

ITT Technical Institute

MA3310T

Calculus I

Onsite Course

SYLLABUS

Credit hours: 4.5

Contact/Instructional hours: 67 (41 Theory Hours, 26 Lab Hours)

Prerequisite(s) and/or Corequisite(s):

Prerequisites: MA1310T College Mathematics II or equivalent

Course Description:

This course is an introduction to differential and integral calculus. Topics include limits, continuity, derivatives, antiderivatives and both definite and indefinite integrals.

Where Does This Course Belong?

Program Information

Program Scope and Core Content Areas

General Education courses include courses in the humanities, composition, mathematics, the sciences, and the social sciences.

Program Goals and Objectives

General Education courses are designed to provide ITT Tech students with a well-rounded education in the context of their technical programs. Each course emphasizes one or more of ITT Tech's General Education Student Learning Outcomes.

1. Demonstrate personal responsibilities
2. Analyze information.
3. Solve complex problems.
4. Communicate effectively in oral, written and visual forms.
5. Contribute as a member of a team.
6. Pursue lifelong learning opportunities.

Career Impact

General Education courses provide breadth to a core technical program. Courses in General Education are intended to broaden a student's educational experience, and therefore, broaden his/her perspective.

NOTE: Refer to the catalog for the state-specific course and program information, if applicable.

Course Summary

Major Instructional Areas

1. Functions and their limits
2. Derivatives and their applications
3. Integrals and their applications
4. Derivatives and integrals of transcendental functions (such as trigonometric, exponential, and logarithmic functions)

Course Objectives

1. Define and apply the concepts of functions and limits to introductory problems.
2. Differentiate algebraic and transcendental functions using the basic derivative rules.
3. Integrate algebraic and transcendental functions using the basic integration rules.
4. Solve application problems involving derivatives.
5. Solve application problems involving integrals.
6. Create and give an oral presentation of a problem solution.
7. Use the ITT Tech Virtual Library to research calculus topics as assigned.

Detailed Topical Outline

1. Functions and Limits
 - 1.1. The Notion of Functions
 - 1.2. Limits of Functions
 - 1.2.1. Limits of Functions Based on Their Graphs and Tables
 - 1.2.2. Limits of Linear Functions
2. Infinite Limits and Derivatives
 - 2.1. Infinite Limits
 - 2.1.1. Two Sided Infinite Limit
 - 2.1.2. Limits at Infinity
 - 2.2. Continuity
 - 2.3. Derivatives
 - 2.3.1. Introducing Derivatives
 - 2.3.2. Rules of Differentiation
3. More on Derivatives
 - 3.1. Chain Rule

- 3.2. Implicit Differentiation
- 3.3. L'Hôpital's Rule
- 3.4. Maxima and Minima
 - 3.4.1. Maximum of a Function
 - 3.4.2. Minimum of a Function
- 3.5. Second Derivative of Functions
4. Integration
 - 4.1. Mean Value Theorem
 - 4.2. Antiderivatives (Indefinite Integrals)
 - 4.3. Definite Integrals
 - 4.3.1. Power Rule
 - 4.3.2. Constant Multiple and Sum Rules
5. More on Integrations
 - 5.1. Fundamental Theorem of Calculus
 - 5.2. Substitution Rule
 - 5.2.1. Substitution Rule for Indefinite Integrals
 - 5.2.2. Substitution Rule for Definite Integrals
6. Applications of Integration
 - 6.1. Velocity and Acceleration
 - 6.2. Areas Between Curves
7. Evaluating Volume by Integration
 - 7.1. Volumes Using the Disk Method
 - 7.1.1. Disk Method About x-Axis
 - 7.1.2. Disk Method About y-Axis
 - 7.2. Volumes Using the Shell Method
 - 7.2.1. Cylindrical Shell Method
 - 7.2.2. Drill Spherical Method
8. Applications of Integrations II
 - 8.1. Lengths of Curves
 - 8.2. Physical Applications of Integrations
 - 8.2.1. Density and Mass
 - 8.2.2. Work
9. More on Derivatives and Integration of Functions
 - 9.1. Inverse of Functions
 - 9.1.1. Existence of Inverse of Functions
 - 9.1.2. Continuity of Inverse of Functions
 - 9.2. Inverses of Trigonometric Functions

- 9.2.1. Inverse of Sine Function
- 9.2.2. Inverse of Cosine Function
- 9.2.3. Integral of Inverses of Trigonometric Functions
- 10. Logarithmic and Exponential Functions
 - 10.1. Logarithmic Functions
 - 10.1.1. Derivatives of Logarithmic Functions
 - 10.1.2. Integrals of Logarithmic Functions
 - 10.2. Exponential Functions
 - 10.2.1. Derivatives of Exponential Functions
 - 10.2.2. Integrals of Exponential Functions
 - 10.2.3. Growth Functions
 - 10.2.4. Decay Functions
- 11. Review and Exam
 - 11.1. Review
 - 11.1.1. Functions
 - 11.1.2. Derivatives
 - 11.1.3. Integrations
 - 11.2. Final Exam

Learning Materials and References

Required Resources

Complete Textbook Package	New to this Course	Carried over from Previous Course(s)	Required for Subsequent Course(s)
Briggs, W., Cochran, L., Thomas, G. B., Weir, M. D., Hass, J., & Giordano, F. R. (2013). <i>Calculus</i> (Custom 2 nd ed.). Boston, MA: Pearson Custom.	■		■
Other Items	New to this Course	Carried over from Previous Course(s)	Required for Subsequent Course(s)
TI-89 Titanium Calculator	■		■
MyMathLab [Web-based software]. (2012). Boston, MA: Pearson Education. Available via access code from http://www.mymathlab.com .	■		■

Recommended Resources

ITT Tech Virtual Library (accessed via Student Portal | <https://studentportal.itt-tech.edu>)

- School of Study> General Education> Subscription Database> Gale Virtual Reference
 - A wide variety of topics applicable to research related to General Education courses; topics include math, environmental science, contemporary social issues, and statistics.
- School of Study> General Education> Recommended Links> Math World
 - A mathematics encyclopedia covering algebra, applied mathematics, calculus, discrete mathematics, geometry, history, number theory, probability, statistics, and more.
- School of Study> General Education> Recommended Links> Math Forum
 - Offers review of math resources by topic.
- School of Study> General Education> Research Guides> Pages> Tips for Math Success> Schaum's Outline of Theory and Problems of Basic Mathematics with Applications to Science and Technology
 - Offers resources for applied technology problems.

Other References

- Kahn Academy: <http://www.khanacademy.org/math/calculus>

Covers calculus topics including differential calculus, integral calculus, and multivariable calculus

NOTE: All links are subject to change without prior notice.

Information Search

Use the following keywords to search for additional online resources that may be used for supporting your work on the course assignments:

- Left-sided limit
- Right-sided limit
- Limit Laws of Calculus
- The Squeeze Theorem
- Continuity of a function
- Discontinuity of a function
- Derivatives of functions
- Rules of differentiations
- Power rules for differentiations
- Differential equations
- Integrations
- Definite integral
- Integrable function
- Substitution Rules of Calculus
- Net Change Theorem
- Volume by slicing
- Volume by shell
- Indefinite Integrals
- Area Between Curves
- Fundamental Theorem of Calculus

Suggested Learning Approach

In this course, you will be studying individually and within a group of your peers. As you work on the course deliverables, you are encouraged to share ideas with your peers and instructor, work collaboratively on projects and team assignments, raise critical questions, and provide constructive feedback.

Use the following advice to receive maximum learning benefits from your participation in this course:

DO	DON'T
<ul style="list-style-type: none"> ▪ Do take a proactive learning approach ▪ Do share your thoughts on critical issues and potential problem solutions ▪ Do plan your course work in advance ▪ Do explore a variety of learning resources in addition to the textbook ▪ Do offer relevant examples from your experience ▪ Do make an effort to understand different points of view ▪ Do connect concepts explored in this course to real-life professional situations and your own experiences 	<ul style="list-style-type: none"> ▪ Don't assume there is only one correct answer to a question ▪ Don't be afraid to share your perspective on the issues analyzed in the course ▪ Don't be negative about the points of view that are different from yours ▪ Don't underestimate the impact of collaboration on your learning ▪ Don't limit your course experience to reading the textbook ▪ Don't postpone your work on the course deliverables – work on small assignment components every day

Instructional Methods

The curriculum is designed to encourage a variety of teaching strategies that support the course objectives while fostering higher cognitive skills. This course will employ multiple methods to deliver content and inspire and engage you, including lectures, collaborative learning options, and hands-on activities. This course is composed of both theory and laboratory components. Your progress will be regularly assessed through assignments, labs, a project and presentation, quizzes, and exams.

Out-of-Class Work

For purposes of defining an academic credit hour for Title IV funding purposes, ITT Technical Institute considers a quarter credit hour to be the equivalent of: (a) at least 10 clock hours of classroom activities

and at least 20 clock hours of outside preparation; (b) at least 20 clock hours of laboratory activities; or (c) at least 30 clock hours of externship, practicum or clinical activities. ITT Technical Institute utilizes a “time-based option” for establishing out-of-class activities which would equate to two hours of out-of-class activities for every one hour of classroom time. The procedure for determining credit hours for Title IV funding purposes is to divide the total number of classroom, laboratory, externship, practicum and clinical hours by the conversion ratios specified above. A clock hour is 50 minutes.

A credit hour is an artificial measurement of the amount of learning that can occur in a program course based on a specified amount of time spent on class activities and student preparation during the program course. In conformity with commonly accepted practice in higher education, ITT Technical Institute has institutionally established and determined that credit hours awarded for coursework in this program course (including out-of-class assignments and learning activities described in the “Course Outline” section of this syllabus) are in accordance with the time-based option for awarding academic credit described in the immediately preceding paragraph.

Course Outline

Unit 1: FUNCTIONS AND LIMITS			
Upon completion of this unit, students are expected to: <ul style="list-style-type: none"> Identify the types and behavior of functions used in mathematical models. Find limits using graphs and tables. Compute limits. 			Total outside work: 6 hours
READING ASSIGNMENT	<ul style="list-style-type: none"> Briggs, Chapters 1 and 2, pp. 1–65 		
OUTSIDE WORK	Activity		Estimated Time
	Complete the reading assignment		4.5 hrs
	Complete homework assignment		1.5 hrs
GRADED ACTIVITIES / DELIVERABLES	Grading Category	Activity/Deliverable Title	Grade Allocation (% of all graded work)
	Lab	Unit 1 Lab 1: Functions and Limits	3%
	Assignment	Unit 1 Assignment 1: Functions and Limits	1%

Unit 2: INFINITE LIMITS AND DERIVATIVES			
Upon completion of this unit, students are expected to: <ul style="list-style-type: none"> Find infinite limits and limits at infinity. Identify points of continuity. Perform calculations using the rules of derivatives. Find derivatives of trigonometric functions. 			Total outside work: 6 hours
READING ASSIGNMENT	<ul style="list-style-type: none"> Briggs, Chapters 2 and 3, pp. 66–129 		
OUTSIDE WORK	Activity		Estimated Time
	Complete the reading assignment		3 hrs
	Complete the homework assignment		2 hrs
	Study for the quiz		1 hrs
GRADED ACTIVITIES / DELIVERABLES	Grading Category	Activity/Deliverable Title	Grade Allocation (% of all graded work)
	Lab	Unit 2 Lab 1: Infinite Limits and Derivatives	3%
	Assignment	Unit 2 Assignment 1: Infinite Limits and Derivatives	1%

Unit 3: MORE ON DERIVATIVES			
Upon completion of this unit, students are expected to: <ul style="list-style-type: none"> Use the chain rule for differentiation. Perform calculations using implicit differentiation. Use derivatives to graph functions. Find the maxima and minima values of a function. Find the second derivative of functions. 			Total outside work: 6 hours

READING ASSIGNMENT	<ul style="list-style-type: none"> Briggs, Chapters 3 and 4, pp. 129–219 		
OUTSIDE WORK	Activity		Estimated Time
	Complete the reading assignment		3 hrs
	Complete the homework assignment		2 hrs
Study for the quiz		1 hrs	
GRADED ACTIVITIES / DELIVERABLES	Grading Category	Activity/Deliverable Title	Grade Allocation (% of all graded work)
	Lab	Unit 3 Lab 1: More on Derivatives	3%
	Quiz	Unit 3 Quiz 1	1%
	Assignment	Unit 3 Assignment 1: More on Derivatives	1%

Unit 4: MEAN VALUE THEOREM AND INTEGRATION

Upon completion of this unit, students are expected to:

- Apply the Mean Value Theorem.
- Evaluate limits using L'Hôpital's Rule.
- Evaluate indefinite and definite integrals using the applicable rules.
- Approximate areas under curves.

Total outside work:
6 hours

READING ASSIGNMENT	<ul style="list-style-type: none"> Briggs, Chapters 4 and 5, pp. 226–279 		
OUTSIDE WORK	Activity		Estimated Time
	Complete the reading assignment		3 hrs
	Complete the homework assignment		2 hrs
Study for the exam		1 hrs	
GRADED ACTIVITIES / DELIVERABLES	Grading Category	Activity/Deliverable Title	Grade Allocation (% of all graded work)
	Lab	Unit 4 Lab 1: Mean Value Theorem and Integration	3%
	Exam	Unit 4 Exam 1	10%
	Assignment	Unit 4 Assignment 1: Mean Value Theorem and Integration	1%

Unit 5: FUNDAMENTAL THEOREM AND INTEGRATION BY SUBSTITUTION

Upon completion of this unit, students are expected to:

- Evaluate definite integrals using the Fundamental Theorem of Calculus.
- Integrate even and odd functions.
- Use the substitution rule to evaluate integrals.

Total outside work:
6 hours

READING ASSIGNMENT	<ul style="list-style-type: none"> Briggs, Chapter 5, pp. 279–311 		
OUTSIDE WORK	Activity		Estimated Time
	Complete the reading assignment		2.5 hrs
	Complete the homework assignment		2.5 hrs

	Study for the quiz	1 hr	
GRADED ACTIVITIES / DELIVERABLES	Grading Category	Activity/Deliverable Title	Grade Allocation (% of all graded work)
	Lab	Unit 5 Lab 1: Fundamental Theorem and Integration by Substitution	3%
	Quiz	Unit 5 Quiz 2	1%
	Assignment	Unit 5 Assignment 1: Fundamental Theorem and Integration by Substitution	1%

Unit 6: APPLICATIONS OF INTEGRATION			Total outside work: 6 hours
Upon completion of this unit, students are expected to:			
<ul style="list-style-type: none"> Find velocity and acceleration. Calculate areas of regions between curves. 			
READING ASSIGNMENT	<ul style="list-style-type: none"> Briggs, Chapter 6, pp. 314–335 		
OUTSIDE WORK	Activity		Estimated Time
	Complete the reading assignment		2.5 hrs
	Complete the homework assignment		2.5 hrs
	Study for the quiz		1 hr
GRADED ACTIVITIES / DELIVERABLES	Grading Category	Activity/Deliverable Title	Grade Allocation (% of all graded work)
	Lab	Unit 6 Lab 1: Applications of Integration	3%
	Quiz	Unit 6 Quiz 3	2%
	Assignment	Unit 6 Assignment 1: Applications of Integration	1%

Unit 7: EVALUATION OF VOLUME BY INTEGRATION			Total outside work: 6 hours
Upon completion of this unit, students are expected to:			
<ul style="list-style-type: none"> Calculate volume by the disk method. Calculate volume by the shell method. Calculate volume by slicing. 			
READING ASSIGNMENT	<ul style="list-style-type: none"> Briggs, Chapter 6, pp. 336–357 		
OUTSIDE WORK	Activity		Estimated Time
	Complete the reading assignment		2 hrs
	Complete the homework assignment		2 hrs
	Study for the exam		2 hrs
GRADED ACTIVITIES / DELIVERABLES	Grading Category	Activity/Deliverable Title	Grade Allocation (% of all graded work)
	Lab	Unit 7 Lab 1: Evaluation of Volume by Integration	3%
	Exam	Unit 7 Exam 2	10%
	Assignment	Unit 7 Assignment 1: Evaluation of Volume by Integration	1%

Unit 8: APPLICATIONS OF INTEGRATION II			Total outside work: 6 hours
Upon completion of this unit, students are expected to: <ul style="list-style-type: none"> Calculate lengths of curves. Solve applications of physics through integration. 			
READING ASSIGNMENT	<ul style="list-style-type: none"> Briggs, Chapter 6, pp. 357–376 		
OUTSIDE WORK	Activity		Estimated Time
	Complete the reading assignment		2.5 hrs
	Complete the homework assignment		2.5 hrs
	Study for the quiz		1 hr
GRADED ACTIVITIES / DELIVERABLES	Grading Category	Activity/Deliverable Title	Grade Allocation (% of all graded work)
	Lab	Unit 8 Lab 1: More Applications of Integration	3%
	Quiz	Unit 8 Quiz 4	2%
	Assignment	Unit 8 Assignment 1: More Applications of Integration	1%

Unit 9: INTEGRATION OF TRIGONOMETRIC FUNCTIONS			Total outside work: 6 hours
Upon completion of this unit, students are expected to: <ul style="list-style-type: none"> Find inverse functions. Find inverse sine and cosine functions. Find derivatives and integrals of inverse trigonometric functions. 			
READING ASSIGNMENT	<ul style="list-style-type: none"> Briggs, Chapter 7, pp. 377–386 and 418–431 		
OUTSIDE WORK	Activity		Estimated Time
	Complete the reading assignment		2.5 hrs
	Complete the homework assignment		2.5 hrs
	Study for the quiz		1 hr
GRADED ACTIVITIES / DELIVERABLES	Grading Category	Activity/Deliverable Title	Grade Allocation (% of all graded work)
	Lab	Unit 9 Lab 1: Integration of Trigonometric Functions	3%
	Quiz	Unit 9 Quiz 5	2%
	Assignment	Unit 9 Assignment 1: Integration of Trigonometric Functions	1%

Unit 10: DIFFERENTIATION AND INTEGRATION OF EXPONENTIAL AND LOGARITHMIC FUNCTIONS			Total outside work: 7 hours
Upon completion of this unit, students are expected to: <ul style="list-style-type: none"> Determine derivatives and integrals of logarithmic functions. Determine derivatives and integrals of exponential functions. Apply exponential models to solve problems. Solve growth and decay problems. 			

READING ASSIGNMENT	<ul style="list-style-type: none"> Briggs, Chapter 7, pp. 387–418 		
OUTSIDE WORK	Activity		Estimated Time
	Complete the reading assignment		2 hrs
	Complete the homework assignment		2 hrs
	Study for the quiz		1 hr
Complete the project		2 hrs	
GRADED ACTIVITIES / DELIVERABLES	Grading Category	Activity/Deliverable Title	Grade Allocation (% of all graded work)
	Lab	Unit 10 Lab 1: Logarithmic and Exponential Functions	3%
	Project	Project (Assigned Unit 2) (ePortfolio)	10%
	Quiz	Unit 10 Quiz 6	2%
	Assignment	Unit 10 Assignment 1: Logarithmic and Exponential Functions	1%

Unit 11: COURSE REVIEW, PRESENTATIONS, AND FINAL EXAMINATION			Total outside work: 7 hours
OUTSIDE WORK	Activity		Estimated Time
	Prepare and practice presentation		2 hrs
	Study for Final Exam		5 hrs
GRADED ACTIVITIES / DELIVERABLES	Grading Category	Activity/Deliverable Title	Grade Allocation (% of all graded work)
	Exam	Final Exam	15%
	Presentation	Presentation of Final Project (Assigned in Week ?)	5%

Note: Your instructor may add a few learning activities that are ungraded.

Evaluation and Grading

Evaluation Criteria

The graded assignments will be evaluated using the following weighted categories:

Category	Weight	In-Class	Out-of-Class
Assignment	10%		10%
Lab	30%	30%	
Project	10%		10%
Presentation	5%		5%
Quiz	10%	10%	
Exam	35%	35%	
TOTAL	100%	75%	25%

Grade Conversion

The final grades will be calculated from the percentages earned in the course, as follows:

Grade	Percentage
A (4.0)	90–100%
B+ (3.5)	85–89%
B (3.0)	80–84%
C+ (2.5)	75–79%
C (2.0)	70–74%
D+ (1.5)	65–69%
D (1.0)	60–64%
F (0.0)	<60%

Academic Integrity

All students must comply with the policies that regulate all forms of academic dishonesty or academic misconduct, including plagiarism, self-plagiarism, fabrication, deception, cheating, and sabotage. For more information on the academic honesty policies, refer to the Student Handbook and the Course Catalog.

(End of Syllabus)