Applied Calculus/MTH 140 Section 103 (CRN 3023)

Fall 2018

**T, R 8:00 – 9:15 A.M.**

**Smith Hall 509**

**(Tentative, 8/30/2018)**

# Instructor: Dr. Bonita A. Lawrence

 Office and Lab – 614 Smith Hall

 696-3040, lawrence@marshall.edu

Office Hours: 2:30 P.M. – 3:30 P.M. T,R

 10:00 A.M. – 11:30 A.M. M,W

 Or a time that we can find that

 works for both of us!

**General University**

**Policies:** By enrolling in this course, you agree to the University Policies presented below. You can read the full text of these important policies online using the following path: Marshall Home Page - Course Catalogs – Undergraduate Catalogs. At this point, choose the catalog you started under (or any catalog after that).

**University Attendance**

 **Policy**: The University Policy that describes excused absences can be found in the Marshall University 2018 - 2019 Undergraduate Catalog on pages 87 – 88.

**Academic Dishonesty Policy:** I expect you to do your own work. You can certainly discuss the homework problems with your colleagues but what you present to me for any type of assessment must be your own. The University’s policy concerning academic dishonesty can be found in the Marshall University 2018 - 2019 Undergraduate Catalog on pages 73 – 75..

**Policy for Students with Disabilities**:

Marshall University is committed to making all programs, services, and activities fully accessible to students with disabilities. The purpose of the Office of Disability Services Program is to provide the educational and physical accessibility support necessary for students to achieve their academic goals and to promote as much independence as possible on the part of the students with disabilities. Students with disabilities who require accommodations must contact the [Office of Disability Services](http://www.marshall.edu/disability/) (URL: http://www.marshall.edu/disability).

**Affirmative Action Policy:** In the spirit of equal opportunity for all, Marshall University has an Affirmative Action Policy. This can be found in the Marshall University 2018 - 2019 Undergraduate Catalog on p. 70.

**Inclement Weather Policy:** In the event of bad weather that may prevent us from coming to school, Marshall has a policy that describes how things will be handled. (Most years, since I have been here, Marshall is shut down for 1 or 2 days. A few years ago we were shut down for a little over a week!) The policy can be found on pp. 71 - 72 of the Marshall University 2018 - 2019 Undergraduate Catalog.

**Catalog Course Description:** This course is a brief survey of calculus including both differentiation and integration with applications. It cannot be substituted for MTH 229 or MTH 203.

**Course Prerequisites:** The prerequisite for the course is a grade of *C* or better in MTH 127 or MTH 130 or Math ACT 24 or above.

**Course Objectives:** This course is designed to introduce you to the power and applicability of Calculus. Physical systems can be modeled with functions. Those who study these systems (it will likely be you one day) are often interested in the behavior of the function that is used to model it over a given period of time. Perhaps you will be interested in intervals of the time when the range values increase or decrease or specific domain values where the range value is at a maximum or minimum in a given interval. Using the tools of Calculus, you can determine these properties and many more!

The course is designed to be an extension of your previous studies of function theory from your algebra training. Concepts from algebra make up the tool box you will use to study the concepts of calculus. With this in mind, we start with a brief overview of some of the important concepts from your algebra studies.

Success in the course will be measured by your ability to meet the following learning outcomes.

The ability to:

1. *Learning Outcome:* Utilize algebraic theory to analyze the behavior of certain functions used to model system applications such as physical systems.

*Skill Development:* Individual, small group and whole group discussions and presentations of application of function theory to the analysis of functions and their graphs. This includes discussions of the concept of a function and the inverse of a function (when one exists) and the absolute value function and its uses. This is a review of material from previous courses. Exercises assigned daily followed by timely feedback.

*Assessment:* Evaluation of written and oral presentations for proper applications of these concepts. This includes assessment of Boardwork, Challenges of the Week and Chapter Excursions.

1. *Learning Outcome:* Choose appropriate methods and successfully calculate limits of functions and use these ideas to determine their instantaneous rates of change (or derivative) at a given point.

*Skill Development:* Individual, small group and whole group discussions of theory and processes for finding limits of functions and calculating rates of change. Exercises assigned daily followed by timely feedback.

*Assessment:* Evaluation of written and oral presentations for proper use of the theory developed and proper selections of presented techniques for calculating limits of functions and finding the function’s instantaneous rate of change (when it exists). This includes assessment of Boardwork, Challenges of the Week and Chapter Excursions.

1. *Learning Outcome:* From given information about the rate of change of a function, choose the proper method and successfully reconstruct the function (finding an anti-derivative).

*Skill Development:* Individual, small group and whole group discussions and presentations of applications of methods for reconstructing a function from its rate of change. Exercises assigned daily followed by timely feedback.

*Assessment:* Evaluation of selection and application of methods for reconstructing a function from its rate of change in both written and oral presentations. This includes assessment of Boardwork, Challenges of the Week and Chapter Excursions.

1. *Learning Outcomes:* Describe the connection between a physical system and a given mathematical model used to study it. Create a mathematical model from the known behavior of a physical system and use the developed calculus to study the system.

*Skill Development:* Individual, small group and whole group discussions presentations of the development and analysis of mathematical models. Exercises assigned daily followed by timely feedback.

*Assessment:* Evaluation of the proper construction of mathematical models from given physical systems and the use of developed calculus theory to analyze the system in both written and oral formats. This includes assessment of Boardwork, Challenges of the Week and Chapter Excursions.

1. *Learning Outcome:* Program the differential analyzer to construct particular functions.

*Skill Development:* Small group and whole group laboratory analysis of how the mechanics of the differential analyzer models mathematics and hands-on setup of particular models on the machine. These studies will take place in the Marshall Differential Analyzer Lab. Lab experience supported and enhanced by formal written lab exercises.

*Assessment:* Evaluation of lab reports for proper descriptions of the required programming and the associated output of the differential analyzer and analysis of what information the output offers us.

1. *Learning Outcome:*  Present written and oral discussions in a valid and logical format.

*Skill Development:*  Individual, small group and whole group discussions of logical organization of information in both written and oral formats. Exercises assigned daily followed by timely feedback.

*Assessment:* Evaluation of all written assignments and oral presentations at the board for validity and logical flow.

1. *Learning Outcome:* Construct at least two different valid and logical approaches to a given problem.

*Skill Development:* Individual, small group and whole group discussions with peers and presentations for peers of multiple approaches to the same problem. Exercises assigned daily followed by timely feedback.

*Assessment:* Evaluation of solutions for the proper use of more than one approach to an exercise presented in both written and oral forms. This includes assessment of Boardwork, Challenges of the Week and Chapter Excursions.

**Textbook:** Applied Calculus for the Life Sciences,

Greenwell, Ritchey and Lial,

 Pearson Education Inc., Boston.

**Grading Procedure:** You grade will be calculated using the following percentages:

 Lab Exercise and Boardwork 10%

 Challenge of the Week 20%

 2 Chapter Exams 50%

 Final Exam: 20%

There will be three exams during the semester, including the final exam (**Thursday, December 13th, 8:00 – 10:00 A.M.).**  At the end of this document you have a schedule of topics and exam dates. In the event you have a University excused absence and are not able to take the exam on the scheduled date (See Attendance Policy on the first page of this document), if possible, contact me before the scheduled exam time so that we can plan a time for you to take the exam early. Otherwise, with an excused absence, you have one week from the date of the excused absence to make-up your exam.

I will assign homework problems every day. At the beginning of each class I will ask a few of you to present some of your fine works of art at the board for my enjoyment as well as that of your peers. This is what I call “Boardwork”. You must visit the board at least twice during the semester to receive full credit for your boardwork.

Once a week I will give you a couple of exercises to do on your own, something I call the “Challenge of the Week”. You will have about 15 minutes to do two or three problems. Keep up to date with your reading and your homework exercises and ask questions that come to mind when you are studying and you will do well on the “Challenge of the Week”.

Your final grade will be determined using the following scale:

90% - 100% A

80% - 89% B

70% - 79% C

60% - 69% D

0% - 59% F

My best advice (It’s free!) is for you to keep up with your reading and homework assignments.

**Attendance Policy:** I expect you to be in class every day you are physically able. It is your responsibility to determine what you missed in the event you are unable to attend class. Requesting notes from a colleague would be wise. I am happy to give you information about any assignments you missed. If you miss an exam or a deadline for an assignment and your absence is excused (See University Attendance Policy, page 1 of this document), you have one week after the date of the excused absence to make it up.

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**Have a great semester and let me know what I can do to help you with your studies.**

**Cheers!**

**Dr. Lawrence**

**A Tentative Program of Events for MTH 140**

**Class Days Topics and Events**

**Week 1 A Review of a Few Important**

**August 21, 23 PreCalculus Topics:**

**The Concept of a Function**

**Exponential Functions**

**Logarithmic Functions**

**Growth and Decay**

**Boardwork**

**Challenge of the Week - Thursday**

**Week 2 Trigonometric Functions**

**August 28, 30 The Concept of a Limit**

**Properties of Limits**

**Continuous Functions**

 **Boardwork - Examples**

 **Challenge of the Week – Thursday**

**Week 3 Continuous Functions**

**September 4, 6 Average Rate of Change and**

 **Instantaneous Rate of Change**

**The Derivative / The Slope of a the**

 **Tangent Line**

**DA Lab I**

**Challenge of the Week - Thursday**

**Week 4 The Derivative / The Slope of a the**

**September 11, 14 Tangent Line**

**Calculating Derivatives**

**Boardwork – Examples and Applications**

**Challenge of the Week - Thursday**

**Week 5 Amazing Properties of Derivatives**

**September 18, 20 Putting Derivatives to Work**

 **Exam I - Thursday**

**Week 6 The Derivative of Products and**

**September 25, 27 Quotients**

**The Derivative of a Composition**

 **Function**

**Boardwork – Examples and Applications**

**Challenge of the Week - Thursday**

**Week 7 Derivatives of Exponential Functions**

**October 2, 4 Derivatives of Logarithmic Functions**

**Derivatives of Trig Functions Boardwork – Examples and Applications**

**Challenge of the Week - Thursday**

**Week 8 Derivatives of Trig Functions (cont.)**

**October 9, 11 Increasing and Decreasing Functions**

**Boardwork – Examples and Applications**

**Challenge of the Week - Thursday**

**Week 9 Local Max and Mins and the**

**October 16, 18 First Derivative Test**

 **Concavity and the Second**

 **Derivative Test**

**Boardwork – Examples and Applications**

**Challenge of the Week - Thursday**

**Week 10 Curve Sketching**

**October 23, 25 Absolute Max and Mins**

**Boardwork – Examples and Applications**

**Challenge of the Week - Thursday**

**Week 11 Implicit Differentiation**

**October 30, November 1 Related Rates**

 **Exam II - Thursday**

**Week 12 Differentials/ Linear Approximation**

**November 6,8 Antiderivatives**

**DA Lab II**

**Challenge of the Week - Thursday**

**Week 13 The Powerful Technique of**

**November 13, 15 Substitution**

 **Calculating area with the Definite**

 **Integral**

**Boardwork – Examples and Applications**

**Challenge of the Week - Thursday**

**Week 14 Thanksgiving Break**

**November 19 – 23 Enjoy a break with your family and friends!**

**Week 15 Area Under a Curve**

**November 27,29 The Big Theorem: The Fundamental**

 **Theorem of Calculus**

**Boardwork – Examples and Applications**

**Week 16 Area Between Curves**

**December 4,6 Integration By Parts**

**Boardwork – Examples and Applications**

**Final Exam:**

**Thursday, December 13th, 8:00 A.M. –10:00 A.M.**