RARITAN VALLEY COMMUNITY COLLEGE
ACADEMIC COURSE OUTLINE

MATH 254 DIFFERENTIAL EQUATIONS

I. Basic Course Information

A. Course Number and Title: Math 254 Differential Equations

B. New or Modified Course: Modified Course

C. Date of Proposal: Fall 2014

D. Effective Term: Fall 2015

E. Sponsoring Department: Mathematics

F. Semester Credit Hours: 4

G. Weekly Contact Hours: 4
   Lecture: 4
   Laboratory: 0

H. Prerequisites/Corequisites: A grade of C or better in MATH 152 Calculus II

I. Laboratory Fees: None

J. Name and Telephone Number or E-Mail Address of Department Chair:
   Rosemarie Gorini (908) 526-1200 extension 8546, rgorini@raritanval.edu

II. Catalog Description

Prerequisite: A grade of C or better in MATH 152 Calculus II. A course in methods for
solving ordinary differential equations including use of Laplace transforms, series, and
numerical procedures.
III. Statement of Course Need

A. This course is required for the Engineering Science program. This course also serves as a math requirement for programs in Computer Science and Mathematics.

Enrollment History:
In the fall 2014 semester we have approximately 22 students who registered for Differential Equations.

B. No lab component.

C. This course generally transfers as a mathematics course in the mathematics program and as a program elective in technical (physical science, computer science) fields.

IV. Place of Course in College Curriculum

A. This course is a free elective and a Mathematics elective for all programs.
B. This course serves as a General Education requirement in Mathematics.
C. This course meets a program requirement in Chemistry, Computer Science, Engineering Science, General Science, and Mathematics.
D. This course transfers as a second semester calculus course. Course transferability: for New Jersey schools go to the NJ Transfer website, www.njtransfer.org. For all other colleges and universities go their individual websites.

V. Outline of Course Content

A. Modeling

B. First-Order Differential Equations
   1. Linear Differential Equations
   2. Existence and Uniqueness
   3. Slope Fields
   4. Separable Differential Equations
   5. Long-term Behavior
   6. Qualitative Analysis
   7. Logistic Model
C. Second-Order Differential Equations
   1. Springs
   2. Constant Coefficients
   3. Direction Fields
   4. Simple Harmonic Motion
   5. Driven Linear ODE’s
   6. Non-Linear Second-Order Differential Equations
D. Applications
   1. Pendulum, Beats, Frequency Response, Electrical Circuits

E. The Laplace Transform
   1. Solving Initial Value Problems
   2. Periodic Functions
   3. Convolution

F. Linear Systems
   1. Eigenvalues, Eigenvectors, and Eigenspaces
   2. Real Eigenvalues, Complex Eigenvalues
   3. Orbital Portraits
   4. Matrix Exponential
   5. Steady State
   6. Theory of General Linear Systems

G. Non-linear Differential Systems
   1. Chemical Kinematics: The Fundamental Theorem
   2. Autonomous Systems, Direction Fields

H. Series Solutions
   1. Power Series
   2. Series Solutions near an Ordinary Point
   3. Regular Singular Points: The Euler ODE

VI. General Education and Course Learning Outcomes

A. General Education Learning Outcomes:

Students will be able to:

1. utilize various techniques in solving general first-order and linear second order
differential equations (GE-NJ2)
2. determine whether unique solutions are guaranteed to exist (GE-NJ2)
3. solve linear systems of differential equations (GE-NJ2)
4. locate equilibrium points for systems of non-linear differential equations (GE-NJ2)

B. Course Learning Outcomes:

See above

C. Assessment Instruments

A. cumulative final examination
B. tests
C. projects
D. individual teacher determinants

VII. Grade Determinants

Factors that may enter into the determination of the final grade:

A. cumulative final examination
B. tests
C. projects
D. individual teacher determinants

Formats, modes, and methods for teaching:

A. lecture
B. homework
C. weekly problems
D. quizzes
E. projects
F. tests
G. cumulative Final Examination

VIII. Texts and Materials


Please Note: The course outline is intended only as a guide to course content and resources. Do not purchase textbooks based on this outline. The RVCC Bookstore is the sole resource for the most up-to-date information about textbooks.

B. A graphing calculator may be required; TI-84 is recommended

IX. Resources

No special resources are needed.