MA 299 **CALCULUS I with Mathematica** **Fall 2018**

Instructor:	**Class Meetings Location/Time:**	**Office Location:**
Lee A. Redmond	MWF - 11:00 - 11:50	136

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COURSE DESCRIPTION

MA 299. CALCULUS I with Mathematica. Functions, limits, differentiation, integration of algebraic functions with uses of Mathematica software notebooks for visualization of concepts. Prerequisite: MA 111/MA 150 or ACT sub-test of 20 in mathematics. 3

COURSE CONTENT

Text

Lawson, R.,Hostetler, R., and Edwards, B. Calculus with Analytic Geometry 10th ed. Houghton Mifflin Company.

MAJOR AREAS OF STUDY

I. Preparation for Calculus - Optional
- A. Equations of a line
- B. Functions
- C. Graphing Equations and Functions by point-plotting
- D. ***Mathematica*** Basics
- E. Lab Activity
- F. Test

II. Limits and their properties
- A. δ-ε definition of a limit
- B. Finding limits numerically and graphically
- C. Evaluating limits analytically
- D. One-sided limits
  Lab Activity
- E. Continuous Functions
- F. Intermediate Value Theorem
- G. Infinite Limits - Lab Activity

III. Differentiation
- A. Finding the slope and derivative by the limit process
- B. Basic Rules for Differentiation and Rates of Change
- C. Higher Order Derivatives
- D. Chain Rule
- E. Lab Activity
- F. Implicit differentiation

IV. Application of Derivatives
   A. Relative Extrema and Critical Numbers
   B. Rolle's Theorem
   C. Mean-Value Theorems
      Lab Activity
   D. Monotonicity and the First Derivative Test
   E. Concavity and the Second Derivative Test
   F. Graph Sketching
      Lab Activity
   G. Limits at Infinity
   H. Differentials

V. Integration (This topic may be delayed until Calculus II)
   A. Anitderivatives and Indefinite Integration
   B. Basic Properties of the Definite Integral
   C. Fundamental Theorem of Calculus
   D. Differential Equations -Initial Conditions and Initial Solutions (Optional)

COURSE OBJECTIVES

Upon completion of this course students will be able to:

(1) Find and discover limits using different methods.
(2) Employ estimation techniques, numerical computations, and graphs to analyze the behavior of functions.
(3) Apply the notion of limits to continuity, rates, derivatives, and other topics in Calculus.
(4) Use modeling to solve problems in various disciplines.
(5) Use **Mathematica** as a problem-solving tool.
(6) Demonstrate knowledge of Differentiation and Integration.

MAJOR STUDENT ACTIVITIES

(1) Students are expected to be in class every day and have a comprehensive understanding materials covered or assigned in chapters 1 through 4. Therefore, they are expected to read intensively from the textbook and spend a considerable amount of time solving problems to help understand the concepts. **Every student must have the textbook and must bring it to class daily**.

(2) Students are expected to pass written examinations based on classroom lectures, labs and homework assignments. For any student who could not take the test, a **make-up test** should be taken before the next scheduled class meeting unless prior preparations have been made with the instructor. Failure to makeup a test results in a grade of **zero**.

(3) Random quizzes may be given. **Quizzes cannot be made up.**

(4) All homework assignments must be completed and submitted on time at the beginning of class. **Incomplete or late** work will not be accepted unless prior preparations have been made with the instructor. An excused absence does not excuse students for any assignments that was submitted on that day. All lab assignments using ***Wolfram Mathematica*** must be completed in the lab . Students are expected to spend time outside of class getting familiar with this software.

(5) A notebook (folder/binder) should be maintained which contains lecture notes and all homework and practice exercises properly labeled. There may be random notebook checks.

(6) Students are strongly encouraged to participate in all class activities and assignments with both the instructor and other students.

EVALUATION AND GRADING PROCEDURES

The following will be used to determine the final grade.

Content Examinations 60%
And Special Assignment
Final Exam 10%
Daily Average 30%
(random quizzes, homework and lab exercises)

Grading Scales:

SCORE	GRADE
90-100	A
80-89	B
70-79	C
60-69	D
BELOW 60	F

Attendance Policy

It is necessary for students to attend every class meeting. Any student who misses more than three unexcused absences will be subject to a decrease in their final grade.

SPECIAL NEEDS STATEMENTS

Mississippi Valley State University is committed to providing reasonable accommodations for students with a documented disability. If you feel you are eligible to receive accommodations for a covered disability(medical, physical, psychiatric, learning , vision, hearing, etc.) and would like to request it for this course, you must be registered with the Services for Students with Disabilities(SSD) program administered by University College. It is recommended that you visit the Disabilities Office located inside the EMAP Computer Lab in the Technical Education (IT) Building to register for the program at the beginning of each semester. If you are determined to be eligible after our confidential consultation, you will be provided with a Memo of Accommodations that must be submitted to each of your instructors.

Technology

Throughout the course, ***Mathematica*** will be used for problem-solving as well as for exploration and discovery. Students will complete assignments or projects using ***Wolfram Mathematica***. The lab is equipped with ***Mathematica*** notebooks to accommodate each major area of study. Students will be given opportunity to use technology to execute complicated computations, to visualize theoretical concepts, to discover alternative approaches, or to verify the results of other solutions.

Useful ***Mathematica*** Commands:

f[x_]: =	Defines a function f(x)
Plot[f[x], {x, a, b}]	Plots the graph of f(x) from x = a to x = b.
Plot[{f[x],g[x]}]	Plots the graph of f(x) and g(x) simultaneously
%	Last result generated (output)
Expand[expression]	Performs multiplication involved in the expression
Simplify[expression]	Simplifies the expression
D[f[x**],x]** or f'[x]	Differentiates the expression f with respect to x.
Integrate[f[x],x]	Gives anti derivative of the expression f(x) w.r.t. x.
Integrate[f[x]**,{x,a,b}]**	Integrates the expression f(x) on the interval [a,b].
N[?] or //N	Convert to numerical value.
Limit[f[x], x→a]	Finds the limit of f(x) as x approaches a.
Solve [**expr1** = = expr2, **x**]	Solve the equation expr1 = expr2 for x.
PlotRange→**{a,b}**	Display y-axis from a to b.
PlotStyle→Hue[o.a]	Puts color in the graph.

Others will be given in class as needed.

Incomplete

Only students with acceptable excuses who could not complete the course requirements within the semester will be considered for a grade of incomplete. The student must have a passing grade (**C or better**) up to the withdrawal date. Otherwise, students should drop or withdraw from the class.

Office Hours: posted on office door.

Note:

Cell phones should not be used at any time during the class period. It is preferred that cell phones not be visible. **They cannot be used as calculators on tests!!!!!!!**

Students should always **show their work** to receive credit for test or homework problems. Answers alone **will not** be accepted.

It is the student's responsibility to check with the instructor and other students before the next class meeting to find out what happened on days when they were out of class. Being excused **does not** mean you are not responsible for any assignments submitted that day.