

Syllabus for Introduction to Quantitative Methods (Math Camp)

Class Time: Tuesday 4:30-6:20pm, at Social Sciences 102 (社科 102 教室)

Intensive Before Semester: 8/12(M), 8/16(F), 8/19(M), 8/22(Th), 8/26(M), 8/30(F)
9:10am-12:10pm at the same room, except 8/22 at Social Sciences 101 (社科 101 教室)

Instructor: Joseph Tao-yi Wang ([josephw "at" ntu.edu.tw](mailto:josephw@ntu.edu.tw)) Office: Social Sciences 754

TA: Wei-Fu Tseng (曾曄富; [b10201033 "at" ntu.edu.tw](mailto:b10201033@ntu.edu.tw))

Office Hours: Tuesday 4:30-6:20pm in class or by email appointment

Class Website: http://homepage.ntu.edu.tw/~josephw/mathcamp_24F.htm

This is a flipped online course to help you go through (undergraduate) real analysis, focusing on the first few chapters of Rudin's *Principles of Mathematical Analysis*. The purpose is to introduce economics students to point-set topology which forms the foundation of Advanced Calculus, so they can study abstract mathematics required for graduate studies in economics. In this class, students are expected to:

1. **Watch Lecture Videos Online:** Such as [高等微積分@NTU OCW](#) or Francis Su at Harvey Mudd College: <http://analysisyawp.blogspot.com/2013/01/lectures.html>
2. **Participate In-Class:** Come and ask questions in office hours before taking weekly quizzes of 50 minutes each, and discuss answer/preview new lectures afterwards.

Textbook and Other Recommended Reading:

1. Rudin, *Principles of Mathematical Analysis*, 3rd ed., McGraw Hill. (Textbook)
2. Tao, [Analysis I: Third Edition](#), Springer. ([e-book](#) available through NTU library)
3. Protter and Morrey, *A First Course in Real Analysis*, 2nd ed., Springer.
4. [Interactive Real Analysis](#) (<https://mathcs.org/analysis/reals/index.html>)

Grading: Final Exam (10/21, 52%) and Weekly Quizzes (8% each for 6 highest). If a quiz is taken online, it counts for only 2%; the remaining 6% will be replaced by the final exam. So, if all quizzes are taken online, the final exam will count as 88%.

Course Outline:

1. [8/12] Lecture 1-2: Constructing the Rational Numbers; Properties of \mathbb{Q}
2. [8/16] Lecture 3-4: Construction of \mathbb{R} ; The Least Upper Bound Property
3. [8/19] Lecture 5-6: Complex Numbers; The Principle of Induction
4. [8/22] Lecture 7-8: Countable/uncountable Set; Cantor Diagonalization, Metric Space
5. [8/26] Lecture 9-10: Limit Points; Relationship between Open and Closed Sets
6. [8/30] Final Exam 1 (You pass the course if you pass this exam!)
7. [9/ 3] Lecture 11-12: Compact Sets; Relationship between Compact, Closed Sets
8. [9/10] Lecture 13-14: Compactness, Heine-Borel Theorem; Connected Sets, Cantor Sets
9. [9/24] Lecture 15-16: Convergence of Sequences; Subsequences, Cauchy Sequences
10. [10/1] Review Session (Answer questions, solve quiz and preview next lecture)
11. [10/8] Lecture 17-18: Complete Spaces; Brouwer Fixed-Point Theorem
12. [10/15] Review Session (Answer questions, solve quiz and preview next lecture)
13. [10/22] Final Exam 2