

## **Math 202 Syllabus (163)**

Coordinator Dr. Bader Al Humaidi

<b>Course Title:</b>	Elements of Differential Equations
<b>Textbook:</b>	A First Course in Differential Equations by D.G. Zill, 10 <sup>th</sup> Ed.
<b>Course Description:</b>	First-order and first-degree differential equations. Linear Models. Homogeneous differential equations with constant coefficients. Undetermined coefficients-Annihilator Approach, reduction of order, variation of parameters, and Cauchy-Euler equation. Series solutions. Systems of linear differential equations.

### **Learning Outcomes for MATH 202**

At the end of this subject, students should be able to:

- 1) Understand some basic definitions and terminology associated with differential equations and their solutions.
- 2) Determine a region in which a first-order initial-value problem has a unique solution.
- 3) Identify and solve first-order differential equations of type: Separable, Linear, Exact, Homogeneous, and of Bernoulli's type.
- 4) Solve some real-life linear models.
- 5) Find solutions to initial-value and boundary-value problems from a given family of solutions.
- 6) Understand the superposition principals for linear higher-order homogeneous or nonhomogeneous differential equations.
- 7) Understand the meaning of a Fundamental Set of Solutions of a higher-order linear homogenous differential equation.
- 8) Apply the method of Reduction of Order to homogeneous linear second-order differential equations.
- 9) Determine the general solution of homogeneous linear nth-order differential equations with real constant coefficient.
- 10) Use the method of Undetermined Coefficients-Annihilator Approach to find a particular solution of a nonhomogeneous nth-order differential equation with real constant coefficients.
- 11) Use the method of Variation of Parameters to find a particular solution of a second-order linear nonhomogeneous differential equation.
- 12) Solve a Cauchy -Euler Equation.
- 13) Find Power Series solutions of linear second-order differential equations about ordinary points.
- 14) Find Series solutions of linear second-order differential equations about regular singular points.
- 15) Find the Eigenvalues and the Eigenvectors of a square matrix.
- 16) Solve systems of linear homogeneous or nonhomogeneous differential equations using matrix techniques and eigenvalues.
- 17) Use a Matrix Exponential as a Fundamental Matrix of a linear system of differential equations.

Wk	Date	Sec.	Material	Homework
1	July 09-13	1.1	Definitions and Terminology	5, 13, 14, 18, 20, 22, 29, 32, 36, 38
		1.2	Initial Value Problems	2, 6, 13,19, 22, 24, 26, 30
		2.2	Separable Variables	6, 10, 12, 21, 26,30, 32,48
		2.3	Linear Equations	4, 12, 15, 18, 20, 22, 28, 30, 36
		2.4	Exact Equations	5, 8, 12, 20, 28, 30, 31, 34, 42(b), 43
<b>15 July : Normal Monday Classes</b>				
2	July 16-20	2.5	Solutions by Substitutions	2, 6, 8, 10, 12,16, 22, 25, 28, 29
		3.1	Linear Models	4, 8, 10, 15, 16, 18, 20
		4.1.1	Initial and Boundary Value Problems	2,4,6, 10, 12,13(c) , 14(d)
		4.1.2	Homogeneous Equations	16, 22, 24,25, 28, 30
		4.1.3	Nonhomogeneous Equations	31,34,36(b,c)
<b>EXAM I: Tuesday 25/7/2017 (19:00-21:00 PM) , Material 1.1-4.1.3</b>				
3	July 23-27	4.2	Reduction of Order	4,6,10,13,16,18,19
		4.3	Homogeneous Linear Equations with Constant Coefficients	5, 8, 12, 14, 18, 22, 28, 32, 36, 42, 49, 50
		4.5	Undetermined Coefficients--Annihilator Approach	2, 8,14, 20, 25, 28,32,34, 44, 48, 50, 61, 64, 68, 71
		4.6	Variation of Parameters	2,6 11, 12, 18, 22, 24, 26, 28
4	July 30-Aug. 03	4.7	Cauchy-Euler Equation (both methods)	1,6, 8, 12, 16, 18, 22, 24, 29, 32, 36, 38, 40
		6.1	Review of Power Series	2,3, 4, 8, 10, 12, 16
		6.2	Solutions about Ordinary Points	2,4,11,12,16,21,22
		6.3	Solutions about Singular Points	1,4,8,12,14,16,19,24,30,32
<b>EXAM II: Wednesday 09/8/2017 (19:00-21:00 PM), Material 4.2-6.2</b>				
5	Aug. 06-10	A.II.2	Matrices and Linear Systems (review)	12,18,22,23,26,30(d, g) , 36,40,44
		A.II.3	Eigenvalue Problem	48, 49, 53, 54, 56, 59, 60, 61
		8.1	Preliminary Theory-Linear Systems	3, 6, 8, 10, 14, 15, 16, 19, 22, 24, 26
		8.2	Homogeneous Linear Systems	NA
6	Aug. 13-17	8.2.1	Distinct Real Eigenvalues	2, 7, 9, 10,14
		8.2.2	Repeated Eigenvalues	22, 24, 26, 27, 29, 30
		8.2.3	Complex Eigenvalues	34, 37, 38, 42, 46
		8.3	Variation of Parameters	12, 14, 15, 28, 30, 31
7	August 20	8.4	Matrix Exponential (No Laplace Trans.)	2, 5, 6, 8, 9, 10, 12
Final Exam: Monday August 21, 2017, 12:30 PM. Material: Comprehensive.				

**Exam Questions:**

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

**Missing Exam I or Exam 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 this exam will be determined based on the existing formula that depends on his performance in the non-missed exam and in the final exam.

**Attendance:**

Attendance is a University Requirement. A DN grade will be awarded to any student who accumulates 7 unexcused absences. Only official excuses are accepted.

**Academic Integrity:** All KFUPM policies regarding ethics apply to this course.

**Remark**

- According to department policy, the passing grade is 50%.

**Grading Policy:**

1. **Exam I: 25%**
2. **Exam II: 25%**
3. **Final Exam 35%**
4. **Classwork: 15%**

The average ( $x$  out of 60) of the Class Work of the sections taught by the same instructor should be in the interval  $[42, 45]$ .