HOSTOS COMMUNITY COLLEGE
DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

MAT 210	**CALCULUS I**
CREDIT HOURS:	**4.0**
EQUATED HOURS:	**4.0**
CLASS HOURS:	**5.0**
PREREQUISITE:	**MAT 160 or by placement**
REQUIRED TEXTS:	**Thomas, Weir & Hass: Calculus, Early Transcendentals, Single Variable, 13th Edition, Pearson**
DESCRIPTION:	**This course provides provides skills in calculus in one real variable. Topics: limits, continuity, differentiation, applications to motion problems, maximum-minimum problems, curve sketching, antiderivatives and definite integrals.**
EXAMINATIONS:	**A minimum of four partial tests (suggested: 60%) and a comprehensive final examination (40%).**
GRADES:	**A, A-, B+, B, B-, C+, C, D, I, F.**

Math 210 (Calculus 1) Student Learning Outcomes

1. Interpret and draw appropriate inferences of functions and their properties from quantitative representations such as graphs of polynomial, rational and trigonometric functions including asymptotes, periodicity and continuity.
2. Use algebraic, numerical and graphical methods to solve mathematical problems including finding the limit of a function, determining derivatives, continuity and differentiability of a function.
3. Represent quantitative problems expressed in natural language in suitable algebraic, functional and graphical form.
4. Effectively communicate quantitative analysis or solutions to mathematical problems in written, graphical or analytic form.
5. Evaluate solutions to problems and graphs of functions for reasonableness by inspection.
6. Apply calculus based methods to problems in other fields such as Physics, Business, Economics, Geometry, Chemistry or Biology.

Pathways Learning Outcomes:

Mathematical and Quantitative Reasoning:

MAT 210 will meet all the following Pathways Learning Outcomes from "Mathematical and Quantitative Reasoning". A student will:

1. Interpret and draw appropriate inferences from quantitative representations, such as formulas, graphs, or tables.

2. Use algebraic, numerical, graphical, or statistical methods to draw accurate conclusions and solve mathematical problems.

3. Represent quantitative problems expressed in natural language in a suitable mathematical format.

4. Effectively communicate quantitative analysis or solutions to mathematical problems in written or oral form.

5. Evaluate solutions to problems for reasonableness using a variety of means, including informed estimation.

6. Apply mathematical methods to problems in other fields of study.

Flexible Common Core:

MAT 210 will meet all the following Pathways Learning Outcomes from "Flexible Common Core". A student will:

1. Gather, interpret, and assess information from a variety of sources and points of view.

2. Evaluate evidence and arguments critically or analytically.

3. Produce well-reasoned written or oral arguments using evidence to support conclusions

4. Demonstrate how tools of science, mathematics, technology, or formal analysis can be used to analyze problems and develop solutions.

5. Articulate and evaluate the impact of technologies and scientific discoveries on the contemporary world, such as issues of personal privacy, security, or ethical responsibilities.

6. Identify and apply the fundamental concepts and methods of a discipline or interdisciplinary field exploring the scientific world, including, but not limited to computer science, history of science, life and physical sciences, linguistics, logic, mathematics, psychology, statistics, and technology-related studies.

Student Learning Outcomes**	Mathematical and Quantitative Reasoning Outcomes**	Flexible Common Core Outcomes**	Assessments and topics***
SLO 1	MQR 1	FCC 1	Test#1,2,3,4, and Final
SLO 2	MQR 2	FCC 2	Test#1,2,3,4, and Final
SLO 3	MQR 3	FCC 3	Test#1,2,3,4, and Final
SLO 4	MQR 4	FCC 4	Test#1,2,3,4, and Final
SLO 5	MQR 5	FCC 5	Test#1,2,3,4, and Final
SLO 6	MQR 6	FCC 6	Test#1,2,3,4, and Final

** Please see above for the list of SLO, MQR, and FCC Outcomes

*** Please see blow for the list of topics that will be assessed in each unit test and final exam

LEARNING OUTCOMES ASSESSMENT TOOLS:

SLO#1, MQR#1, and FCC#1:

- Unit Test #1: Identify the domain and range of a function from its graph. Identify the existence of limits based on graph of functions. Recognize continuous functions and be able to spot points of discontinuity of graphs or formulas of functions.

- Unit Test #2: Determine if a function is differentiable from its graph or by using the formal definition of derivative. Find derivatives by using formulas such as the chain rule and power rule.

- Unit Test #3: Identify maximum and minimum points of a function based on their graphs. Determine if a function is increasing or decreasing on an interval. Use the derivative tests for concavity. Sketch curves that include all relevant information.

- Unit Test #4: Recognize the anti-derivative as area under a curve.

- Departmental Final Exam: Cumulative

SLO#2, MQR#2, and FCC#2:

- Unit Test #1: Use algebraic and numerical methods to determine the limit of a function. Determine whether or not a function is continuous.

- Unit Test #2: Find derivatives using the multiple rules for differentiation including higher order derivatives, the chain rule and implicit differentiation. Determine velocity using derivatives. Calculate the derivatives of all six trigonometric functions.

- Unit Test #3: Find maximum and minimum values of functions using the appropriate rules of differentiation. Compute limits using L'Hôpital's rule.

- Unit Test #4: Compute the area under a curve. Represent functions in rectangular coordinates.

- Final Exam: Cumulative

SLO#3, MQR#3, and FCC#3:

- Unit Test #1: Express the notion of a limit in words. Explain the difference between a continuous and discontinuous function in precise mathematical language.

- Unit Test #2: Express velocity problems using the relationship between position, velocity and acceleration.

- Unit Test #3: Translate various situations into calculus-based problems. Convert graphs into function notation using the properties of the first and second derivatives.

- Unit Test #4: State area under a curve in terms of anti-derivatives. Explain the Fundamental Theorem of Calculus.

- Final Exam: Cumulative

SLO#4, MQR#4, and FCC#4:

- Unit Test #1: Express if a function has a limit or is continuous using appropriate written form.

- Unit Test #2: Communicate solutions to derivative problems using accurate and appropriate language.

- Unit Test #3: Interpret solutions to optimization and maximum/minimum problems using appropriate language. Demonstrate the ability to explain the indeterminate and when L'Hôpital's rule is appropriate.
- Unit Test #4: Express the anti-derivative as the inverse process of differentiation.
- Final Exam: Cumulative

SLO#5, MQR#5, and FCC#5:

- Unit Test #1: Use the informal notion of continuity to inspect a graph for continuity. Check for the existence of limits by inspecting a graph.

- Unit Test #2: Check solutions to derivatives using basic properties of the derivative such as the derivative of a polynomial should have a lower degree than the initial problem.

- Unit Test #3: Ensure solutions to maximum and minimum problems are realistic. Inspect graphs for the correct basic shape. If using a graphing calculator, be sure that the viewing window is set to suitable limits.

- Unit Test #4: Explain why areas found by anti-derivatives are not always positive numbers.

- Final Exam: Cumulative

SLO#6, MQR#6, and FCC#6:

- Unit Test #1: Use limits to derive the exponential function. Determine the equation of the tangent line.

- Unit Test #2: Describe the derivative as velocity of an initial position function and extend the notion of derivative to explain the relation between velocity and acceleration.

- Unit Test #3: Apply related rates, optimization and max/min problems to problems in Physics, Business, Economics, Geometry, Chemistry or Biology. Use calculus-based methods of curve sketching to graph functions in detail.

- Unit Test #4: Use definite integrals to calculate position given velocity. Find the area under a curve using anti-derivatives.

- Final Exam: Cumulative.

SUGGESTED COURSE OUTLINE

WEEK	CLASS	TOPICS
1	**1**	Review of Functions and Their Graphs, Combining Functions, Shifting and Scaling Graphs
	2	Review of Trigonometric Functions, Inverse Functions and Logarithms.
	3	Introduction to two dimensional vectors (not including dot or cross products)
2	**4**	Rates of Change and Tangents to Curves
	5	Limit of a Function and Limit Laws. One-sided Limits.
	6	Precise Definition of a Limit.
3	**7**	Continuity
	8	Limits Involving Infinity, Asymptotes of Graphs including Horizontal, Vertical and Oblique asymptotes.
	9	**Review For Exam 1**
4	**10**	**EXAM 1 (Suggested 15%)**
	11	Tangents and the Derivative at a Point
	12	The Derivative as a Function
5	**13**	Rules for Polynomials and Exponentials
	14	Rules for Products and Quotients
	15	The Derivative as a Rate of Change
6	**16**	Derivatives of Trigonometric Functions
	17	The Chain Rule
	18	The Chain Rule, continued
7	**19**	Implicit Differentiation
	20	Implicit Differentiation and Derivatives of Inverse Functions
	21	Derivatives of Logarithms
8	**22**	Inverse Trigonometric Functions
	23	Related Rates
	24	Related Rates, continued
9	**25**	**Review for Exam 2**
	26	**EXAM 2 (Suggested 15%)**
	27	Extreme Values of Functions and the Mean Value Theorem
10	**28**	Monotonic Functions and the First Derivative Test
	29	Concavity and the Second Derivative Test
	30	Curve Sketching and the Second Derivative Test
11	**31**	**Review for Exam 3**
	32	**EXAM 3 (Suggested 15%)**
	33	Indeterminate Forms and L'Hôpital's Rule
12	**34**	Indeterminate Forms and L'Hôpital's Rule, continued
	35	Applied Optimization
	36	Antiderivatives and Indefinite Integrals
13	**37**	Area and Estimating with Finite Sums, Sigma Notation and Limits of Finite Sums
	38	The Definite Integral and The Fundamental Theorem of Calculus
	39	**EXAM 4 (Suggested 15%)**
14	**40-42**	**Review for Final Exam**
15		**Final Exam (Suggested 40%)**

Note that this syllabus is a suggested time line only. Instructors are responsible for covering all of the material in the syllabus but they may do so at their own pace.