BIOS Boot Camp: Real Analysis

Summer 2018

- **Course Description:** The analysis review will prepare you for the first year doctoral-level courses. This course will cover some very basics of classical real analysis, including sequences and series, functions and elemental measure theory.

- **Class Time:** 12:30 pm – 2:30 pm, M-F from August 1 through August 13. Room: MC 2301
  
  **Final Exam:** 10:30 am – 11:15 am, August 14. Room: MC 2301

- **Instructor:** Yue Wang (taryue@live.unc.edu)

- **Grader:** Phoebe Jiang (xiaotong@live.unc.edu)

- **Office Hours:** 2:30 pm – 4:30 pm, M-F from August 1 through August 13. Room: MC 2303

- **Textbooks:**

- **Grading System:** There are 4 sets of homework and a final exam for this course. Final grade is based on performance on 4 homeworks and the final exam. The distribution is respectively 15%, 15%, 15%, 15% and 40%. Homework will be due at the beginning of class on August 3, August 6, August 9 and August 13. The final exam will be on August 14 from 10:30 am – 11:15 am in Room MC 2301.

- **Main Topics:**

  1. Basic topology: open, closed and bounded set, compactness, metric space

  2. Sequences, series and convergence: Cauchy sequence, bounded sequence, monotone sequence, power series, limsup and liminf, definition of Big O and little o.

  3. Functions: continuity, uniform continuity, differentiability, Taylor expansion, convex function, sequences of functions.
4. Introduction to measure theory: Finite, countable and uncountable; definition and properties of measure; Lebesgue measure; measurable sets and measurable functions;

5. Integration: Riemann integral, Newton-Leibniz formula, integration by parts; Lebesgue integral: Fatou lemma, Fubini theorem

6. Distribution theory, complex numbers, Fourier Transformation (If time allows)

- **Other Information:** Working in groups for homeworks is encouraged but plagiarism (copying) is strictly prohibited. It is recommended that, if you wish to work in groups, you first try the problems on your own before discussing them with the group. Due to time limit, only selected topics of the two textbooks will be covered in this course. You are encouraged to read the chapters that are not covered in class. Feel free to stop by during the office hours if you have questions, comments, ideas or suggestions.