Buffalo State
State University of New York

MAT 161: Calculus I

Co-requisite: MAT 163   **Prerequisite**: advanced study of algebra and functions

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Course Description

This course will focus on developing a deep understanding of the theory and concepts underlying single-variable calculus through multiple perspectives including verbal, graphical, numerical, and symbolic along with developing competence in applying the concepts in a broad range of contexts and situations. These objectives will be accomplished through a multi-pronged approach to instruction. There are three hours of "lecture", one problem-solving hour, and one technology exploration hour that together will develop the content by interweaving topic strands and experiences. Specifically, this course will focus on the topics of functions; limits; continuity; differentiation of algebraic, trigonometric, exponential, and logarithmic functions; applications of the derivative; and anti-differentiation.

Student Learning Outcomes:

Students will:
1. explain the concept of rate of change and its fundamental relationship to real-world phenomena.
2. analyze and compute limits graphically, symbolically, and numerically and use limit theory to solve problems and determine continuity and differentiability of functions.
3. explain the concept of derivative as instantaneous rate of change graphically, numerically, and symbolically, and its relationship to average rate of change.
4. compute derivatives of algebraic, trigonometric, exponential, and logarithmic functions using appropriate techniques of differentiation.
5. analyze applied differentiation problems from related disciplines and describe results using appropriate mathematical language and notations.
6. solve selected differential equations and related initial value problems with and without the use of technology.
7. use technology to solve problems and as a tool to provide insight into significant concepts of calculus.
8. use deductive reasoning and proof as tools to generate mathematical knowledge and provide insight into significant concepts of calculus.
9. solve problems from related disciplines individually and in small groups within a Socratic environment during weekly problem solving sessions.

Materials

Text: *Calculus from Graphical, Numerical, and Symbolic Points of View*
    by Ostebee and Zorn
Internet access: While this is not an online or hybrid course, the assignments will at times, require access to the internet for purposes of viewing video.
Graphing calculator: A TI-84, N-Spire or equivalent is required for every class.

Attendance:
>You are expected to attend every class. Your active involvement individually, in small groups, and with the entire class is an important way to help meet the course objectives. For you to be involved you must be present. Less than perfect attendance may affect your participation grade as described below. In the event of an absence you should contact a classmate to discuss the material covered and assignments prior to contacting the professor for assistance.

Grading Policy:
>Final grades will be calculated based upon the following activities.

Quizzes	20%
Exams (2 @ 15%)	30%
Final Exam	20%
Assignments	15%
Problem Solving Session Work	10%
Class Participation/Group Process	5%
	100%

Quizzes: Frequent quizzes will take place at the start of class and relate to the assigned readings or videos, and material covered in the previous one or two classes.

Exams: There will be two examinations and a cumulative final exam that may include material from MAT 163. The exams will be administered on the following dates:
Exam #1: Wednesday, March 6   Exam #2: Wednesday, April 17
Final Exam: (Cumulative) Date to be determined but will take place during CEP (5/13 – 5/16)

>NOTE: A minimum of a two-hour notification of an absence from an exam is required. This notification can be by e-mail or telephone to the above number or the department office at 878-5621. In addition, written documentation of the problem is required if a make-up is to be allowed. A physician's note must be presented in the event of illness. In the event of a death in the family a copy of the obituary is required. Failure to adhere to these procedures will result in a grade of zero on the exam.

Assignments: Assignments will be an integral part of your learning experience in this course and will include both in- and out-of-class work. Out-of-class assignments will be posted on my webpage at **math.buffalostate.edu/~wilsondc** I do not have an ANGEL site. Assignments are due at the start of the class. One or two problems will be selected from each assignment to grade using the rubric below. The assignments will be substantial and you should expect to spend 8-10 hours per week outside of class on them (including reading and video- see below). You are encouraged to work with your classmates on the assigned problems provided you complete your own personal write-up of the solutions. (see NOTE under Academic Integrity) In addition, you will frequently work in class and complete tasks individually or in groups that may be collected and assessed. You (or your group) may be asked to present to the class occasionally.
>Late Submissions: Unless otherwise stated, assignments are to be submitted at the start of class the date they are due. If you have a problem submitting an assignment on time, discuss it with me as soon as possible. Any work that is not completed on time will suffer a reduction in grade that will vary according to the degree of tardiness. I will not be able to accept an assignment more than 2 class meeting days late. In the event of a class absence, assignments should be e-mailed or placed in my mailbox on the due date to avoid a reduction in grade.

Reading/Video Assignments:

Most classes will have a reading and/or video assignment that will focus on content that will be developed during the following class. The text has been selected in part, due to the student-friendly writing the authors employ in developing the content. Reading and/or video assignments may be accompanied by questions to assist in gaining insight into the assigned reading.

Problem Solving Hour

The problem solving hour is devoted to accomplishing the following objectives that are set forth by the Mathematical Association of America regarding undergraduate mathematics courses. *Every course should incorporate activities that will help all students' progress in developing analytical, critical reasoning, problem-solving, and communication skills and acquiring mathematical habits of mind. More specifically, these activities should be designed to advance and measure students' progress in learning to*

i. *State problems carefully, modify problems when necessary to make them tractable, articulate assumptions, appreciate the value of precise definition, reason logically to conclusions, and interpret results intelligently;*

ii. *Approach problem solving with a willingness to try multiple approaches, persist in the face of difficulties, assess the correctness of solutions, explore examples, pose questions, and devise and test conjectures;*

iii. *Read mathematics with understanding and communicate mathematical ideas with clarity and coherence through writing and speaking*

In an attempt to accomplish these goals you will have one 50-minute session per week that enhances your understanding of the topics under study through your engagement in cooperative problem-solving activities. Work will be collected and assessed using the above rubric and cooperative efforts will be assessed as described below.

Assignment/PSS Rubric:

4: Solutions include a complete, error-free work and/or justification along with diagrams where appropriate including coordinate graphs (on graph paper if directed in the text). Solution shows understanding of the question's mathematical purpose and ideas and includes response to all parts of the question. May include examples and counterexamples where appropriate.

3: Solutions are good solid responses but is not error-free and/or explanation is less complete. Supporting work may lack some of the above elements or parts of the question may have been omitted and/or misunderstood. Conclusions may not be fully supported.

2: Submission contains incomplete responses, multiple errors and/ or the explanation may be muddled. Lacks diagrams or includes diagrams that are unclear or inappropriate. Indicates some understanding of mathematical ideas but they are not expressed clearly. Discussion incomplete.

1: Omits significant parts of the questions and/or has major errors. May use inappropriate strategies or fail to document solution paths with diagrams, work, and/or supporting discussion.

Class Participation and Group Process

You are expected to participate fully in the discussions that take place within your groups and across the class. In part, your engagement in these discussions is a way of developing your own thinking about the course content and thus is an integral part of the learning experience. It is expected that you will function effectively as part of a group and the following rubric will be used to assess your active engagement in the group process and efforts at promoting an effective learning environment for all.

Individual Assessment of Cooperative Learning indicators

	4	3	2	1
Works Toward Group Goals				
Uses Effective Interpersonal Skills				
Contributes to Group Maintenance				
Takes on a Variety of Roles				

Indicator descriptions

Works Toward Group Goals:
4: Actively helps identify group goals and works hard to meet them
3: Communicates commitment to group goals and effectively carries out work to meet them
2: Communicates a lack of commitment to the group goals
1: Does not work toward group goals or actively works against them

Uses Effective Interpersonal Skills:
4: Actively promotes effective group interactions and the expression of ideas and opinions in a way that is sensitive to the feelings and knowledge base of others
3: Participates in group interaction without prompting. Expresses ideas and opinions in a way that is sensitive to the feelings and knowledge base of others.
2: Participates in group interaction with prompting or expresses idea and opinions without considering the feelings and knowledge base of others.
1: Does not participate in group interaction even with prompting or expresses ideas and opinions in a way that is insensitive to the feelings or knowledge base of others.

Contributes to Group Maintenance:
4: Actively helps the group identify changes or modifications necessary in the group process and works toward carrying out those changes.
3: Helps identify changes or modifications necessary in the group process and works toward carrying out those changes.
2: When prompted, helps identify changes or modifications necessary in the group process or is minimally involved in carrying out those changes.
1: Does not attempt to identify changes or modifications necessary in the group process even when prompted or refuses to work toward carrying out those changes

Takes on a Variety of Roles:
4: Effectively performs multiple roles within the group
3: Effectively performs one role within the group
2: Makes an attempt to perform one role but has little success
1: Rejects opportunities to perform one role

<u>Academic Integrity</u>:

The university has a responsibility to promote academic honesty and integrity and to develop procedures to deal effectively with instances of academic dishonesty. Students are responsible for the honest completion and representation of their work, for the appropriate citation of sources, and for respect for others' academic endeavors.** By placing their name on academic work, students certify the originality of all work not otherwise identified by appropriate acknowledgments.
No credit shall be awarded in situations where it has been determined that this policy has not been followed.
** Adapted from the University of Wisconsin's *Student Disciplinary Guidelines*.
NOTE: I use a *0 to indicate a grade of zero that reflects what I see as plagiarized work. You may challenge this grade by making an appointment with me and discussing the solution(s) and process by which you arrived at it.

<u>Statement on Students with Disabilities:</u>

If you have a diagnosed physical disability, learning disability, or psychological disability which will make it difficult for you to carry out the course work outlined above or which requires accommodations such as assistance from note takers and/or readers, extended time on assignments, and so on, please advise me during the first week of the course and contact the Office of Special Services for Students with Disabilities (878-4500) to discuss possible arrangements for reasonable accommodations.

<u>Classroom Etiquette:</u> Please **<u>turn off</u>** all cell phones and put them out of sight so as not to interrupt your engagement in the lesson. Please inform me of any emergency situation that requires otherwise. Similarly, you are expected to arrive on time for every class.

<u>Important Dates (see exam dates above):</u>

February 18	no class- President's Day
March 25, 27	no classes- Spring Break
April 5	Last day for course withdrawal
May 10	no class- Study Day for CEP