

SYLLABUS

DATE OF LAST REVIEW: 10/2019

CIP CODE: 24.0101

SEMESTER: Departmental Syllabus

COURSE TITLE: Differential Equations

COURSE NUMBER: MATH0227

CREDIT HOURS: 3

INSTRUCTOR: Departmental Syllabus

OFFICE LOCATION: Departmental Syllabus

OFFICE HOURS: Departmental Syllabus

TELEPHONE: Departmental Syllabus

EMAIL: Departmental Syllabus
KCKCC issued email accounts are the official means for electronically communicating with our students.

PREREQUISITE(S): Students need to meet the correct placement measure for this course, or have completed the prerequisite course of MATH0123 Calculus and Analytic Geometry II earning a grade of “C” or better. May be taken concurrently with MATH0224 Calculus and Analytic Geometry III.

REQUIRED TEXT AND MATERIALS: Please check with the KCKCC bookstore <http://kckccbookstore.com> for the required text for your particular class. The TI-83 or 84 Series graphing calculator is required.

COURSE DESCRIPTION: Differential Equations is designed for students in mathematics, hard sciences, and engineering. Content includes standard types of ordinary differential equations, (first, second, and higher order), systems of differential equations, and applications to geometry and physical science. Students will be expected to use appropriate technology as one tool to achieve competency in Differential Equations.

METHOD OF INSTRUCTION: A variety of instructional methods may be used depending on content area. These include but are not limited to: lecture, multimedia, cooperative/collaborative learning, labs and demonstrations, projects and presentations,

speeches, debates, and panels, conferencing, performances, and learning experiences outside the classroom. Methodology will be selected to best meet student needs.

COURSE OUTLINE:

- I. Introduction to Differential Equations
 - A. Classification
 - B. Solutions
 - C. Existence
 - D. Models

- II. First-Order Differential Equations
 - A. Separation of variables
 - B. Exact equations
 - C. General solutions
 - D. Substitutions

- III. Modeling with First-Order Differential Equations
 - A. Linear equations
 - B. Non-linear equations
 - C. System of equations

- IV. Differential Equations of Higher Order
 - A. Initial-value equations
 - B. Boundary-value equations
 - C. Linear independence
 - D. Fundamental set
 - E. Undetermined coefficients
 - F. Variation of parameters
 - G. Systems of equations
 - H. Non-linear equations
 - I. Applications

- V. Series Solutions of Linear Equations
 - A. Interval of convergence
 - B. Solution of equations

- VI. Laplace Transform
 - A. Transforms
 - B. Inverse transforms
 - C. Solution of equations

- VII. Numerical Methods of Ordinary Differential Equations
 - A. Direction fields
 - B. Euler's method
 - C. Runge-Kutta methods

EXPECTED LEARNER OUTCOMES:

- A. The student will be able to identify and classify differential equations (DE).
- B. The student will be able to solve first-order ordinary differential equations (ODE).
- C. The student will be able to solve first-order ODE in applications.
- D. The student will be able to solve higher-order ODE in applications.
- E. The student will be able to find power series solutions to ODE.
- F. The student will be able to solve ODE using the Laplace transform.
- G. The student will be able to approximate a solution to ODE using numerical methods.

COURSE COMPETENCIES:

Upon successful completion of the course:

The student will be able to identify and classify differential equations (DE).

- 1. The student will be able to classify a differential equation (DE) by type, order, and linearity.
- 2. The student will be able to show that a given function is a solution to an ordinary differential equation (ODE).
- 3. The student will be able to determine the existence of a unique solution to a ODE.
- 4. The student will be able to construct ODE's as mathematical models.

The student will be able to solve first-order ordinary differential equations (ODE).

- 5. The student will be able to solve a ODE by separation of variables with or without an initial condition.
- 6. The student will be able to determine if a ODE is exact and solve it if it is exact.
- 7. The student will be able to find the general solution of a linear ODE with and without initial conditions.
- 8. The student will be able to solve a homogeneous and Bernoulli ODE using a substitution.

The student will be able to solve first-order ODE in applications.

- 9. The student will be able to construct a linear ODE as a mathematical model.
- 10. The student will be able to construct a non-linear ODE as a mathematical model.
- 11. The student will be able to construct a system of linear ODE's as a mathematical model.

The student will be able to solve higher-order ODE in applications.

- 12. The student will be able to solve a nth-order initial-value problem (IVP).
- 13. The student will be able to solve a nth-order boundary-value problem (BVP).
- 14. The student will be able to determine whether given functions are linearly independent or dependent.
- 15. The student will be able to verify that given functions form a fundamental set of solutions.
- 16. The student will be able to solve ODE's using undetermined coefficients.
- 17. The student will be able to solve ODE's by variation of parameters.
- 18. The student will be able to solve a system of ODE's by systematic elimination or determinants.
- 19. The student will be able to solve non-linear equations using a substitution.
- 20. The student will be able to construct ODE's as mathematical models to initial-value problems.

- The student will be able to find power series solutions to ODE.*
21. The student will be able to find the interval of convergence of a power series.
 22. The student will be able to solve ODE's using power series.
The student will be able to solve ODE using the Laplace transform.
 23. The student will be able to find the Laplace transform of a given function.
 24. The student will be able to find the inverse Laplace transforms.
 25. The student will be able to solve ODE's using Laplace transforms.

The student will be able to approximate a solution to ODE using numerical methods.
 26. The student will be able to create direction fields for ODE's.
 27. The student will be able to approximate a solution to a ODE using Euler's and the improved Euler's method.
 28. The student will be able to approximate a solution to a ODE using Runge-Kutta methods.

ASSESSMENT OF LEARNER OUTCOMES:

Student progress is evaluated by means that include, but are not limited to, exams, written assignments, and class participation.

SPECIAL NOTES:

Material included is intended to provide an outline of the course and rules that the instructor will adhere to in evaluating the student's progress. However, this syllabus is not intended to be a legal contract. Questions regarding the syllabus are welcome any time.

Kansas City Kansas Community College is committed to an appreciation of diversity with respect for the differences among the diverse groups comprising our students, faculty, and staff that is free of bigotry and discrimination. Kansas City Kansas Community College is committed to providing a multicultural education and environment that reflects and respects diversity and that seeks to increase understanding.

Kansas City Kansas Community College offers equal educational opportunity to all students as well as serving as an equal opportunity employer for all personnel. Various laws, including Title IX of the Educational Amendments of 1972, require the college's policy on non-discrimination be administered without regard to race, color, age, sex, religion, national origin, physical handicap, or veteran status and that such policy be made known.

Kansas City Kansas Community College complies with the Americans with Disabilities Act. If you need accommodations due to a documented disability, please contact the disabilities services office at (913) 288 -7664.

All enrolled students at Kansas City Kansas Community College are subject to follow all rules, conditions, policies and procedures as described in both the Student Code of Conduct as well as the Student Handbook. All Students are expected to review both of these documents and to understand their responsibilities with regard to academic conduct and policies. The Student Code of Conduct and the Student Handbook can be found on the KCKCC website.