1. **MA 26200 – Linear Algebra and Differential Equations**

2. **Credits and contact hours:**
   4 credits
   Lecture – 3 days per week at 50 minutes for 15 weeks.
   Recitation - 1 day per week at 50 minutes for 15 weeks.

3. **Instructor's or course coordinator's name:** Ying Zhang, Hunter Simper, Patricia E. Bauman, Daesung Kim, Samy Tindel …

4. **Textbook(s):** None
   a. **Other supplemental materials:** *Linear Algebra and Differential Equations,* (Notes-Selected on of the options listed. – 9780135310403 – Homework access code for 26200; 9781323909683 Package with the MML access code and Custom Book.)

5. **Specific course information**
   a. **Catalog description:** Linear algebra, elements of differential equations. Not open to students with credit in MA 26500 or 26600. Typically offered Fall Spring Summer.
   b. **Prerequisites or co-requisites:** MA 26100 Minimum Grade of C- or MA 18200 Minimum Grade of C- or MA 17400 Minimum Grade of C- or MA 27100 Minimum Grade of C- or MA 27101 Minimum Grade of C- or MATH 26100 Minimum Grade of C- or MA 17200 Minimum Grade of C- or MA 26300 Minimum Grade of C-
   c. **Course status:**

6. **Specific goals for the course**
   a. **Student Learning Outcomes:**
      1. Recall and articulate the basic properties of matrices.
      2. Solve systems of linear equations using Gaussian elimination.
      3. Recall and articulate the basic properties of determinants.
      4. Articulate the basic properties of linear independence, spanning sets, and bases in the context of vector spaces.
      5. Recall the theory of eigenvalues and eigenvectors and be able to calculate them for matrices up to size 4 by 4.
      6. Solve first order differential equations, including linear, separable, and exact first order differential equations.
      7. Articulate basic concepts from the theory of second order and higher order differential equations linear differential equations and solve equations of this type.
      8. Recall and articulate the theory of systems of first order linear differential equations and solve systems of this type.

b. Relationship of course to program outcomes:

7. Topics

Lessons

1	Background; Solutions and initial value problems; Direction fields
2	Motion of a falling body; Separable equations
3	Linear Equations
4	Exact Equations
5	Substitutions and Transformations
6	Newtonian Mechanics
7	Systems of linear equations; Row reduction and echelon forms
8	Vector equations; The matrix equation Ax=b
9	Solution sets of linear systems; Linear independence
10	Introduction to linear transformations; The matrix of a linear transformation
11	Matrix Operations
12	The inverse of a matrix
13	Introduction to determinants; Properties of determinants
14	Cramer's rule, volume and linear transformations
15	Vector spaces and subspaces
16	Null spaces, column spaces and linear transformations
17	Linearly independent sets, bases
18	The dimension of a vector space
19	Rank
20	Eigenvalues and eigenvectors
21	The characteristic equation
22	Complex eigenvalues (omit theorem 9)
23	The mass-spring oscillator; Homogeneous linear equations: the general solution
24	Auxiliary equations with complex roots
25	Nonhomogeneous equations: the method of undetermined coefficients
26	The superposition principle and underdetermined coefficients revisited
27	Variation of parameters
28	Variable-coefficient equations
29	A closer look at free mechanical vibrations
30	Basic theory of higher-order linear differential equations
31	Homogeneous linear differential equations with constant coefficients
32	Undetermined coeff. And annihilator method; Method of variation of parameters
33	Matrix methods for linear systems of odes; Linear systems in normal form
34	Homogeneous linear systems with constant coefficients
35	Complex eigenvalues
36	Nonhomogeneous linear systems (undetermined coeffiecients + variation of parameters)