KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
Department of Mathematics & Statistics
Math208 Course Syllabus
Term – 182
Coordinator: **Dr. Suliman Al-Homidan;**

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

Credits : 3-0-3

Textbook : Differential Equations and Linear Algebra, C.H. Edwards and D.E. Penny, Prentice Hall, Third Edition (2014)

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.**

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Week	Date	Section	Topic	Suggested Homework
1	Jan. 06 -10	1.1 1.2	Differential Equations & Math. Models (Only Decay & Growth) Integrals as General & Particular Solutions	1,6, 8,10,14,20,35,38 1, 4, 6, 8, 11, 17
2	Jan. 13 – 17	1.4 1.5	Separable Equations (Without Applications) Linear First Order Eqs.	3, 8, 10, 24, 26, 34,40
3	Jan. 20 – 24	1.5 1.6	Linear First-Order Eqs. (cont.) Substitution Methods & Exact Eqs. - **Only Exact Eqs**	3, 8, 10, 21, 28, 32
4	Jan. 27 – 31	1.6 3.1-3.6 3.6	Substitution Methods & Exact Eqs - **Only Exact Eqs.** **Review only** Linear Systems, Matrices & Gaussian Elimination, Reduced Row-Echelon Form, Matrix Operations, Inverse Matrices, Determinants Inverse & the Adjoint Matrix	32, 36, 40, 42 **Sec 3.1:** 4, 13, 18, 24, 28 **Sec 3.2**: 2, 10, 15, 28 **Sec 3.3:** 2, 6, 10, 26, 28 **Sec 3.4:** 1, 10, 14, 25 **Sec 3.5:** 3, 8, 23 **Sec 3.6:** 2,7,17,21 33, 38
			First Major, Thursday Feb 7 5:30 pm -7:30 pm	
5	Feb. 03 – 07	4.1 4.2 4.3	The Vector Space R^3 The Vector Space R^n & Subspaces Linear Combination & Independence of vectors	2, 4, 6, 8, 10, 16, 19, 20 1, 8, 12, 14, 17, 26 1, 6, 12, 17, 25
6	Feb. 10 -14	4.4 4.5 5.1	Bases & Dimension for vector spaces Row & Column Spaces (**Rank of Matrices only**) Introduction : Second Order Linear Equations	1, 9, 12, 13, 16, 23 2,4,8,12,14,16 1, 10, 15, 19, 26, 28, 43
7	Feb. 17 -21	5.2 5.3	General solutions of Linear Eqs. Homogeneous Eqs. with Constant Coefficients	2, 9, 14, 22, 26 1,4,14,19,22,28,31,33,39
8	Feb. 24 - 28	5.5 5.5	Nonhomogeneous Eqs. & Undetermined Coefficients Method of Variation of Parameters	2, 4, 8, 16, 21, 27, 42, 44 48, 52, 57, 58, 62
9	March 03 - 07	7.1 7.2	First Order Systems & Applications Matrices & Linear Systems	2,3,8,14,20,21 2, 6, 12, 16, 20, 24
10	March 10 - 14	6.1 7.3	Introduction to Eigenvalues The Eigenvalue Method for Linear Systems	2, 7, 14, 25,31
			Second Major, Tuesday March 12 8:00 pm -10:00 pm	
11	March 17 - 21	7.3 6.2	The Eigenvalue Method for Linear Systems - Continued Diagonalization of Matrices	1, 3, 9, 18, 25, 26 2, 10, 15, 18, 27
12	March 24 - 28	6.3 7.5	**Only** The Caley Hamilton Theorem Multiple Eigenvalue Solutions	2, 15, 18, 22
13	March 31 – April 04	7.5	Multiple Eigenvalue Solutions (continued) Jordan Normal Form	4, 9, 13, 16, 25, 28, 31 38, 40, 43
14	April 07 - 11	8.1 8.2	Matrix Exponentials & Linear Systems Nonhomogeneous Linear Systems (**Only Variation of Parameters Method**)	2, 6, 10, 24, 26
15	April 14 - 18	8.2	Nonhomogeneous Linear Systems - Continued Catch-up and Review	17, 19, 26, 32

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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 9 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. When a student misses Exam-I or Exam-II for a legitimate reason (such as medical emergencies), his 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.