

Course Last Updated 02/15/2024



EDUCATION  
ABROAD



University of  
New Haven

## Calculus III

### Section I: Course Overview

**Course Code:** MATH245MAD

**Subject Area(s):** Mathematics

**Prerequisites:** Calculus I or Calculus II

**Language of Instruction:** English

**Total Contact Hours:** 60

**Credits:** 4

**Course Fees:** none

### Course Description

In this course you will cover material related principally to Calculus III dealing with functions of multivariable calculus. These mathematics are an important tool in science and engineering and an extensions of the concepts from Calculus I. The content of this course will thus focus on: curves and surfaces in Euclidean 3-space, length and curvature, area and volume; surfaces, partial derivatives, total differential, tangent planes to surfaces; gradient; vector-valued functions; path integral; Stokes' theorem, Green's Theorem, and Divergence Theorem.

In addition to the cognitive and knowledge skills listed above, students in this course will explore practical applications of math and science to the field of engineering.

### Learning Objectives

Upon successful completion of this course, students are able to:

- Identify tangent and normal vectors and their geometric and physical interpretations.
- Compute partial derivatives, tangent planes, directional derivatives, gradients, three-dimensional integration, and integrals.
- Calculate vector fields, divergence, and curl.

- Evaluate basic mathematical and/or logical information numerically, graphically, and symbolically.
- Interpret mathematical and/or logical modes such as formulas, graphs, tables and schematics and draw inference from them.

## Section II: Instructor & Course Details

### Instructor Details

**Name:** TBA

**Contact Information:** TBA

**Term:** TBA

**Course Day and Time:** TBA

**Office Hours:** By Appointment

### Grading & Assessment

The instructor assesses students' mastery of course learning objectives by using the forms of assessment below. Each of these assessments is weighted toward the final grade. The Assessment Overview section provides further details for each.

**Engagement - 20%**

**Homework Presentation - 30%**

**Midterm Examination - 25%**

**Final Examination - 25%**

### Assessment Overview

This section provides a brief description of each form of assessment listed above. Forms of assessment may be slightly modified in the term syllabus.

**Engagement (20%):** Students are expected to be engaged in class, to have read the CEA CAPA Engagement Policy, and to understand the [Class Engagement Rubric](#) that outlines how engagement is graded.

**Homework Presentation (30%):** Students will present their solutions to selected problems during the problem-solving classes. To get full 30%, the student has to present at least 5 times in 5 different classes throughout the term.

**Midterm Examination (25%):** A comprehensive midterm examination will be administered in the middle of the term.

**Final Examination (25%):** A comprehensive final examination will be administered at the conclusion of the term.

## Active Learning

Experiential learning is an essential component of education abroad, and participation in field studies is a required part of coursework. In this course, students explore the city in which they are studying using a variety of methods. This provides the opportunity to gain nuance and perspective on the host context and course content, as well as to collect information and resources for assigned papers, projects, and presentations.

- Technical Museum Visit

## Readings and Resources

The below readings and resources are representative of what will be assigned as required in this course but may vary slightly in the term syllabus.

All students are given access to the online library of the University of New Haven (UNH), accessible [here](#), and are expected to comply with [UNH Policies](#) regarding library usage.

Wherever possible, required readings are made accessible through the online library or Canvas. Students are responsible for obtaining all required readings.

Each course utilizes Canvas as its LMS. Students are expected to check Canvas regularly for updates and deadlines. Canvas is also the primary platform for contacting your instructor in case of questions or concerns about the course.

### Required

Larson, R., & Edwards, B. H. (2015). Calculus: Early transcendental functions. Cengage Learning.

## Course Calendar

Session 1	
Topics	<b>Introduction to course</b> Review of Syllabus & Classroom Policies  <b>10.1 &amp; 10.2 &amp; 10.3</b> Conics and Calculus Plane Curves and Parametric Equations Parametric Equations and Calculus
Activity	Lecture & Sample Problems
Readings & Assignments	<b>Recommended exercises from class 1</b> p. 692 no. 1-6, 11, 15, 17, 19, 23, 29, 31, 33, 37, 41, 45, 51-58 p. 703 no. 3, 9, 15, 17, 23, 31, 45, 57-64, 69-72
Session 2	
Topics	<b>10.3 &amp; 10.4 &amp; 10.5</b> Polar Coordinates and Polar Graphs Area and Arc Length in Polar Coordinates
Activity	Lecture & Sample Problems

Readings & Assignments	<b>Recommended exercises from class 2</b> p. 711 no. 7, 9, 15, 27, 31, 41, 45, 69 p. 722 no. 3, 15, 25, 29, 31, 33, 35, 37, 39, 41, 43-52, 59, 65, 69, 75, 79, 83, 85 p. 731 no. 1-4, 7, 9, 15, 25, 45, 53
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<b>Session 3</b>	
Topics	<b>10.6 &amp; 11.1 &amp; 11.2</b> Equations of Conics and Kepler's Laws Vectors in the Plane Space Coordinates and Vectors in Space
Activity	Lecture & Sample Problems
Readings & Assignments	<b>Recommended exercises from class 3</b> p. 739 no. 1-4, 7-12, 13, 17, 33, 35, 37, 39, 41, 43 p. 755 no. 3, 7, 11, 17, 19, 21-26, 33, 37, 39, 43, 45, 49, 55, 69 p. 763 no. 3, 5, 9, 13, 17, 19, 25, 27, 35, 39, 41, 47, 61, 63, 69, 73

<b>Session 4</b>	
Topics	<b>Problem Solving</b>
Activity	Collective problem-solving & Presenting solutions to the given set of exercises
Readings & Assignments	Exercises to present in class 4 CHAPTER 10 p. 692 no. 11, 33, 45 p. 703 no. 23, 31 p. 711 no. 15, 45, 69 p. 722 no. 37, 39, 59, 69, 79 p. 731 no. 15, 45 p. 739 no. 17, 33

<b>Session 5</b>	
Topics	<b>11.3, 11.4 &amp; 11.5</b> The Dot Product of Two Vectors The Cross Product of Two Vectors in Space Lines and Planes in Space
Activity	Lecture Sample Problems
Readings & Assignments	<b>Recommended exercises from class 5</b> p. 773 no. 3, 11, 19, 31, 37, 57, 77 p. 781 no. 3, 9, 13, 41, 42, 47-50 p. 790 no. 1, 5, 11, 15, 25, 35, 43, 51, 55, 65, 77, 89

<b>Session 6</b>	
Topics	<b>11.6 &amp; 11.7</b> Surfaces in Space Cylindrical and Spherical Coordinates
Activity	Lecture

	Sample Problems
Readings & Assignments	<b>Recommended exercises from class 6</b> p. 802 no. 1-6, 11, 13, 18, 19, 21, 39, 43, 53* p. 809 no. 3, 7, 13, 21, 23, 29, 41, 49, 51, 57-62, 65, 73, 87, 93, 95, 109

Session 7	
Topics	<b>Problem Solving</b>
Activity	Collective problem-solving & Presenting solutions to the given set of exercises
Readings & Assignments	<b>Exercises to present in class 7</b> CHAPTER 11 p. 755 no. 39, 45, 49, 69 p. 763 no. 41, 61 p. 773 no. 37, 57 p. 781 no.13, 41, 42 p. 790 no. 5, 15, 89 p. 802 no. 13, 18, 19, 39 p. 809 no. 13, 23, 65, 73, 93, 95

Session 8	
Topics	<b>12.1 &amp; 12.2 &amp; 12.3</b> Vector-Valued Functions Differentiation and Integration of Vector-Valued Functions Velocity and Acceleration
Activity	Lecture Sample Problems
Readings & Assignments	<b>Recommended exercises from class 8</b> p. 821 no. 3, 9, 13, 19-22, 23, 37, 57, 71 p. 830 no. 3, 7, 13, 25, 31, 49, 55, 61 p. 838 no. 27, 39

Session 9	
Topics	
Activity	Lecture Sample Problems
Readings & Assignments	

Session 9	
Topics	<b>12.4 &amp; 12.5</b> Tangent Vectors and Normal Vectors Arc Length and Curvature
Activity	Lecture Sample Problems
Readings & Assignments	<b>Recommended exercises from class 9</b> p. 848 no. 7, 13, 21, 33, 49 p. 860 no. 3, 7, 13, 17, 33, 37, 43

Session 10	
Topics	<b>13.1 &amp; 13.2 &amp; 13.3</b> Introduction to Functions of Several Variables Limits and Continuity Partial Derivatives
Activity	Lecture Sample Problems
Readings & Assignments	<b>Recommended exercises from class 10</b> p. 876 no. 7, 25, 29, 33, 37, 45-48, 51, 53, 71 p. 887 no. 5-8, 9, 13, 23, 25, 27, 29, 31, 33, 43, 45, 47, 55, 68-72 p. 896 no. 9, 13, 31, 47, 53, 67, 97

Session 11	
Topics	<b>Problem Solving</b>
Activity	Collective problem-solving Presenting solutions to the given set of exercises REVIEW
Readings & Assignments	<b>Exercises to present in class 11</b> CHAPTER 12 p. 821 no. 37, 57, 71 p. 830 no. 3, 25, 55, 61 p. 838 no. 27, 39 p. 848 no. 21, 49 p. 860 no. 7, 37, 43

Session 12	
Mid-term	

Session 13	
Topics	<b>13.4 &amp; 13.5 &amp; 13.6.</b> Differentials Chain Rules for Functions of Several Variables Directional Derivatives and Gradients
Activity	Lecture Sample Problems
Readings & Assignments	<b>Recommended exercises from class 13</b> p. 905 no. 3, 17 p. 913 no. 3, 7, 13, 17, 19, 21, 29 p. 924 no. 1, 5, 7, 13, 21, 27, 51

Session 14	
Topics	<b>13.7 &amp; 13.8 &amp; 13.9</b> Tangent Planes and Normal Lines Extrema of Functions of Two Variables Applications of Extrema of Functions of Two Variables
Activity	Lecture Sample Problems

Readings & Assignments	<b>Recommended exercises from class 14</b> p. 933 no. 5, 17, 23, 31, 37, 49 p. 942 no. 5, 9, 15, 27, 39, 47, 53, 55-58 p. 949 no. 5, 9, 21
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Session 15	
Topics	<b>Problem Solving</b>
Activity	Collective problem-solving & Presenting solutions to the given set of exercises
Readings & Assignments	<b>Exercises to present in class 15</b> CHAPTER 13 sections 1-9 p. 876 no. 25, 37, 53 p. 887 no. 23, 25, 29, 43, 45, 47 p. 896 no. 53, 67 p. 913 no. 13, 29 p. 924 no. 5, 13, 21, 51 p. 933 no. 5, 17, 37, 49 p. 942 no. 15, 39, 53 p. 949 no. 21

Session 16	
Topics	<b>13.10 &amp; 14.1 &amp; 14.2</b> Lagrange Multipliers Iterated Integrals and Area in the Plane Double Integrals and Volume
Activity	Lecture Sample Problems
Readings & Assignments	<b>Recommended exercises from class 16</b> p. 958 no. 5, 7, 15, 17, 21, 33 p. 972 no. 3, 9, 11, 19, 15, 33, 41, 45 p. 983 no. 9, 15, 19, 21, 25, 37

Session 17	
Topics	<b>14.3 &amp; 14.5</b> Change of Variables: Polar Coordinates Surface Area
Activity	Lecture Sample Problems
Readings & Assignments	<b>Recommended exercises from class 17</b> p. 991 no. 5-8, 11, 17, 29, 39, 45, 49 p. 1007 no. 1, 5, 7, 11, 13, 15, 25, 27

Session 18	
Topics	<b>14.6 &amp; 14.7 &amp; 14.8</b> Triple Integrals and Applications Triple Integrals in Other Coordinates Change of Variables: Jacobians
Activity	Lecture Sample Problems

Readings & Assignments	<b>Recommended exercises from class 18</b> p. 1017 no. 1, 5, 13, 17, 21, 33, 37, 59, 63 p. 1025 no. 5, 11, 15, 17, 33, 37, 39 p. 1032 no. 5, 7, 15, 19, 23, 35
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Session 19	
Topics	<b>Problem Solving</b>
Activity	Collective problem-solving & Presenting solutions to the given set of exercises
Readings & Assignments	<b>Exercises to present in class 19</b> <b>SECTION 13.10 &amp; CHAPTER 14</b> p. 958 no. 15 p. 949 no. 5 + p. 958. no. 33 p. 972 no. 11, 19, 45 p. 983 no. 19, 21, 25, 37 p. 1007 no. 11, 25, 27 p. 1017 no. 13, 33 p. 1025. no. 11, 15 p. 1032 no. 7, 15, 35

Session 20	
Topics	<b>15.1. &amp; 15.2 &amp; 15.3</b> Vector Fields Line Integrals Conservative Vector Fields and Independence of Path
Activity	Lecture Sample Problems
Readings & Assignments	<b>Recommended exercises from class 20</b> p. 1049 no. 1-4, 7, 17, 25, 29, 39, 43, 51, 57, 69, 73, 75 p. 1061 no. 1, 2, 7, 17, 23, 27, 35, 45, 59, 63 p. 1072 no. 1, 5, 11, 15, 29

Session 21	
Topics	<b>15.4 &amp; 15.5 &amp; 15.6 &amp; 15.7 &amp; 15.8</b> Green's Theorem Parametric Surfaces Surface Integrals Divergence Theorem Stokes Theorem
Activity	Lecture Sample Problems
Readings & Assignments	<b>Recommended exercises from class 21</b>  p. 1081 no. 1, 7, 11, 19, 21, 25 p. 1091 no. 1-6, 7, 21, 23, 31, 35 p. 1104 no. 1, 5, 11, 15, 17, 21, 23, 29 p. 1112 no. 1, 7, 17, 23* p. 1119 no. 1, 5, 9, 15, 19

Session 22	
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Field Study
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Session 23	
Topics	<b>Problem Solving</b>
Activity	Collective problem-solving & Presenting solutions to the given set of exercises  REVIEW
Readings & Assignments	<b>Exercises to present in class 23</b> CHAPTER 15 p. 1049 no. 17, 25, 57, 69 p. 1061 no. 7, 17, 35, 63 p. 1072 no. 5, 15, 29 p. 1081 no. 11, 21, 25 p. 1091 no. 11, 23, 31 p. 1104 no. 5, 17 p. 1112 no. 7, 17 p. 1119 no. 5, 15

Session 24
Final Exam

## Section III: Academic Policies and Standards

### Academic Policies

Students are expected to review and understand all CEA CAPA student policies, including our [Academic Policies](#) and [Engagement Policy](#). CEA CAPA reserves the right to change, update, revise, or amend existing policies and/or procedures at any time. Additional requirements that may be associated with a specific course or program are addressed in the term syllabus.

### Student Learning & Development Objectives

CEA CAPA has identified [Student Learning and Development Objectives \(SLDOs\)](#) for all programs in all locations: content in context, navigating differences, power and equity, critical thinking and intellectual curiosity, career and professional development, and sustainability and migration. These are meta-level learning objectives that transcend coursework and are infused across all elements of program delivery, beyond specifics of course offerings, addressing student learning holistically and framing it a larger learning context.