

ECO2010 H1F

Mathematics and Statistics for PhD Students

Department of Economics, University of Toronto

Summer 2022

Course Dates: August 16 – September 2
Instructor: Prof. Martin Burda
Office: Economics Department, room 234
Contact: martin.burda@utoronto.ca; phone 416-978-4479

TA: Xiaoya Gao
Contact: xya.gao@mail.utoronto.ca

Course Description

The course provides an intensive introduction to rigorous mathematical and statistical analysis at the graduate level. All incoming PhD students are required to take the course.

Course Materials

Course materials consist of lecture notes that will be posted on [Quercus](#).

Evaluation

At the end of the course students will obtain either the grade "CR" (i.e. Credit) or "NCR" (i.e. No Credit). The grade does not affect GPA at U of T in any way. However, obtaining CR is a requirement for completing the Economics PhD program. The grade is based on the following:

Task	Date
Term Test 1	Friday, August 26, 2022
Term Test 2	Friday, September 2, 2022

Credit for the course is earned by scoring at least 50% on Term Test 1, and at least 50% on Term Test 2. In exceptional circumstances the instructor may require a written assignment that will enter the final grade. There are no make-up tests or any additional tests after Term Test 2. No percentage or numerical grade will be given.

Tentative Timetable

Day	Date	Reading from Lecture Notes	Problem Sets discussed
Tuesday	Aug 16	1. Methods of Proofs 2. Set Theory	
Wednesday	Aug 17	3. Metric Spaces 4. Analysis in Metric Spaces	PS 1
Thursday	Aug 18	5. Vector Spaces 6. Linear Algebra in Vector Spaces	PS 2
Friday	Aug 19	7. Correspondences 8. Continuity	PS 3
Monday	Aug 22	9. Constrained Optimization 10. Dynamic Optimization 11. Dynamic Programming	PS 4
Tuesday	Aug 23	12. DP Application - Optimal Economic Growth 13. DP Application - Labor Supply 14. Dynamic Optimization in Continuous Time	PS 5
Wednesday	Aug 24	15. Introduction to Probability 16. Measure-Theoretic Probability 17. Random Variables and Distributions	PS6
Thursday	Aug 25	18. Statistical Properties of Estimators 19. Stochastic Orders and Delta Method	PS7
Friday	Aug 26	<i>Term Test 1</i> (topics 1-14)	
Monday	Aug 29	20. Regression with Matrix Algebra 21. Maximum Likelihood 22. GMM	PS 8
Tuesday	Aug 30	23. Testing of Nonlinear Hypotheses 24. Bootstrap Approximation	PS 9
Wednesday	Aug 31	25. Elements of Bayesian Analysis 26. MCMC	Q&A
Thursday	Sep 1	27. Neural Networks and Machine Learning	Q&A
Friday	Sep 2	<i>Term Test 2</i> (topics 15-26)	