Columbus State Community College
Mathematics Department Syllabus

Course and Number: MATH 2177 – Mathematical Topics for Engineers
Credits: 6 **Class Hours Per Week:** 6
Prerequisites: MATH 1172 or 2153 with a C or higher

COURSE DESCRIPTION: This course covers multiple integrals, line integrals, matrix theory, linear (ordinary and partial) differential equations, with applications to science and engineering.

COURSE GOALS AND/OR OBJECTIVES
To introduce to the student the concepts, methods, and applications of topics in multivariable calculus, linear algebra and differential equations necessary for further study in engineering; to present key ideas and concepts from a variety of perspectives; to develop student's mathematical thinking and problem solving ability.

INSTITUTIONAL LEARNING GOALS: Critical Thinking and Quantitative Skills

TEXTBOOK, MANUALS, REFERENCES, AND OTHER REQUIRED MATERIALS:
Custom CSCC edition (*Mathematical Topics for Engineers*, Pearson), which includes:

- Textbook Sections from *Calculus for Scientists and Engineers: Early Transcendentals,* Briggs, Cochran, Gillett and Shulz, Chapters 13-15
- Textbook Sections from *Introduction to Linear Algebra*, by Johnson, Riess, and Arnold, 5th edition, Chapter 1: Matrices and Systems of Linear Equations
- Textbook Sections from *Fundamentals of Differential Equations and Boundary Value Problems*, by Nagle, Saff and Snider, 8th Edition, Chapter 10
- A graphing calculator is recommended. The TI-89, TI-92, TI-Nspire CAS, and other Computer Algebra Systems (CAS) are never allowed during proctored assessments.

GENERAL INSTRUCTIONAL METHODS: Instructional methods may include face-to-face or video lectures or demonstration, face-to-face or virtual discussion, individual or group activities including the use of visual aids, computers and/or other technologies. Students may be expected to participate in these activities during class and/or outside of class. Instructors may require class participation, collaborative learning, and peer review.

STANDARDS AND METHODS FOR EVALUATION: The final examination will be weighted between 25% and 35% (inclusive) of the course grade. The remainder of the course grade will be determined by the instructor.

GRADING SCALE: Letter grades for the course will be awarded using a 90%-80%-70%-60% scale. Grades will NOT be curved, skewed, or otherwise inflated.

Course Topics

PART ONE: Multivariable Integral Calculus
Textbook Sections from *Calculus for Scientists and Engineers: Early Transcendentals*, Briggs, Cochran, Gillett and Shulz, Chapters 13-15

Text	Topic
13.8	Maximum/Minimum Problems
13.9	Lagrange Multipliers
14.1	Double Integrals over Rectangular Regions
14.2	Double Integrals over General Regions
14.3	Double Integrals in Polar Coordinates
14.4	Triple Integrals
14.5	Triple Integrals in Cylindrical and Spherical Coordinates
14.7	Change of Variables in Multiple Integrals
15.1	Vector Fields
15.2	Line Integrals
15.3	Conservative Vector Fields

PART TWO: Matrices and Linear Systems of Equations
Textbook Sections from *Introduction to Linear Algebra*, by Johnson, Riess, and Arnold, 5th edition, Chapter 1: Matrices and Systems of Linear Equations

Text	Topic
1.1	Introduction to Matrices and Systems of Linear Equations
1.2	Echelon Form and Gauss-Jordan Elimination
1.3	Consistent Systems of Linear Equations
4.4	Applications (optional)
1.5	Matrix Operations
1.6	Algebraic Properties of Matrix operations
1.7	Linear Independence and Nonsingular Matrices
1.8	Data Fitting, Numerical Integration and Numerical Differentiation

PART THREE: Second Order Constant Coefficient Ordinary Differential Equations
Textbook Sections from *Calculus for Scientists and Engineers: Early Transcendentals*, Briggs, Cochran, Gillett and Shulz, Chapter 16 and Appendix C

Text	Topic
16.1	Basic Ideas
Appx C	Complex Numbers
16.2	Linear Homogeneous Equations
16.3	Linear Nonhomogeneous Equations
16.4	Applications

PART FOUR: Fourier Series & Partial Differential Equations
Textbook Sections from *Fundamentals of Differential Equations and Boundary Value Problems*, by Nagle, Saff and Snider, 8th Edition, Chapter 10

Text	**Topic**
10.1	Introduction: A Model for Heat Flow
10.2	Method of Separation of Variables
10.3	Fourier Series
10.4	Fourier Cosine and Sine Series
10.5	The Heat Equation
10.6	The Wave Equation