Real Variables I

Fall 2016

MTH 650 Section 101, CRN 3097

**M,W,F 3:00 – 4:15, Smith Hall 614**

(Revised 8/22/2016)

# Instructor: Dr. Bonita A. Lawrence

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 696 – 3040 or 696-3854, lawrence@marshall.edu

Office Hours: 11:00 A.M. – 12:00 A.M M,W

 10:00 A.M. – 11:00 P.M. T,R

Or by appointment: If you are not able to come for office hours because you have other commitments, please let me know and we will find a good time that will work 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 2015– 2016 Undergraduate Catalog on pages 85 – 86. Also, see attached document.

**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 2015 – 2016 Undergraduate Catalog on pages 71 - 73.

**Policy for Students with Disabilities:** Marshall University is committed to equal opportunity for all. Students with physical, learning or psychological disabilities should contact the Office of Disabled Students Services (DSS) in Prichard Hall Room 117, 304 696-2271 and provide documentation of their disability. After consultation the DSS coordinator will send a letter to the student’s instructors describing the accommodations the student will need. For more information, go to <http://www.marshall.edu/disabled> or call or visit the office in Prichard Hall.

**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 2015 – 2016 Undergraduate Catalog on p. 68.

**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. (Prior to last year, during my time at Marshall, the University was only shut down for 1.5 days. However, last spring it was more than a week!) The policy can be found on pp. 69 -70 of the Marshall University 2015 – 2016 Undergraduate Catalog.

**Textbook:** Measure, Integral and Probability, 2nd Edition

Marek Capinski and Ekkehard Kopp

We will use this as our formal textbook. I will supplement (with references) the concepts and ideas found in this nicely prepared text.

**Course Prerequisites:** MTH 528, Advanced Calculus II. We will build on your knowledge of integration theory commonly developed in an Advanced Calculus sequence.

**Course Objectives:** In this course you will expand you understanding of integration. We will move from the structure developed by Newton and Leibniz to the work of Henri Lebesgue. This will require some discussion of the properties of a measure and an introduction to measureable functions. In particular, we will study the Lebesgue measure and Lebesgue Integration. Such a structure offers integrability to a larger class of functions than the Riemann Integration structure. We will see that this offers us powerful analytical tools.

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

 The ability to

1. Exhibit an understanding of the motivation for this field of study.

Skill Development: Reading assignments and class discussions of the origins of the development of the field that include examples that exhibit a need for these studies. Daily exercises followed by timely feedback.

Assessment: Review of written and oral presentations of examples that show the elegance and power of this generalized integration theory.

1. Exhibit an understanding of the theory of generalized measures and measureable functions.

Skill Development: Group discussions (lead by you or one of your colleagues) of definitions, properties and theorems related to measures and measureable functions. Daily homework exercises followed by timely feedback.

Assessment: Review of written and oral analyses of definitions and theorems, complete with proof, that make up the foundations of measure theory for conceptual understanding and understanding of the relationships between ideas.

1. Construct formal proofs of propositions that address concepts discussed during the course of the semester.

Skill Development: Peer lead discussions that include the construction of proofs of propositions that develop the structure of measure theory and Lebesgue integration. Daily homework exercises followed by timely feedback.

Assessment: Review of all written and oral presentations of proofs for proper construction and clarity of fundamental theorems and other propositions discussed during the course of the semester.

1. Exhibit an appreciation and understanding of the proof techniques used to verify classical theorems.

Skill Development: Peer lead discussions of the logical flow of proofs of classical theorems. Daily homework exercises followed by timely feedback.

Assessment: Review of written and oral presentations of proofs of classical theorems focusing on logical flow and validity.

1. Present your work clearly and concisely in both written and oral form. Organization and logical flow will be the secrets to success in meeting this objective.

Skill Development: Peer lead discussions that include the creation of clear and concise proofs of stated theorems and propositions. Daily homework exercises with review the following day.

Assessment: Review of all written assignments and oral presentations at the board for clarity and understanding.

1. Recognize and appreciate various approaches to the same problem.

Skill Development: Peer lead discussions of various approaches to the same problem.

Assessment: Review of written and oral exercises requiring the use of more than one approach to the proof of a proposition for proper construction and clarity of process.

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

 Homework: 20%

 Boardwork: 20%

 Midterm Exam: 30%

 Final Exam: 30%

I want to contribute to your quest to be a lifelong learners. To achieve this goal, I have planned the following format for our class time:

This will be a seminar class. Class time will be spent in discussion of the topics at hand. Throughout the semester, you will be assigned certain topics that we will use to develop the structure of Measure Theory and Lebesgue Integration. You will lead your colleagues and me in interesting and engaging discussions of these topics. (At your level, I find that this is one of the best ways to study mathematics. It will prepare you for advanced studies of mathematics as well as other topics.) I will oversee the discussion and make comments. My comments will have purpose so take note. You will have homework exercises that you will submit regularly.

There will be two tests during the semester, a midterm and a final exam **Monday, Dec. 12th, 3:00 – 5:00.** In the event you are not able to take the exam on the scheduled date because of very serious circumstances, (see http://www.marshall.edu/academic-affairs/policies/) please contact me before the scheduled exam time so that we can plan a time for you to take the exam early.

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.

**Have a great semester and let me know if I can help you. If I can’t answer your question, I’ll find someone who can!**

**Cheers!**

**Dr. Lawrence**

University Class Attendance Policy (Approved by the Faculty Senate, Spring 2015)

Students are expected to attend punctually all class meetings, laboratory sessions and field experiences and to participate in all class assignments and activities as described in the Course Syllabus. Absences are counted from the first class meeting after the student registers. Students registering late are expected to make up all missed assignments in a manner determined by the instructor. Students should be aware that excessive absences, whether excused or unexcused, may affect their ability to earn a passing grade. The instructor of each class shall establish a policy on class attendance and make-up work, and provide the policy to students in the Course Syllabus. This policy must not conflict with university policies, including this policy. Class attendance may be a criterion in determining a student’s final grade in the course if the instructor provides a statement to this effect in the course syllabus.

Students must promptly consult with their instructors about all class absences. Instructors will work with students to identify appropriate documentation and discuss any missed class time, tests, or assignments. A student may not be penalized for an excused absence, provided that the student, in a manner determined by the instructor, makes up the work that has been missed.

Instructors are required to honor University Excused Absences and to provide reasonable and equitable means for students to makeup work missed as a result of those absences. Academic obligations that cannot be made up should be addressed by the course instructor in consultation with the student to ensure that continued enrollment is feasible while there is still an opportunity to drop the course within the established withdrawal period.

This policy excludes academic endeavors that require the completion of a specific number of clock hours, such as clinical experiences, practica, and internships. For those courses, the department chair or program supervisor will determine the maximum number of absences. This policy does not supersede program accreditation requirements.

This policy also excludes laboratory courses that require significant preparation and monitoring. For such courses, departments will determine the minimum number of laboratories a student must complete to pass the course. If a student cannot complete this number of labs, the instructor may recommend that the student withdraw from the class.

If the instructor believes that the number of absences accrued under the terms of this policy (whether excused or unexcused) is such that a student cannot fulfill the learning experience and mastery that a course requires, the instructor may recommend that the student withdraw from the class.