Course number and name: MA 16600  Analytic Geometry and Calculus II

Credits and contact hours: 4.0 Credits; 4.0 Lectures

Instructor’s or course coordinator’s name: Marc Lipman and Peter Dragnev

Text book, title, author, and year

*Essential Calculus: Early Transcendentals* (w/Enh WebAssign Access Codes).
Stewart (2013), (2nd ed.).

*Essential Calculus: Early Transcendentals.* Stewart (2012), (2nd ed.).

Course Description

Vectors in two and three dimensions. Techniques of integration, infinite series, polar coordinates, surfaces in three dimensions.

Prerequisites or co-requisites: MA 16500 with a grade of C or higher. Continuation of MA 16500.

Whether a required, elective, or selected elective course in the program: Require

Course Goals:

Course Objectives

Upon successful completion of the course requirements, a student should be able to do:

- **Techniques of Integration:** Students learn and use all the standard integration methods, including integration by parts, trigonometric substitution, integration of trigonometric functions, and integration of rational functions using partial fractions. They learn how to use tables and computer algebra systems to find the antiderivatives of more complicated functions. They learn the importance of approximate integration, and know how to use the Midpoint Rule, the Trapezoidal Rule and Simpson’s Rule to approximate integrals. Students understand and can evaluate improper integrals by definition, or decide if convergent or divergent using the Comparison Theorem.

- **Applications of Integral:** Students should be able to divide a quantity into small pieces, estimate with Riemann sums, and recognize the limit as an integral. General methods are developed for finding geometrical quantities, such as areas of regions and surfaces, volumes of solids, arc length of curves, as well as quantities used in Physics and Engineering, such as work, hydrostatics pressure and force, and moments and centers of mass. They also learn about basic differential equations, and solve separable differential equations.

- **Infinite Series:** Students learn evaluate limits of sequences, and can decide if a sequence is convergent or divergent. They learn the definition of convergence, the basic properties and several important examples of infinite series. They can decide if a geometric or telescopic series is convergent or divergent, and find the sum of the series if convergent.
They use the Divergence Test, the Integral Test, the Comparison and the Limit Comparison Tests to decide if a given series is convergent or divergent. They learn about alternating series and about absolute convergence, and know how to use the Ratio and Root tests. They understand power series, their basic behavior and their applications. They can use different methods to represent functions as power series.

- **Parametric Equations, Polar Coordinates, and Complex Numbers:** Students learn about parametric curves and use calculus to find tangent lines, areas, and arc lengths for parametric curves. They understand the polar coordinate system, and can graph polar curves. They use calculus to find tangent lines, areas, and arc lengths for polar curves. Students learn the definition and basic operations with complex numbers. They can solve equations that have complex roots. They can represent complex numbers in polar form and perform multiplications, divisions, evaluate powers and take roots using the polar form. They learn Euler’s Formula in connection to power series and they revisit the Fundamental Theorem of Algebra.

**Student Outcomes**
The course learning outcomes of MA 166 support outcomes \{a, k\} of the Computer Engineering Program Student Outcomes:

- a. an ability to apply knowledge of mathematics, science, and engineering
- k. an ability to use the techniques, skills, and modern tools necessary for computer engineering practice

**Major Topics Covered in the Course**
Techniques of Integration;
Applications of the Integral
   - Geometric quantities – arc lengths, areas, and volumes
   - Applications to Physics and Engineering - work, hydrostatics pressure and force, and moments and centers of mass

Infinite Series
   - Sequences,
   - Infinite series – Basic results,
   - Infinite series: More on convergence and divergence

Power Series

Parametric Equations, Polar Coordinates, and Complex Numbers
   - Parametric Equations
   - Polar Coordinates
   - Complex Numbers)