

# KING FAHD UNIVERSITY OF PETROLEUM & MINERALS

Department of Mathematics & Statistics

## Math260 Course Syllabus

Term – 152

Coordinator: **Dr. Abdulaziz M. Al-Assaf**

([alassaf@kfupm.edu.sa](mailto:alassaf@kfupm.edu.sa))

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**Course Title** : Math260 (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** : This 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 mixture, 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. 17 – Jan. 21	1.1 1.2	Differential Equations & Mathematical Models Integrals as General & Particular Solutions	4, 8, 10, 26, 30, 34, 40 4, 6, 7, 16, 18
2	Jan. 24 – Jan. 28	1.4 1.5	Separable Equations & Applications Linear First-Order Equations	1, 10, 24, 27, 33 4, 10, 21, 26, 32
3	Jan. 31 – Feb. 4	1.5 1.6	Linear First-Order Equations (contin.) Substitution Methods & Exact Equations	2, 8, 27, 40, 60
4	Feb. 7 – Feb. 11	3.1 3.2	Introduction to Linear Systems Matrices and Gaussian Elimination	4, 13, 18, 23, 28 3, 10, 15, 28
5	Feb. 14 – Feb. 18	3.3 3.4	Reduced Row-Echelon Matrices Matrix Operations	4, 11, 25, 35 2, 9, 20, 25
<b>The First Major Exam: Feb. 22, 2016 – Monday</b> (Materials to be covered Sections 1.1 – 3.4)				
6	Feb. 21 – Feb. 25	3.5 3.6	Inverse of Matrices Determinants	6, 13, 18, 28 2, 4, 11, 32, 40, 46
7	Feb. 28 – Mar 3	4.1 4.2	The Vector Space $\mathbb{R}^3$ The Vector Space $\mathbb{R}^n$ & Subspaces	1, 6, 13, 16, 24, 26, 30 3, 8, 16, 19
8	Mar. 6 – Mar. 10	4.3 4.4	Linear Combination & Independence of Vectors Bases & Dimension for Vector Spaces	1, 6, 12, 17, 26 3, 8, 13, 16, 22
<b>Mid-Term Vacation (March 13 – 17)</b>				
9	Mar. 20 – Mar. 24	5.1 5.2	Introduction: Second-Order Linear Equations General Solutions of Linear Equations	1, 11, 16, 19, 25, 28, 44 2, 8, 13, 24, 26
10	Mar. 27 – Mar. 31	5.3 5.5	Homogeneous Equations with Constant Coefficients 2 Nonhomogeneous Eq's and Undetermined Coefficients	1, 4, 14, 22, 28, 33, 38 4, 12, 26, 32, 36
<b>The Second Major Exam: Mar. 31, 2016 – Thursday</b> (Materials to be covered Sections 3.4 – 5.2)				
11	Apr. 3 – Apr. 7	5.5 6.1	Method of Variation of Parameters Introduction to Eigenvalues	47, 52, 57, 60 2, 15, 24, 28, 36
12	Apr. 10 – Apr. 14	6.2 6.3	Diagonalization of Matrices Applications involving Powers of Matrices	2, 14, 25, 28 2, 10, 20, 26, 36
13	Apr. 17 – Apr. 21	7.1 7.2	First-Order Systems & Applications Matrices & Linear Systems	2, 8, 13, 18, 21 2, 4, 12, 16, 20, 25
14	Apr. 24 – Apr.28	7.3	The Eigenvalue Method for Linear Systems	4, 9, 18, 24, 26
15	May 1 – May 5	7.5	Multiple Eigenvalue Solutions	4, 10, 16, 28, 30

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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.

The **average** (x out of 60) of the Class Work of the sections taught by the same instructor should be in the interval [36, 45].

### 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.