Required Syllabus Information – all must be included in the course syllabus

MAT 265
Course Title: Differential Equations: MA1
Course Credits: 3
Course Description: Explores techniques of problem solving and applications. Topics include first, second, and higher order differential equations, series methods, approximations, systems of differential equations, and Laplace transforms.

GT Pathways Requirements:

Guaranteed Transfer (GT) Pathways Course Statement:
The Colorado Commission on Higher Education has approved MA 265 for inclusion in the Guaranteed Transfer (GT) Pathways program in the GT- MA1 category. For transferring students, successful completion with a minimum C– grade guarantees transfer and application of credit in this GT Pathways category. For more information on the GT Pathways program, go to http://highered.colorado.gov/academics/transfers/gtpathways/curriculum.html.

MATHEMATICS CONTENT CRITERIA GT-MA1

a) Demonstrate good problem-solving habits, including:
   - Estimating solutions and recognizing unreasonable results.
   - Considering a variety of approaches to a given problem, and selecting one that is appropriate.
   - Interpreting solutions correctly.
b) Generate and interpret symbolic, graphical, numerical, and verbal (written or oral) representations of mathematical ideas.
c) Communicate mathematical ideas in written and/or oral form using appropriate mathematical language, notation, and style.
d) Apply mathematical concepts, procedures, and techniques appropriate to the course.
e) Recognize and apply patterns or mathematical structure.
f) Utilize and integrate appropriate technology.

COMPETENCIES & STUDENT LEARNING OUTCOMES FOR GT-MA1

Quantitative Literacy:

1. **Interpret Information**
   a. Explain information presented in mathematical forms (e.g., equations, graphs, diagrams, tables, words).
2. **Represent Information**
   a. Convert information into and between various mathematical forms (e.g., equations, graphs, diagrams, tables, words).
3. **Perform Calculations**
   a. Solve problems or equations at the appropriate course level.
   b. Use appropriate mathematical notation.

c. Solve a variety of different problem types that involve a multi-step solution and address the validity of the results.

4. **Apply and Analyze Information**
    a. Make use of graphical objects (such as graphs of equations in two or three variables, histograms, scatterplots of bivariate data, geometrical figures, etc.) to supplement a solution to a typical problem at the appropriate level.
    b. Formulate, organize, and articulate solutions to theoretical and application problems at the appropriate course level.
    c. Make judgments based on mathematical analysis appropriate to the course level.
5. **Communicate Using Mathematical Forms**
    a. Express mathematical analysis symbolically, graphically, and in written language that clarifies/justifies/summarizes reasoning (may also include oral communication).

SYSTEM REQUIREMENTS:

REQUIRED COURSE LEARNING OUTCOMES

1. Recognize and classify differential equations.
2. Use graphical approaches to analyze solution curves.
3. Solve first and second order linear, homogeneous and nonhomogeneous differential equations using classical techniques.
4. Solve first and second order linear homogeneous and linear nonhomogeneous differential equations using Laplace Transforms and power series.
5. Solve 2 by 2 linear homogeneous systems of differential equations.
6. Apply differential equations to solve various problems in the physical and natural sciences.

REQUIRED TOPICAL OUTLINE

I. Recognize and classify differential equations.
    a. Classification by type
    b. Classification by order
    c. Classification by linearity

II. Use graphical approaches to analyze solution curves.
    a. Slope fields
    b. Phase lines
    c. Phase planes

I. Solve first and second order linear, homogeneous and nonhomogeneous differential equations using classical techniques.
    a. Separation of variables
    b. Integrating factor method
    c. Method of undetermined coefficients
    d. Method of variation of parameters
    e. Methods of substitution such as reduction of order, y over x, etc.
    f. Exact equations

g. Auxiliary equations including distinct roots, repeated roots, and imaginary roots
h. Linear independence
i. Wronskian Determinants to prove linear independence
j. Existence and Uniqueness Theorem

II. Solve first and second order linear homogeneous and linear nonhomogeneous differential equations using Laplace Transforms and power series.
a. Laplace transformations of elementary functions
b. Laplace transformations of periodic functions and derivatives
c. Laplace transformations of inverse transforms
d. Power series solutions
e. Solve 2 by 2 linear homogeneous systems of differential equations.
f. Matrix forms for systems of differential equations
g. Distinct real, repeated and complex eigenvalues

III. Apply differential equations to solve various problems in the physical and natural sciences.
a. Spring - mass systems
b. Growth and decay
c. Newton's Law of Cooling

CCCOnline Course Policies: http://www.ccconline.org/ccconline-course-policies/

Effective Implementation date: Spring 2018, 201830