NEW RIVER COMMUNITY COLLEGE
DUBLIN, VIRGINIA

COURSE PLAN

Course Number and Title:　　MTH 267 Differential Equations

Prepared by:　　Mathematics Department　　　　　Fall 2022
　　　　　　　　　　　　　　　　　　　　　　　　　　　(Date)

Approved by: _S. Talbert-Hungy_　　　　　Fall 2022
　　　　　　　　　(Dean)　　　　　　　　　　　　(Date)

I.　Course Description

Introduces ordinary differential equations. Includes first order differential equations, second and higher order ordinary differential equations with applications, and numerical methods.

Prerequisite: MTH 264: Calculus II or equivalent with a grade of C or better. Lecture 3 hours per week.

II.　Introduction

This course is primarily for the student in mathematics, engineering, and the sciences. The general purpose is to give the student a solid grasp of the methods solving and applying differential equations, and to prepare the student for further coursework in mathematics, engineering, computer science, and the sciences.

III.　Student Learning Outcomes

For the following chapters, the student should be able to:

A. First Order Differential Equations
　　a. Classify a differential equation as linear or nonlinear.
　　b. Understand and create a directional field for an arbitrary first-order differential equation.
　　c. Determine the order, linearity or nonlinearity, of a differential equation.
　　d. Solve first order linear differential equations.
　　e. Solve Separable differential equations.
　　f. Solve initial value problems.
B. Numerical Approximations
　　a. Use the Euler or tangent line method to find an approximate solution to a linear differential equation.
C. Higher Order Differential Equations
　　a. Solve second order homogenous linear differential equations with constant coefficients including those with complex roots and real roots.
　　b. Determine the Fundamental solution set for a linear homogeneous equation.

      c. Calculate the Wronskian.

      d. Use the method of Reduction of order.

      e. Solve nonhomogeneous differential equations using the method of undetermined coefficients.

      f. Solve nonhomogeneous differential equations using the method of variation of parameters.

D. Applications of Differential Equations, Springs-Mass-Damper, Electrical Circuits, Mixing Problems

      a. Solve applications of differential equations as applied to Newton's Law of cooling, population dynamics, mixing problems, and radioactive decay. (1st order)

      b. Solve springs-mass-damper, electrical circuits, and/or mixing problems (2nd order)

      c. Solve application problems involving external inputs (non-homogenous problems).

E. Laplace Transforms

      a. Use the definition of the Laplace transform to find transforms of simple functions

      b. Find Laplace transforms of derivatives of functions whose transforms are known

      c. Find inverse Laplace transforms of various functions.

      d. Use Laplace transforms to solve ODEs.

IV. General Education Student Learning Outcomes Included in Course

General education at NRCC provides the educational foundation necessary to promote intellectual and personal development. Upon completing the associate degree, graduates will demonstrate competency in student learning outcomes in 1) civic engagement, 2) critical thinking, 3) professional readiness, 4) quantitative literacy, 5) scientific literacy, and 6) written communication.

This course includes the following general education student learning outcomes:

- Identify the problem or complex issue and its various parts.
- Seek and evaluate the information needed to fully understand the problem or complex issue.
- Explain numerical information presented in mathematical forms (e.g., equations, graphs, diagrams, tables, words).
- Accurately solve mathematical problems.

V. Instructional Methods

The instructional methods will include lectures, discussions, in class work, online homework, reviews and tests.

VI. Instructional Materials

Textbook: W. Kohler and L. Johnson, Elementary Differential, 2nd Edition

Calculator: See instructor specific requirements.
Cell phones may not be used as calculators.

Software: Octave (any version) or other software to carry out numerical calculations.
Lumen OHM for homework.

Other: Pencils and paper. Ink is not to be used for any graded work

VII.   Course Content

- First order differential equations
- Higher order differential equations.
- Applications of differential equations, springs-mass-damper, electrical circuits, mixing problems.
- Laplace Transforms
- Numerical approximations using Eulers method

VIII.   Evaluation

The grade for the course may be calculated from Tests, quizzes, online homework, a final exam and other work as deemed appropriate by the instructor. See individual syllabus for details on percentages/points.

IX.   Attendance

Regular attendance at classes is required. When absence from a class becomes necessary, it is the responsibility of the student to inform the instructor prior to the absence whenever possible. The student is responsible for the subsequent completion of all study missed during an absence. Any instruction missed and not subsequently completed will necessarily affect the grade of the student regardless of the reason for the absence.

X.   Cheating Policy

The giving or receiving of any help on any graded portion (computer or written) of the course is considered cheating and will not be tolerated. Any student found cheating will receive a grade of "0" on that portion and possibly and "F" for the course. This "0" will not be replaced by the final exam score. When you are doing a computer Evaluate you are not allowed to use your book or notebook.

XI.   Withdrawal Policy

Student Initiated Withdrawal Policy

A student may drop or withdraw from a class without academic penalty during the first 60 percent of a session. For purposes of enrollment reporting, the following procedures apply:

a.   If a student withdraws from a class prior to the termination of the add/drop period for the session, the student will be removed from the class roll and no grade will be awarded.

b.   After the add/drop period, but prior to completion of 60 percent of a session, a student who withdraws from a class will be assigned a grade of "W." A grade of

"W" implies that the student was making satisfactory progress in the class at the time of withdrawal, that the withdrawal was officially made before the deadline published in the college calendar, or that the student was administratively transferred to a different program.

c. After that time, if a student withdraws from a class, a grade of "F" or "U" will be assigned. Exceptions to this policy may be made under documented mitigating circumstances if the student was passing the course at the last date of attendance.

A retroactive grade of "W" may be awarded only if the student would have been eligible under the previously stated policy to receive a "W" on the last date of class attendance. The last date of attendance for a distance education course will be the last date that work was submitted.

Late withdrawal appeals will be reviewed and a decision made by the Coordinator of Admissions and Records.

No-Show Policy

A student must either attend face-to-face courses or demonstrate participation in online courses by the last date to drop for a refund. A student who does not meet this deadline will be reported to the Admissions and Records Office and will be withdrawn as a no-show student. No refund will be applicable, and the student will not be allowed to attend/participate in the class or submit assignments. Failure to attend or participate in a course will adversely impact a student's financial aid award.

Instructor Initiated Withdrawal

A student who adds a class or registers after the first day of class is counted absent from all class meetings missed. Each instructor is responsible for keeping a record of student attendance (face-to-face classes) or performance/participation (online classes) in each class throughout the semester.

When a student's absences equal twice the number of weekly meetings of a class (equivalent amount of time for summer session), the student may be dropped for unsatisfactory attendance in the class by the instructor.

Since attendance is not a valid measurement for Online courses, a student may be withdrawn due to non-performance. A student should refer to his/her online course plan for the instructor's policy.

When an instructor withdraws a student for unsatisfactory attendance (face-to-face class) or non-performance (online class), the last date of attendance/participation will be documented. Withdrawal must be completed within five days of a student's meeting the withdrawal criteria. A grade of "W" will be recorded during the first sixty percent (60%) period of a course. A student withdrawn after the sixty percent (60%) period will receive a grade of "F" or "U" except under documented mitigating circumstances when a letter of appeal has been submitted by the student. A copy of this documentation must be placed in the student's academic file.

The student will be notified of the withdrawal by the Admissions and Records Office. An appeal of reinstatement into the class may be approved only by the instructor.

XII. **Disability and Non-Discrimination Statements**

If you are a student with a documented disability who will require accommodation in this course, please register with the Disability Services Office located in the Advising Center for assistance in developing a plan to address your academic needs.

This College promotes and maintains educational opportunities without regard to race, color, national origin, religion, disability, sex, sexual orientation, gender identity, ethnicity, marital status, pregnancy, childbirth or related medical conditions including lactation, age (except when age is a bona fide occupational qualification), veteran status, or other non-merit factors.

Evacuation Procedure: Please note the evacuation route posted at the classroom doorway. Two routes are marked in case one route might be blocked.