

**Course Information**

<b>Course Title</b>	Calculus III
<b>Course Prefix, Num. and Title</b>	MATH 2415
<b>Division</b>	Math & Physical Sciences
<b>Department</b>	Mathematics
<b>Course Type</b>	Academic General Education Course (from ACGM, but not WCJC Core)
<b>Course Catalog Description</b>	Advanced topics in calculus, including vectors and vector-valued functions, partial differentiation, Lagrange multipliers, multiple integrals, and Jacobians; application of the line integral, including Green's Theorem, the Divergence Theorem, and Stokes' Theorem.
<b>Pre-Requisites</b>	MATH 2414 Calculus II; or consent of department head
<b>Co-Requisites</b>	None

**Semester Credit Hours**

<b>Total Semester Credit Hours (SCH): Lecture Hours:</b>	4:4:0
<b>Lab/Other Hours</b>	
<b>Equated Pay Hours</b>	4
<b>Lab/Other Hours Breakdown: Lab Hours</b>	0
<b>Lab/Other Hours Breakdown: Clinical Hours</b>	0
<b>Lab/Other Hours Breakdown: Practicum Hours</b>	0
<b>Other Hours Breakdown</b>	0

**Approval Signatures**

<b>Title</b>	<b>Signature</b>	<b>Date</b>
<b>Prepared by:</b>		
<b>Department Head:</b>		
<b>Division Chair:</b>		
<b>Dean/VPI:</b>		
<b>Approved by CIR:</b>		

## Additional Course Information

**Topical Outline:** Each offering of this course must include the following topics (be sure to include information regarding lab, practicum, and clinical or other non-lecture instruction).

### Chapter 9 - Differential Equations

- 9.1 Modeling with Differential Equations
- 9.2 Direction Fields and Euler's Method
- 9.3 Separable Equations
- 9.4 Models for Population Growth
- 9.5 Linear Equations
- 9.6 Predator-Prey Systems

### Chapter 12 - Vectors and the Geometry of Space

- 12.1 Three Dimensional Coordinate Systems
- 12.2 Vectors
- 12.3 The Dot Product
- 12.4 The Cross Product
- 12.5 Equations of Lines and Planes
- 12.6 Cylinders and Quadric Surfaces

### Chapter 13 - Vector Functions

- 13.1 Vector Functions and Space Curves
- 13.2 Derivatives and Integrals of Vector Functions
- 13.3 Arc Length and Curvature
- 13.4 Motion in Space: Velocity and Acceleration

### Chapter 14 - Partial Derivatives

- 14.1 Functions of Several Variables
- 14.2 Limits and Continuity
- 14.3 Partial Derivatives
- 14.4 Tangent Planes and Linear Approximations
- 14.5 The Chain Rule
- 14.6 Directional Derivatives and the Gradient Vector
- 14.7 Maximum and Minimum Values
- 14.8 Lagrange Multipliers

### Chapter 15 - Multiple Integrals

- 15.1 Double Integrals over Rectangles
- 15.2 Double Integrals over General Regions
- 15.3 Double Integrals in Polar Coordinates
- 15.4 Applications of Double Integrals
- 15.5 Surface Area
- 15.6 Triple Integrals
- 15.7 Triple Integrals in Cylindrical Coordinates
- 15.8 Triple Integrals in Spherical Coordinates
- 15.9 Change of Variables in Multiple Integrals

### Chapter 16 - Vector Calculus

- 16.1 Vector Fields
- 16.2 Line Integrals
- 16.3 The Fundamental Theorem for Line Integrals

- 16.4 Green's Theorem
- 16.5 Curl and Divergence
- 16.6 Parametric Surfaces and Their Areas
- 16.7 Surface Integrals
- 16.8 Stokes' Theorem

## Course Learning Outcomes:

### Learning Outcomes – Upon successful completion of this course, students will:

1. Perform calculus operations on vector-valued functions, including derivatives, integrals, curvature, displacement, velocity, acceleration, and torsion.
2. Perform calculus operations on functions of several variables, including partial derivatives, directional derivatives, and multiple integrals.
3. Find extrema and tangent planes.
4. Solve problems using the Fundamental Theorem of Line Integrals, Green's Theorem, the Divergence Theorem, and Stokes' Theorem.
5. Apply the computational and conceptual principles of calculus to the solutions of real-world problems.

### Methods of Assessment:

Final Exam (Required)

Other Methods of Assessment:

- Hour Exams
- Homework
- Quizzes
- Short Answer
- Discussion Board
- Participation
- Projects

### Required text(s), optional text(s) and/or materials to be supplied by the student:

"Calculus" by Stewart, Cengage, 8<sup>th</sup> edition

### Suggested Course Maximum:

35

### List any specific or physical requirements beyond a typical classroom required to teach the course.

Students must have computer access to the WCJC website, their WCJC student email and online accounts. WCJC has open computer labs, with internet access, on all campuses for students to use.

**Course Requirements/Grading System:** Describe any course specific requirements such as research papers or reading assignments and the generalized grading format for the course.

- A. Final Exam 15-30%  
B. Other Course Requirements 70-85%

A = 90-100  
B = 80-89  
C = 70-79  
D = 60-69  
F = 59 or below

## Curriculum Checklist:

- Administrative General Education Course** (from ACGM, but not in WCJC Core) – No additional documents needed.
- Administrative WCJC Core Course.** Attach the Core Curriculum Review Forms
  - Critical Thinking
  - Communication
  - Empirical & Quantitative Skills
  - Teamwork
  - Social Responsibility
  - Personal Responsibility
- WECM Course** -If needed, revise the Program SCANS Matrix and Competencies Checklist