<table>
<thead>
<tr>
<th>Semester</th>
<th>FALL 2017</th>
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<tbody>
<tr>
<td>Class code</td>
<td>MATH-UA 9211</td>
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<tr>
<td>Instructor Details</td>
<td>Simon Hubbert</td>
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<tr>
<td>Class Details</td>
<td>Mathematics for Economics I</td>
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<tr>
<td>Prerequisites</td>
<td>Exposure to high-school calculus</td>
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</tbody>
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**Class Description**
The course will provide the student with a clear exposition of the essential mathematical tools and techniques that are frequently used to solve problems arising in economics.

The course will be delivered by traditional “chalk and talk” lectures and supplemented with regular take home assignments.

**Desired Outcomes**
- To be able to use the method of induction to prove mathematical results.
- To master the theory and properties of real valued functions.
- To be able describe an economic problem using mathematical language and then solve using the appropriate mathematical method.
- To be able to use methods from calculus to find the optimal location and value (maximum/minimum) of a mathematical function.

**Assessment Components**
- Assignments 20%
- Midterm 40%
- Final 40%

Failure to submit or fulfil any required course component results in failure of the class.

**Assessment Expectations**

- **Grade A:** Thorough understanding of both theory and its applications.
- **Grade B:** A good understanding of the theory and confidence in its applications.
- **Grade C:** A good understanding of the theory and reasonable competence in its applications.
- **Grade D:** A reasonable understanding of both theory and applications.
Grade F: An inability to master both the theory and its applications to an acceptable level.

**Required Text(s)**
There is no single text for the course the lecture notes are designed to be self-contained.

**Supplemental Text(s) (not required to purchase as copies are in NYU-L Library)**
Lectures will be self-contained however the following text books are excellent:

- Mathematics for Economists by Carl P. Simon and Lawrence Blume ISBN 978-0393117523 [To explore the subject in greater depth]

**Internet Research Guidelines**
None

**Additional Required Equipment**
Pen, paper and calculator.

**Session 1**
Introductory material:
*Number line, functions and Linear Equations*

No Assignment

**Session 2**
Equation solving:
*Properties of functions, supply and demand, theory of quadratic equations, the domain and range of a mathematical function, economic examples.*

Assignment 1: Due next lecture.

**Session 3**
Mathematical Functions:
*Exponential and logarithmic functions, present and future value of money, linear combinations of function, compositions, the inverse function. Economics examples*

Assignment 2: Due next lecture.

**Session 4**
Further equilibrium theory and introduction to limits:
*Equilibrium under tax constraints, continuity of functions, limiting values of functions, practical examples of computing limits.*

Assignment 3: Due next lecture.
Session 5
Differentiation:
Intermediate value theorem, definition of a derivative, geometric interpretation of derivative (as tangent line to a curve), computing derivatives from first principles, locating a stationary point of a function, economic applications.

Assignment 4: Due next lecture.

Session 6
Differentiation continued:
Rules of differentiability, implicit differentiation, L’hopitals rule for computing limits, linear approximations, the concept of elasticity with economic examples.

No assignment.

Session 7
Revision Lecture/ Exam practice
No assignment

Session 8
Mid-term test: Two hour test covering the topics in session 1-6.

Session 9
Optimization:
Further examples of calculating derivatives, using derivatives to distinguish the type of stationary point, max, min or inflection, practical examples.

Assignment 5: Due next lecture.

Session 10
Functions of several variable:
Further examples of optimization. Properties of functions of several variables, visualization in two-dimensional context using contour diagrams, notion of the partial derivatives, the small increments formula and applications

Assignment 6: Due next lecture.

Session 11
Functions of several variables continued:
Mixed derivatives, stationary points of a function of several variables, classification of stationary points (max, min or saddle point), economic examples.

Assignment 6: Due next lecture.
Session 12

Multivariable optimization:
A recipe for finding the extreme points of a function of two variables, solution of constrained problems using the substitution method.

Assignment 7: Due next lecture.

Session 13

A retrospective of the entire course: Revision of key themes and exam practice.

Session 14

Final exam. Two hour test covering all topics in the course

Session 15

Classroom Etiquette

Mobile phones switched off.

Required Co-curricular Activities

Estimated Travel Costs

Suggested Co-curricular Activities