

Ming Li
Department of Economics
Concordia University

Econ 525/425: Mathematics for Economists
<http://alcor.concordia.ca/~mingli/teaching/econ525.htm>

Course Information

This course is aimed at giving students the necessary mathematical training for graduate course work in economics. Students are assumed to have learned at least one year of calculus and one semester of linear algebra.

1. Contact: **Ming Li**
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Office Hours: M 11:00-12:00, W 15:00-16:00, and by appointment.
2. Tutorial section: starts in Week 3.
3. Homework: there will be a total of 6 assignments.
4. Midterm: February 15.
5. Final: TBA.
6. Evaluation: homework: 20% (based on best 5 of 6 assignments), midterm: 35%, final: 45%.

References

Here are the main references:

1. Sundaram, R., "A First Course in Optimization Theory," Cambridge University Press, Cambridge, 1996.
2. Hogg R., McKean J., and A. Craig, "Introduction to Mathematical Statistics," Prentice Hall, 2004 (HMC hereafter).
3. Rudin, W., "Principles of Mathematical Analysis," McGraw-Hill, New York, 1976.

The course consists of three parts: mathematical preliminaries, optimization, and probability theory. We will use various chapters of Sundaram's book for the mathematical preliminaries and optimization parts. Rudin is a classic reference on introduction to analysis mainly useful for the mathematical preliminaries part. We will also use Chapters 1 and 2 of HMC for the probability theory part of the course. You are expected to read the relevant course materials and do all the assigned homework, in order to be successful in the course. You are encouraged to work in groups on the assignments, but are required to submit your own answers.

The following is a tentative outline of the course. Materials may be added or deleted due to time considerations. Although it is divided into three seemingly independent parts, do keep in mind that the second and third parts make heavy use of materials of the first part. The materials with an asterisk are relatively advanced and so may be skipped when we get there. There is a tutorial section, where the tutor will go through exercises with you. It is a vital supplement to the course, so you are strongly encouraged to attend it.

PART I Mathematical Preliminaries (about 6.5 weeks)**1. Elements of Set Theory and Logic (Sundaram Appendix, Rudin Chs. 1 and 2)**

Sets, relations, functions, countable and uncountable sets, the real numbers;

2. Properties of \mathbb{R}^n (Sundaram Ch. 1.1-1.2, Rudin Chs. 2 and 3)

Sequences, ^{*}limit points, limits, open and closed sets, compactness, convex sets;

3. Functions (Sundaram Ch. 1.4, Rudin Chs. 4 and 5)

Continuity, continuity and compactness, differentiation, partial derivatives, first order conditions;

4. Selected Important Results from Analysis (Sundaram Ch 1.6, Rudin Chs. 4 and 5)

Intermediate and mean value theorems, inverse and implicit functions theorems, ^{*}Taylor's theorem;

5. Matrices and Quadratic Forms (Sundaram Chs. 1.3 and 1.5)

Matrix calculations, rank, determinant, inverse, semi-definiteness and definiteness, eigenvalues and eigenvectors;

PART II Optimization Theory (about 4 weeks)**6. Unconstrained Optimization in \mathbb{R}^n (Sundaram Chs. 3 and 4, Rudin Chs. 4 and 5)**

The Weierstrass theorem, first- and second-order conditions;

7. Constrained Optimization in \mathbb{R}^n (Sundaram Chs. 5-8)

Local constrained optimization, Lagrange method, the Kuhn-Tucker theorem;

PART III Probability Theory (about 2.5 weeks)**8. Elementary Probability Theory (HMC Ch. 1)**

Probability set function, conditional probability and independence, Bayes' Rule, random variables, probability distribution, expectation, important inequalities;

9. ^{*}Multivariate Distributions (HMC Ch. 2)

Distribution of two variables, conditional distributions and expectations, independence, correlation coefficient.

Disclaimer: In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in this course is subject to change. Undergraduate students please note there are no supplemental privileges for this course, as per departmental policy.

LIST OF SERVICES

- * Department's Academic Advisors for Undergraduate Students:
<http://artsandscience1.concordia.ca/economics/undergraduate/advising/schedule/>
- * Concordia Counselling and Development offers career services, psychological services, student learning services, etc.
<http://cdev.concordia.ca/>
- * The Concordia Library Citation and Style Guides:
<http://library.concordia.ca/help/howto/citations.html>
- * Advocacy and Support Services
<http://supportservices.concordia.ca/>
- * Student Transition Centre
<http://stc.concordia.ca/>
- * New Student Program
<http://newstudent.concordia.ca/>
- * Access Centre for Students with Disabilities
<http://supportservices.concordia.ca/disabilities/>
- * Student Success Centre
<http://studentsuccess.concordia.ca/>
- * The Academic Integrity Website
<http://provost.concordia.ca/academicintegrity/>
- Financial Aid & Awards
<http://web2.concordia.ca/financialaid/>
- * Health Services
<http://www-health.concordia.ca/>