINAL EXAM: - TIME:-7:00 PM DATE: -August 1, 2019 DAY OF EXAM: - Thursday VENUE: - To be announced
Grading Policy:

- Major Exam-I: 25% (100 points)
- Major Exam-II: 25% (100 points)
- Final Exam: 35% (140 points) Comprehensive
- Class Work: 15% (60 points). It is based on Quizzes (Minimum 4 quizzes), Homework & Attendance.

Attendance:

- KFUPM attendance policy will be enforced. A DN grade will be awarded to any student who accumulates 8 unexcused absences.

Exam Questions:

- The questions of the common exams are based on the examples, homework problems and the exercises of the textbook.

Missing one of the Two Common Major Exams – I or II:

- No makeup exam will be given under any circumstance.
- If Exam-I or Exam-II is missed for a legitimate reason (such as medical emergencies), the grade for that exam will be determined based on the existing formula which depends on his performance in the non-missing exam and in the final exam.

Academic Integrity:

- All KFUPM policies regarding ethics apply to this course.

Office Hours Policy:

- I will hold regular office hours as decided with the consent of students. Students can also book special office hours by email. If needed, you can also contact me (by booking a specific time slot) for online discussions via https://appear.in/dr.ashfaquebokhari

Cell Phones in Class:

- Student are not allowed to use cell phone for any purpose during the class. For using cell phones to take pictures of slides, you must seek prior permission from the instructor. Failing in abiding by these regulations will result in penalty decided by the instructor.

Passing Grade:

- Passing grade in the course is 50% (200 out of 400).