

*Montgomery College - Department of Mathematics
Takoma Park/Silver Spring Campus*

**MA282 – Differential Equations
3 Semester Hours**

Description First order differential equations; higher order linear differential equations and systems of linear equations; numerical methods; the Laplace transform and applications. Both quantitative methods and qualitative analysis will be included. Matlab, Derive, and Scientific Notebook will be used.

MA282 meets for 3 hours each week.

Prerequisites A grade of C or better in MA 182 or equivalent or consent of department.

- Topics**
- I. First order differential equations
 1. Modeling
 2. Solving separable equations
 3. Slope fields
 4. Euler's method
 5. Existence and uniqueness of solutions
 6. Phase lines, equilibria
 7. Bifurcations
 8. Solving linear equations using an integrating factor
 - II. First order systems of differential equations
 1. Modeling
 2. Phase portraits
 3. Solving decoupled and partially decoupled systems
 4. Characteristic equations
 5. Euler's method for systems
 - III. Linear first order systems
 1. Linearity principle
 2. Finding eigenvalues and eigenvectors
 3. Qualitative analysis of systems
 - a. Real and distinct eigenvalues
 - b. Complex eigenvalues
 - c. Real and repeated eigenvalues

4. Solving unforced linear second order differential equations using systems
- IV. Forcing and resonance
 1. Method of undetermined coefficients
 2. Harmonic oscillators with forcing
- V. Laplace Transforms
 1. Solving first and second order initial value problems
 2. Heaviside functions

Text

A First Course in Differential Equations with Modeling Applications. 8th edition. Zill, Dennis; Brooks/Cole, 2005.