CALCULUS I FOR MATHEMATICIANS, SCIENTISTS AND EDUCATORS

The University of Toledo
Mathematics & Statistics Department, College of Natural Sciences and Mathematics
MATH1830-0XX, CRN XXXXX

Instructor:	(Insert Name)	**Class Location:**	(Insert Building/Room)
Email:	(Insert Email Address)	**Class Day/Time:**	(Insert Days/Time)
Office Hours:	(Insert Days/Time)	**Lab Location:**	(Insert Bldg/Office #, if applicable)
Office Location:	(Insert Building/Office #)	**Lab Day/Time:**	(Insert Days/Time, if applicable)
Office Phone:	(Insert Phone Number)	**Credit Hours:**	4
Term:	(Insert Semester/Year)		

COURSE DESCRIPTION

Limits of sequences and functions, derivatives, Mean Value Theorem, curve sketching, definite and indefinite integral, Fundamental Theorem of Calculus. Of interest to students requiring a conceptual understanding of calculus. Not for major credit.

STUDENT LEARNING OUTCOMES

The successful Calculus I student should be able to apply the following competencies to a wide range of functions, including piecewise, polynomial, rational, algebraic, trigonometric, inverse trigonometric, exponential and logarithmic:

- ***Limits***: Determine the existence of, estimate numerically and graphically and find algebraically the limits of functions. Recognize and determine infinite limits and limits at infinity and interpret them with respect to asymptotic behavior.
- ***Continuity***: Determine the continuity of functions at a point or on intervals and to distinguish between the types of discontinuities at a point.
- ***Derivatives***: Determine the derivative of a function using the limit definition and derivative theorems. Interpret the derivative as the slope of a tangent line to a graph, the slope of a graph at a point, and the rate of change of a dependent variable with respect to an independent variable.
- ***Indeterminate Forms***: Evaluate limits that result in indeterminate forms, including the application of L'Hopital's Rule.
- ***Higher Order Derivatives***: Determine the derivative and higher order derivatives of a function explicitly and implicitly and solve related rates problems.
- ***Graph Sketching***: Determine absolute extrema on a closed interval for continuous functions and use the first and second derivatives to analyze and sketch the graph of a function, including determining intervals on which the graph is increasing, decreasing, constant, concave up or concave down and finding any relative extrema or inflection points. Appropriately use these techniques to solve optimization problems.
- ***Antiderivatives***: Determine antiderivatives, indefinite and definite integrals, use definite integrals to find areas of planar regions, use the Fundamental Theorems of Calculus, and integrate by substitution.

PREREQUISITES

Before enrolling in MATH 1830, students must attain sufficient ACT MATH, College Algebra and Trigonometry placement test results or a minimum grade of C- in MATH 1320 and MATH 1330 or MATH 1340. Students with marginal trig placement test scores take MATH 1980 concurrently. For details on the scores on the ACT MATH, College Algebra and Trigonometry placement tests required for MATH 1830, see the Department's placement table.

TEXTBOOK: *Thomas' Calculus, A Custom Edition for the University of Toledo*, 1st Edition, by George B. Thomas, Maurice D. Weir packaged with MyLabsPlus (ISBN: 9781269644334), Pearson.

UNIVERSITY POLICIES:

POLICY STATEMENT ON NON-DISCRIMINATION ON THE BASIS OF DISABILITY (ADA)
The University is an equal opportunity educational institution. Please read The University's Policy Statement on Nondiscrimination on the Basis of Disability Americans with Disability Act Compliance.

ACADEMIC ACCOMMODATIONS
The University of Toledo is committed to providing equal access to education for all students. If you have a documented disability or you believe you have a disability and would like information regarding academic accommodations/adjustments in this course please contact the Student Disability Services Office (Rocket Hall 1820; 419.530.4981; studentdisabilitysvs@utoledo.edu) as soon as possible for more information and/or to initiate the process for accessing academic accommodations. For the full policy see: `http://www.utoledo.edu/offices/student-disability-services/sam/index.html`

ACADEMIC POLICIES:

STUDENT PRIVACY
Federal law and university policy prohibits instructors from discussing a student's grades or class performance with anyone outside of university faculty/staff without the student's written and signed consent. This includes parents and spouses. For details, see the Confidentiality of Student Records (FERPA) section of the University Policy Page at `http://www.utoledo.edu/policies/academic/undergraduate/index.html`

MISSED CLASS POLICY
If circumstances occur in accordance with The University of Toledo Missed Class Policy (found at `http://www.utoledo.edu/policies/academic/undergraduate/index.html`) result in a student missing a quiz, test, exam or other graded item, the student must contact the instructor in advance by phone, e-mail or in person, provide official documentation to back up his or her absence, and arrange to make up the missed item as soon as possible.

ACADEMIC DISHONESTY
Any act of academic dishonesty as defined by the University of Toledo policy on academic dishonesty (found at `http://www.utoledo.edu/dl/students/dishonesty.html`) will result in an F in the course or an F on the item in question, subject to the determination of the instructor.

GRADING AND EVALUATION
Your syllabus should describe the methods of evaluation, whether by quizzes, exams or graded assignments. (There should be at least two one-hour in-class exams. If quiz scores are not included in the final grade computation, there should be three one-hour exams.) If a grading scale is used, it should be clearly stated. A statement of the proportion that each evaluation component contributes toward the final grade should also be included. A sample reasonable distribution for this class would be:

Component	points
Homework and/or Quizzes	30%
Midterm Exams	40%
Final Exam	30%

In scheduling quizzes and exams, it should be kept in mind that the last day to add/drop the class is the end of the second week of classes and the last day to withdraw is the end of the tenth week. By these dates, students should have sufficient data to realistically gauge their progress in the class.

For program assessment purposes, each semester a committee of all Calculus I instructors will prepare a set of six common exam questions to appear on the final exams of all sections of the course.

Information about the algebra and trigonometry placement (including practice tests) may be found on the Math Department website at `http://www.math.utoledo.edu/placement_index.html`

Peculiarity of this class compared to the standard Math 1850 Calculus I: Math 1830, Calculus I for Mathematicians, Scientists and Educators, is a trigonometry based calculus course that has the special objective of training students in the more rigorous aspects of calculus. Although the course will have the same expectations as

Math 1850 for students acquisition of the algorithmic skills of calculus, more time will be spent in developing students appreciation for the foundational ideas of calculus with the expectation that their understanding will develop to the extent that they can use these ideas in problem solving. For this reason, student projects are considered to be an important component of the course. In order to give time so that students can concentrate on understanding the concepts of calculus, some materials, such as related rates, linear approximations, optimization problems could be moved to students' projects. Please keep in mind however, that related rates and optimization problems are compulsory topics according to the Ohio Transfer Modules Agreement.

To present some fundamental ideas in Calculus the instructor might choose to emphasize the notion of convergence (together with the precise definition of limits) or the notion of asymptotic approximation (for instance via Taylor polynomials and via the Landau's notation of $o(x)$ and $O(x)$) and how it can be used to solve many problems.

IMPORTANT DATES
The instructor reserves the right to change the content of the course material if he perceives a need due to postponement of class caused by inclement weather, instructor illness, etc., or due to the pace of the course.

MIDTERM EXAM:
FINAL EXAM:

OTHER DATES:
The last day to drop this course is:
The last day to withdraw with a grade of W from this course is:

STUDENT SUPPORT SERVICES
Students should be made aware of the tutoring help available during each week of the semester in the Mathematics Learning and Resource Center, located in Rm B0200 in the lower level of Carlson Library (phone ext 2176). The center operates on a walk-in basis. MLRC hours can be found at `http://www.math.utoledo.edu/mlrc/MLRC.pdf`.

CLASS SCHEDULE: The syllabus should provide a list of sections to be covered and ideally, should indicate the material that might be covered on each in-class examination. Please include in your syllabus a list of important dates, including mid-term exam dates, the drop and withdrawal dates, and the time and place of the final exam. (The time of the exam can be found at `http://www.utoledo.edu/offices/registrar/exam_schedules.html`)

A recommended schedule of the class time to be devoted to each section is listed below. While individual experiences may vary somewhat, the schedule is a template for completing all of the topics in the course and it should be consulted periodically to ensure that you are on track to complete the syllabus with an appropriate amount of time devoted to each section. Most students passing this course will proceed to Calculus II. (If you are not familiar with our calculus sequence, please consult the course coordinator.) **It is critically important that you do not shortchange them or hamper Calculus II instructors by skipping important sections or by rushing through the introduction to integration because of poor planning.**

SUGGESTED SCHEDULE

Chapter	1	**Functions**	(total 5 hr)
	1.1	**(Op.)**Functions and Their Graphs	
	1.2	**(Op.)** Combining Functions: Shifting and Scaling Graphs	
	1.3	Trigonometric Functions	1
	1.4	**(Op.)**Graphing with Calculators and Computers	
	1.5	Exponential Functions	1.5
	1.6	Inverse Functions and Logarithms	2.5
Chapter	2	**Limits and Continuity**	(total 7 hr)
	2.1	**(Op.)** Rates of Change and Tangents to curves	
	2.2	Limit of a Function and Limit Laws; *Limits*	1.5
	2.3	The Precise Definition of a Limit; *Limits*	2
	2.4	One-Sided Limits; *Limits*	1
	2.5	Continuity; *Continuity*	1.5
	2.6	Limits Involving Infinity; Asymptotes of Graphs; *Limits*	1
Chapter	3	**Differentiation**	(total 12 hr)
	3.1	Tangents and the Derivative at a Point; *Derivatives*	1
	3.2	The Derivative as a Function; *Derivatives*	1
	3.3	Differentiation Rules; *Derivatives*	1.5
	3.4	The Derivative as a Rate of Change; *Derivatives*	1
	3.5	Derivatives of Trigonometric Functions; *Derivatives*	1
	3.6	The Chain Rule; *Derivatives*	1.5
	3.7	Implicit Differentiation and Higher Order Derivatives; *Higher Order Derivatives*	1
	3.8	Derivatives of Inverse Functions and Logarithms; *Derivatives*	1.5
	3.9	Inverse Trigonometric Functions; *Derivatives*	1.5
	3.10	Related Rates; *Higher Order Derivatives*	1
	3.11	**(Op.)** Linearization and Differentials	
Chapter	4	**Applications of Derivatives**	(total 6 hr)
	4.1	Extreme Values of Functions; *Graph Sketching*	1.5
	4.2	**(Op.)** The Mean Value Theorem	
	4.3	Monotonic Functions and the First Derivative Test; *Graph Sketching*	1
	4.4	Concavity and Graph Sketching; *Graph Sketching*	1.5
	4.5	Indeterminate Forms and L'Hopital's Rule; *Indeterminate Forms*	1
	4.6	Applied Optimization; *Graph Sketching*	1
	4.7	**(Op.)** Newton's Method	
	4.8	**(Op.)** Antiderivatives	
Chapter	5	**Integration**	(total 7 hr)
	5.1	Area and Estimating with Finite Sums; *Antiderivatives*	1
	5.2	**(Op.)** Sigma Notation and Limits of Finite Sums	
	5.3	The Definite Integral; *Antiderivatives*	1.5
	5.4	The Fundamental Theorem of Calculus and Antiderivatives; *Antiderivatives*	1.5
	5.5	Indefinite Integrals and the Substitution method; *Antiderivatives*	1.5
	5.6	Substitution and Area Between Curves and Definite integrals; *Antiderivatives*	1.5
		Total Hours	37