Math 5307: Mathematical Analysis I

Section 001 – Fall 2013

Time: TR 12:30 – 1:50 PM
Classroom: Pickard Hall 311
Instructor: Prof. Barbara Shipman
Office: Pickard Hall 437
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Office Hours: Monday, Tuesday, Wednesday 10:30—11:30 AM
Website: www.uta.edu/faculty/shipman at Student Center, Math 5307

Prerequisite: MATH 4335 or consent of the Graduate Advisor.

Textbook (required)**:** *Mathematical Analysis*, Second Edition, by Tom M. Apostol.

Course Content: Elements of topology, real and complex numbers, limits, continuity, and differentiation, functions of bounded variation, Riemann-Stieltjes integrals. For more details see http://www.uta.edu/math/pages/main/phdreqs/5307.htm.

Learning Outcomes: On successful completion of Math 5307, students should be able to demonstrate, clearly in writing, a solid knowledge of the material including (but not limited to) the following topics (numbered by textbook chapter): **1. Real Numbers and Set Theory:** rational and irrational numbers, exponential, logarithmic, sine, and cosine functions, upper and lower bounds, completeness, functions, countable and uncountable sets. **2. Elements of Topology:** open sets, the Bolzano-Weierstrass Theorem, the Cantor Intersection Theorem, Heine-Borel compactness, metric spaces. **3. Limits and Continuity:** sequences, series, limits of real-valued functions, continuous functions, intermediate value theory, homeomorphisms, uniform continuity, discontinuities of functions, monotonic functions, contraction mapping theorem. **4. Derivatives:** analytic and geometric notions of derivatives, local extrema, Mean-Value Theorem, Intermediate-Value Theorem, Taylor's Theorem **5. Functions of Bounded Variation:** monotonic functions, functions of bounded variation, total variation, curves and paths. **6. Riemann-Stieltjes Integral:** upper and lower sums, existence, Riemann's theorem on discontinuities of measure zero, properties of the Riemann-Stieltjes integral

Expectations of the Student:

- **Attendance Policy:** You are expected to attend every class, arrive on time, and remain in class for the whole period. A missed class or exam cannot be made up.
- **15 hours/week outside of class.** You are expected to spend at least 15 hours per week outside of class studying and working on problems for this course.
- **MavMail and Announcements:** You must have an activated MavMail account and check it regularly. You are responsible for all information that I send to your MavMail account and all announcements that I make in class or on the course website: go to the Student Center, Math 5307 at www.uta.edu/faculty/shipman .
- **Personal responsibility.** The ultimate responsibility for your learning lies with you. The onus is on you to attend every class, keep up with daily assignments, put in the expected hours, and ask for help when needed.

Study Problems will be assigned daily as posted on the course website. You are expected to work out correct solutions to all study problems, resolve any questions that you have on them, keep your correct solutions organized in a class binder, and review them regularly, along with your class notes. All study problems must be prepared as follows:

- In the top left corner of every page, write your name and the course number.
- Write out the complete question before presenting your solution.
- Write neatly and large and dark enough for good legibility. You may type your work.
- Explain all your answers and justify all claims in your proofs.

Graded Study Problems: Every Tuesday, except for Dec. 3, and Thursday, August 29, you will be asked to hand in one or more study problems that I will select from any of those assigned up to that point. You are expected to have all previously assigned study problems ready to hand in; you will be told which problem(s) to hand in on the day they are collected. These problems will be scored by the GTA and returned with comments. Late work is not accepted. You are expected to re-work all study problems to correct any mistakes. Points may be lost for not preparing study problems according to the guidelines above. You may study with classmates, but the work that you hand in must be your own.

Assigned Reading: Reading from the textbook will be assigned along with the study problems. The readings may include additional material and proofs not covered in class for lack of time. All readings constitute course material that may appear on quizzes or the final exam.

Quizzes: Zero to two short quizzes will be given each week; these will take the place of longer midterm exams and will provide you with frequent feedback on your progress. Quizzes are cumulative and may cover any study problems, material, or readings assigned or discussed up to that point. You are expected to come to every class prepared for a possible quiz; the dates of the quizzes will be unannounced. A missed quiz cannot be made up for any reason. Two (and only two) lowest quiz scores will be dropped. Here are some tips on preparing for the quizzes:

- Know all definitions perfectly and completely.
- Regularly review all class notes, assigned reading, and study problems.
- Re-work study problems and problems discussed in class without resorting to notes. Consult notes only after a solid effort to re-work the problems on your own.
- Think about why every part of the hypothesis of a theorem is needed. Find examples to show that the conclusion may fail if any part of the hypothesis is dropped.
- Set aside ample time to work out all study problems carefully before the next class.
- Form study groups with classmates and work on coursework together.
- Pinpoint the specific question if you “get stuck” on a problem. Often in seeking to identify the question, one will see how to solve it.
- Consult with the instructor to settle remaining questions that you may have.

Final Exam: There will be a comprehensive final exam on Thur. Dec. 12, 11 AM—1:30 PM in the same room as the class. A missed final exam cannot be made up.

Grading: Your work will be graded on correctness, completeness, and clarity. Homework will be graded by the Graduate Teaching Assistant (GTA), in conjunction with the instructor. The quizzes and final exam will be graded by the Instructor.

Graded Study Problems:	15%
Quiz Average:	45%
Final Exam:	40%
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Course Average	100%

The final grade is based on the course average. A: 90—100%; B: 80—89%; C: 70—79%; D: 60—69%; F: 0—59%. Students are expected to keep track of their performance throughout the semester and seek guidance from available sources (including the instructor) if their performance drops below satisfactory levels.

Course Schedule: *The day-by-day outline is approximate; the instructor may adjust this schedule in any way that better serves the educational needs of the students enrolled in this course.*

Week 1	Aug 22	The real number system
Week 2	Aug 27 Aug 29	Basic notions of set theory and functions Basic notions of set theory and functions
Week 3	Sep 3 Sep 5	Elements of point set topology Elements of point set topology
Week 4	Sep 10 Sep 12	Elements of point set topology Elements of point set topology
Week 5	Sep 17 Sep 19	Limits and continuity Limits and continuity
Week 6	Sep 24 Sep 26	Limits and continuity Limits and continuity
Week 7	Oct 1 Oct 3	Limits and continuity Limits and continuity
Week 8	Oct 8 Oct 10	Differentiation Differentiation
Week 9	Oct 15 Oct 17	Differentiation Functions of bounded variation
Week 10	Oct 22 Oct 24	Functions of bounded variation and rectifiable curves Functions of bounded variation and rectifiable curves
Week 11	Oct 29 Oct 30 Oct 31	Riemann-Stieltjes integration Last day to drop a class Riemann-Stieltjes integration
Week 12	Nov 5 Nov 7	Riemann-Stieltjes integration Riemann-Stieltjes integration
Week 13	Nov 12 Nov 14	Riemann-Stieltjes integration Riemann-Stieltjes integration
Week 14	Nov 19 Nov 21	Riemann-Stieltjes integration Riemann-Stieltjes integration
Week 15	Nov 26 Nov 28	Riemann-Stieltjes integration Thanksgiving Day; no class
Week 16	Dec 3	Riemann-Stieltjes integration
Final Week	Dec 12	Final Exam 11 AM —1:30 PM (Thursday)

Policies of the University of Texas at Arlington:

Drop Policy: Students may drop or swap (adding and dropping a class concurrently) through self-service in MyMav from the beginning of the registration period through the late registration period. After the late registration period, students must see their academic advisor to drop a class or withdraw. Undeclared students must see an advisor in the University Advising Center. Drops can continue through a point two-thirds of the way through the term or session. It is the student's responsibility to officially withdraw if they do not plan to attend after registering. Students will not be automatically dropped for non-attendance**.** Repayment of certain types of financial aid administered through the University may be required as the result of dropping classes or withdrawing. For more information, contact the Office of Financial Aid and Scholarships (http://wweb.uta.edu/ses/fao).

Americans with Disabilities Act: The University of Texas at Arlington is on record as being committed to both the spirit and letter of all federal equal opportunity legislation, including the *Americans with Disabilities Act (ADA)*. All instructors at UT Arlington are required by law to provide "reasonable accommodations" to students with disabilities, so as not to discriminate on the basis of that disability. Any student requiring an accommodation for this course must provide the instructor with official documentation in the form of a letter certified by the staff in the Office for Students with Disabilities, University Hall 102. Only those students who have officially documented a need for an accommodation will have their request honored. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at www.uta.edu/disability or by calling the Office for Students with Disabilities at (817) 272-3364.

Academic Integrity: All students enrolled in this course are expected to adhere to the UT Arlington Honor Code:
I pledge, on my honor, to uphold UT Arlington's tradition of academic integrity, a tradition that values hard work and honest effort in the pursuit of academic excellence.

I promise that I will submit only work that I personally create or contribute to group collaborations, and I will appropriately reference any work from other sources. I will follow the highest standards of integrity and uphold the spirit of the Honor Code.

Instructors may employ the Honor Code as they see fit in their courses, including (but not limited to) having students acknowledge the honor code as part of an examination or requiring students to incorporate the honor code into any work submitted. Per UT System *Regents' Rule* 50101, §2.2, suspected violations of university's standards for academic integrity (including the Honor Code) will be referred to the Office of Student Conduct. Violators will be disciplined in accordance with University policy, which may result in the student's suspension or expulsion from the University.

Student Support Services: UT Arlington provides a variety of resources and programs designed to help students develop academic skills, deal with personal situations, and better understand concepts and information related to their courses. Resources include tutoring, major-based learning centers, developmental education, advising and mentoring, personal counseling, and federally funded programs. For individualized referrals, students may visit the reception desk at University College (Ransom Hall), call the Maverick Resource Hotline at 817-272-6107, send a message to resources@uta.edu, or view the information at www.uta.edu/resources.

Electronic Communication: UT Arlington has adopted MavMail as its official means to communicate with students about important deadlines and events, as well as to transact university-related business regarding financial aid, tuition, grades, graduation, etc. All students are assigned a MavMail account and are responsible for checking the inbox regularly. There is no additional charge to students for using this account, which remains active even after graduation. Information about activating and using MavMail is available at http://www.uta.edu/oit/cs/email/mavmail.php.

Student Feedback Survey: At the end of each term, students enrolled in classes categorized as lecture, seminar, or laboratory shall be directed to complete a Student Feedback Survey (SFS). Instructions on how to access the SFS for this course will be sent directly to each student through MavMail approximately 10 days before the end of the term. Each student's feedback enters the SFS database anonymously and is aggregated with that of other students enrolled in the course. UT Arlington's effort to solicit, gather, tabulate, and publish student feedback is required by state law; students are strongly urged to participate. For more information, visit http://www.uta.edu/sfs.

Final Review Week: A period of five class days prior to the first day of final examinations in the long sessions shall be designated as Final Review Week. During this week, classes are held as scheduled, and instructors may introduce new concepts as appropriate. The purpose of this week is to allow students sufficient time to prepare for final examinations. During this week, there shall be no scheduled activities such as required field trips or performances; instructors may give assignments that have a completion date during or following this week *only if specified in the class syllabus*. During Final Review Week, an instructor shall not give any examinations constituting 10%

or more of the final grade, except make-up tests and laboratory examinations. In addition, no instructor shall give any portion of the final examination during Final Review Week.

Student Disruption: The University reserves the right to impose disciplinary action for an infraction of University policies. This includes engagement in conduct, alone or with others, that obstructs, disrupts, or interferes with any function of class activities.

Emergency Exit Procedures: Should we experience an emergency event that requires us to vacate the building, students should exit the room and move toward the nearest exit, which is located at the northeast corner of Pickard Hall; exit the classroom and turn right. When exiting the building during an emergency, one should never take an elevator but should use the stairwells. Faculty members and instructional staff will assist students in selecting the safest route for evacuation and will make arrangements to assist handicapped individuals.