

MA 214 Calculus IV

MA 214 Course Competencies

General Education Competencies

- A. Knowledge of human cultures and the physical and natural worlds through study in the sciences and mathematics, social sciences, humanities, histories, languages, and the arts.
- B. Intellectual and practical skills, including
- inquiry and analysis
 - critical and creative thinking
 - written and oral communication
 - quantitative literacy
 - information literacy
 - teamwork and problem solving
- C. Personal and social responsibility, including
- civic knowledge and engagement (local and global)
 - intercultural knowledge and competence
 - ethical reasoning and action
 - foundations and skills for lifelong learning
- D. Integrative and applied learning, including synthesis and advanced accomplishment across general and specialized skills.

Student Learning Outcomes for Quantitative Reasoning

In MA 214, students will learn to:

1. Interpret information presented in mathematical and/or statistical forms by (Gen Ed Comp B):
 - Solve differential equations by separation of variables.
2. Illustrate and communicate mathematical and/or statistical information symbolically, visually, and/or numerically by (Gen Ed Comp A, B, C):
 - Solve application problems using differential equations involving simple and damped harmonic motion.
3. Determine when computations are needed and execute the appropriate computations by (Gen Ed Comp A, B):
 - Solve homogeneous, exact, and linear differential equations.
 - Solve differential equations with constant coefficients.
 - Solve differential equations using reduction of order and variation of parameters.
4. Apply an appropriate model to the problem to be solved by (Gen Ed Comp A, B, C):
 - Solve application problems using differential equations of first order.

5. Make inferences, evaluate assumptions, and assess limitations in estimation modeling and/or statistical analysis by (Gen Ed Comp A, D):
 - Find the Laplace transforms of common functions, and use Laplace Transforms to solve differential equations.

MA 214 Course Outline

1. Classification of Differential Equations
2. First Order Differential Equations
 - (a) Linear Equations with Variable Coefficients
 - (b) Separable Equations
 - (c) Exact Equations and Integrating Factors
 - (d) Existence and Uniqueness of Solutions
 - (e) Applications of First Order Equations
3. Second Order Linear Differential Equations
 - (a) Homogeneous Equations with Constant Coefficients
 - (b) Fundamental Solutions of Linear Homogeneous Equations
 - (c) Linear Independence and the Wronskian
 - (d) Complex Roots of the Characteristic Equation
 - (e) Repeated Roots of the Characteristic Equation
 - (f) Solution of Nonhomogeneous Equations using Method of Undetermined Coefficients
 - (g) Variation of Parameters Method
 - (h) Applications of Second Order Equations
4. Higher Order Linear Differential Equations
 - (a) General Theory of n th Order Linear Equations
 - (b) Homogeneous Equations with Constant Coefficients
 - (c) Method of Undetermined Coefficients
5. Series Solutions of Second Order Linear Differential Equations
 - (a) Series solutions near an Ordinary Point (recommended)
6. Laplace Transforms
 - (a) Definition of Laplace Transform
 - (b) Solution of Initial Value Problems using Laplace Transforms
 - (c) Step Functions
 - (d) Differential Equations with Discontinuous Forcing Functions
 - (e) Impulse Functions