Math 383/683, Summer 2017

Dr. Sarah Raynor

Textbook: The Real Numbers: An Introduction to Set Theory and Analysis, John Stillwell, ISBN: 978-3-319-34726-4. We will cover some or all of Chapters 1-3 and 6-9 of the text. The text can be rented as a Kindle book from Amazon for $15 for the duration of the course.

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Course Website: Please see the course Sakai website at sakai.wfu.edu for course materials. Please also create an account on Overleaf for homework assignments. The Overleaf account is free. Overleaf is an online collaborative tool for creating mathematical documents using the typesetting program LaTeX.

Prerequisites: Math 112, 117, and 121.

Course Description: This course will fill in the gaps in the standard upper level courses offered, discussing an axiomatic presentation of the real numbers, construction of the real numbers, set theory and cardinality, the Cantor set and related sets, the Axiom of Choice, and the Continuum Hypothesis. Time permitting, some discussion of measure will be included. This course will be an excellent complement to Math 311/611; for students who have not yet taken 311/611, it will provide a ground work in analysis-style proofs and ideas, while for those who have taken 311/611, it will fill in a number of details and related topics of interest for which the 311/611 syllabus does not allow time. We will take the time to learn how to write proper mathematical proofs using these abstract ideas.

Student Learning Outcomes:

- Comfort with the structure and topology of the real line.
- Facility with the ideas of set theory and cardinality
- Proficiency in the construction of mathematical proofs involving these concepts.

Assignments:
Writing will be an important component of this course. Proofs will be assigned regularly, with one rewrite allowed for each homework after initial grading. A schedule of assignments is given in the course calendar, below.

Projects:

In addition to regular homework, students will have an extended project assignment. Project assignments will comprise a presentation and written report on a topic relevant to course material but not actually covered in class. The mathematical topic will be mutually agreed upon by each student and Dr. Raynor. No duplication of topics is allowed; topics will be chosen on a "first-come, first-served"basis, but final topic selection is due by July 13. Topics may be related to the student's other interests but may not duplicate work already performed for another course or research project.

Each project should contain at least one mathematical theorem with a significant proof, written in the student's own words, as well as some context: historical information, applications, and relationships to other material in this course.

Each written report will consist of eight to ten pages and will be graded on content, correctness, clarity, writing, and proof quality. Each presentation will be 15-20 minutes long and will be graded on topic choice, clarity, correctness, visual aids, and interaction with the audience. The written and oral components of the project are weighted equally in the project grade. A rubric will be available in advance of the deadline.

Graduate students enrolled in 683 will be expected to produce a project on an appropriate graduate-level topic.

Some possible project topics include (but are not limited to):

1. The Sierpinski Gasket
2. Space-Filling Curves
3. Infinite Series
4. Riemann integration
5. Ordinal Numbers
6. Non-measurable sets

Evaluation: There are 5 components of your final grade.

1. There will be two midterm examinations which will be worth 15% of your grade each. Each will have both a take-home and in-class component.
2. There will be a cumulative final examination which will have both in-class and take-home portions, and will be worth 30% of your grade.
3. The written homework is worth 15% of your grade.
4. The project assignment is worth 15% of your grade.
5. Positive participation in class is worth 10% of your grade.

Make-up assignments will not be given, and late work will not be accepted. If you have to miss an assignment due to a legitimate excuse, that assignment will be excused and other assignments of the same type will be weighted more heavily to replace it.

The Honor Code: At Wake Forest, we expect you to behave as honorable citizens of the class, the university, and the world as a whole. When you complete an assignment with your name on it, you are representing that everything you are turning in is your own work. That means that you do not copy from other students, textbooks, or websites. You do not obtain the main ideas of a proof from someone else unless I have explicitly permitted you to do so.

The honor code is a token of our respect for you as members of the academic community. When one person cheats, it diminishes the experiences of everyone else in the program, both faculty members and students. Please, respect yourselves, each other, and me, and turn in only your own personal work. If at any time I become aware of cheating or plagiarism in this course, I will submit the information to the honor council. The format of any future assignments may also be affected, for the entire class.

Important Note for Graduate Students: Students enrolled in Math 683 will be held to a higher standard. As appropriate, this expectation will be reflected in course topics, homework and project assignments, exams, and grades.

Course Calendar:

Date	Deadlines	Homework	Rewrites
July 6			
July 7			
July 10		1	
July 11			
July 12		2	
July 13	Project Topic Due		1
July 14		3	
July 17			2
July 18	**Exam # 1**		
July 19		4	3
July 20	Take Home # 1 Due		
July 21		5	
July 24			4
July 25	Project Outline Due	6	
July 26			5
July 27		7	6
July 28	**Exam #2**		
July 31	Take Home #2 Due	8	
August 1	Project Draft Due		7
August 2		9	
August 3			8
August 4		10	
August 7			9
August 8	Projects Due	11	
August 9			All Rewrites Due
August 10	**FINAL EXAM 2-5pm**		
August 13	Take Home Final Due		