

School of Mathematics

Course 381 — Mathematical Economics
(J.S./S.S. Mathematics, J.S./S.S. TSM)

2000–01

Lecturer: Dr C Gurdgiev

Requirements/prerequisites: 211 is an essential prerequisite, 221 and 251 are strongly recommended and 212 would be useful, but not essential.

This course and 412 (Measure theory and probability) are complementary and students with an interest in finance should take both, in any order.

Duration: Michaelmas, Hilary

Number of lectures per week: 2lectures + 1 tutorial per week.

Assessment: Problem sets will be distributed throughout the course and students are expected to attempt them in advance of the tutorials in which they are discussed. Collaboration on the more difficult problems is encouraged. The course mark will be based on the midterm examination (15Examinations will be based to a significant extent on the problem sets.

End-of-year Examination: 3-hour end of year exam.

Description: Mathematics course 381 is a course in mathematical economics (including a substantial component on mathematical finance) taught by Dr. C Gurdgiev (Economics Department). It is a compulsory mathematics course for Junior Sophister TSM students in mathematics and economics and may also be chosen by the following:

- Sophister students in single honor mathematics
- Senior Sophister TSM students in mathematics whose other subject is not economics

Objective The objective of this course is to introduce students of mathematics to a few of the countless applications of pure mathematics in modern economics. Much of the mathematics will be familiar, and the emphasis will be on applying it in economics.

Course outline

Following a brief introduction to economics, the remainder of the course will be broken down into the following topics:

1. Topology And Applied Legal Analysis
2. Convexity and Optimisation:
 - (a) Unconstrained optimisation
 - (b) Equality constrained optimisation: The Lagrange Multiplier Theorems
 - (c) Inequality constrained optimisation: The Kuhn-Tucker Theorems, Fixed point Theorems
 - (d) Quadratic programming
 - (e) Duality

3. Choice Under Certainty And Uncertainty:

- (a) Axioms
- (b) Marshallian and Hicksian demand
- (c) Indirect utility and expenditure
- (d) General equilibrium theory
- (e) Review of basic probability
- (f) The expected utility paradigm
- (g) Jensen's inequality and Siegel's paradox
- (h) Risk aversion

All of the above topics will not necessarily be covered in every year.

Bibliography

Assigned (main) text:

1. Debreu, Gerard "Theory of value" (1959)
2. Useful reference materials include:
3. Kzeps, David M. "A course in Microeconomics Theory"
4. Varian, Hal R. "Microeconomic Analysis"
5. Rudin, Walter "Principles of Mathematical Analysis"
6. Hoel, P.G, Port, S.C. and Stone C.J. "Introduction to stochastic Processes"
7. Dwett, Richard "Probability: Theory And Examples"

October 9, 2001