MATH 302/600 Intro. to Mathematical Analysis II
Section 01 Spring 2017

- Instructor: Dr. Jinglai Shen

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- Lectures: Tue and Thu, 4:00–5:15 pm, at MP 101

- Office hours: Tue and Thu, 3:00–4:00 pm or by appointment

- Course web-page: http://www.math.umbc.edu/~shenj

- Prerequisites: Math 251 and Math 301

- Textbook: *Elementary Classical Analysis* by J.E. Marsden and M.J. Hoffman, 2nd Edition, W.H. Freeman, Inc., 1993.

- Other references:

    - *Principles of Mathematical Analysis* by W. Rudin, 3rd Edition, McGraw Hill, Inc., 1976. (Recommended for Math 600)
    - *Introduction to Real Analysis* by R.B. Bartle and D.S. Sherbert, 4th Edition, John Wiley & Sons, Inc., 2011.

- Important dates:

    - No class on March 20-24 (spring break)
    - Last class: May 16 (Tue)
    - Final exam: May 23 (Tue)

Course Description and Objectives   This course, which is a continuation of Math 301 (*Introduction to Mathematical Analysis I*), is concerned with the Euclidean space, metric spaces, the spaces of continuous functions, and their fundamental analytic and topological properties, such as completeness, compactness, connectedness, and continuity. The course focuses on rigorous, logically sound reasoning (known as proofs) for solving problems. The proof skills and mathematical knowledge developed in this class will prepare you for advanced mathematical courses and will benefit you in various areas of pure and applied mathematics, such as topology, geometry, differential equations, scientific computing, and optimization.

Topics   We will cover most of Chapters 1–5 and 7 of the textbook (Marsden & Hoffman). Specific topics are:

- Euclidean Space and Metrics (Chapter 1)

  ○ Euclidean space (§1.6)
  ○ Norms, inner products, and metrics (§1.7)

- Topology of Euclidean Space (Chapter 2)

  ○ Open/closed sets and interior (§2.1 − 2.3)
  ○ Accumulation points, closure and boundary (§2.4 − 2.6)
  ○ Sequences and completeness (§2.7 − 2.8)

- Compact and Connected Sets (Chapter 3)

  ○ Compactness and Heine-Borel Theorem (§3.1 − 3.2)
  ○ Connectedness and path-connectedness (§3.4 − 3.5)

- Continuous Mappings (Chapter 4)

  ○ Continuity and implications (§4.1 − 4.2)
  ○ Operations on continuous mappings (§4.3)
  ○ Continuous mappings on compact sets (§4.4 − 4.5)
  ○ Uniform continuity (§4.6)

- Uniform Convergence (Chapter 5, and Chapter 8 of Bartle & Sherbert)

  ○ Pointwise and uniform convergence, M-test (§5.1 − 5.2)
  ○ Integration and differentiation of series (§5.3)
  ○ The space of continuous functions, Arzela-Ascoli Theorem (§5.5 − 5.6)
  ○ Contraction mapping principle (§5.7)

- Inverse and Implicit Function Theorems (Chapter 7)

Please note that these topics are subject to change, depending on class progress.

Homework Weekly homework will be assigned. Homework is usually collected in class on Tuesdays unless a due date change is announced. *No late homework will be accepted.* Present your answers neatly and show all your work; answers without supporting work may not receive full credit. Staple your homework if it has multiple pages.

Exams There will be two (2) in-class mid-term exams and one (1) final exam. An exam date will be announced at least one week before an exam is held. A mid-term exam mainly focuses on topics covered in the month before the exam, but the final exam will be comprehensive. Please be aware that

- there will be *no* optional final exam, and all the exams are closed-book;

- calculators and other computing devices are *not* allowed for any exam.

Grading Policy The grading scheme is as follows:

- homework: 24%

- mid-term exams: 50% (25% for each)

- final exam: 26% (the final is comprehensive)

The letter grade will be computed based upon the numerical grade:

$$A : \geq 90; \quad B : 89 - 80; \quad C : 79 - 65; \quad D : 64 - 50; \quad F :< 50$$

Academic Integrity

- The UMBC Academic Integrity Statement:

  "By enrolling in this course, each student assumes the responsibilities of an active participant in UMBC's scholarly community in which everyone's academic work and behavior are held to the highest standards of honesty. Cheating, fabrication, plagiarism, and helping others to commit these acts are all forms of academic dishonesty, and they are wrong. Academic misconduct could result in disciplinary action that may include, but is not limited to, suspension or dismissal."

- All work in a homework or an exam must be your own; collaborating on an exam is *not* permitted. Discussions with other students on homework problems are allowed, but you should present your own work in the final turn-in; simply copying other people's work or solution manual is violation of UMBC's academic integrity code.

- If you wish to contest a graded exam, you must make an appeal within *one week* of the return date to the class. All appeals should be made in writing to the instructor with a signed and dated note on the exam. An end of the semester appeal for an earlier exam will be ignored.

- Makeup tests: if you must miss an exam due to a prior obligation, you must speak to the instructor *in advance* of the exam. If you must miss an exam due to an unforseen but valid reason (e.g., illness), you must submit a written excuse. Failing to do so may result in loss of substantial points in your makeup.

Some Suggestions

- Math 302 is a *challenging* class, and it demands a great deal of time and effort. You are expected to spend 3-4 hours per week going over class materials and another 3-4 hours (or even more, particularly if you are registered in Math 600) working on homework problems.

- Problem solving is critical to learning analysis. Simply reading definitions, theorems, and examples is far from enough for you to grasp problem solving skills. One must try to work problems out by his/her own effort.

- Be critical about your results; make sure that each step in your argument is well justified by given conditions or definitions. Always ask more why's.

- If you have already done your best but sill have questions about materials, either see the instructor or get helps from other sources immediately. If you are left behind at a certain point, it may take you much more time and effort to catch up.