ECO2010 H1F

Mathematics and Statistics for PhD Students
Department of Economics, University of Toronto

Summer 2024

Course Dates: August 13 – 30
Instructor: Prof. Martin Burda
Office: Economics Department, room 234
Contact: martin.burda@utoronto.ca
TA: Alimohammad Faraji
Contact: alim.faraji@mail.utoronto.ca

Lectures: 10 am – 12 pm
Discussion: 1 pm – 2 pm
Tutorial: 2 pm – 4 pm
Location: WO 35

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 23, 2024, 10:10 am – 12 pm (in regular classroom)
Term Test 2	Friday, August 30, 2024, 10:10 am – 12 pm (in regular classroom)

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 13	1. Methods of Proofs 2. Set Theory	
Wednesday	Aug 14	3. Topological and Metric Spaces 4. Analysis in Metric Spaces	PS 1
Thursday	Aug 15	5. Vector Spaces 6. Linear Algebra in Vector Spaces	PS 2
Friday	Aug 16	7. Correspondences 8. Analysis with Correspondences	PS 3
Monday	Aug 19	9. Constrained Optimization 10. Dynamic Optimization	PS 4
Tuesday	Aug 20	11. Dynamic Programming 12. Dynamic Programming Application 13. Dynamic Optimization in Continuous Time	PS 5
Wednesday	Aug 21	14. Introduction to Probability 15. Measure-Theoretic Probability 16. Random Variables and Distributions	PS6
Thursday	Aug 22	17. Statistical Properties of Estimators 18. Stochastic Orders and Delta Method	PS7
Friday	Aug 23	*Term Test 1* (topics 1-13)	
Monday	Aug 26	19. Regression with Matrix Algebra 20. Maximum Likelihood 21. GMM	PS 8
Tuesday	Aug 27	22. Bayesian Analysis 23. MCMC	PS 9
Wednesday	Aug 28	24. Hypothesis Testing and Model Selection 25. Bootstrap Approximation	PS 10
Thursday	Aug 29	26. Machine Learning and Neural Networks	
Friday	Aug 30	*Term Test 2* (topics 14-25)	