Central European University

Department of Economics

1. **Name of the course:** Quantitative Methods: Mathematics. Pre-Session for Economic Policy and Global Markets, 2015/2016 Fall

2. **Instructor:** Laszlo Balazsi (Room: Nador 11, 416B)

3. **No. of Credits (no. of ECTS credits):** 0 CEU credits (0 ECTS credits)

4. **Pre-requisites:** High school math is strongly recommended

5. **Course Level:** Master

6. **Start and end dates:** August 24 – September 14.

7. **Course Outline:** The course equips students with the math knowledge allowing them to go through the MA program successfully. Completion of the course is a necessary condition for continuing the program.

8. **Goals of the course:** The course aims to ensure that all the students mastered the mathematical skills sufficient to participate in the program.

9. **Learning outcomes:** Having completed the course, the students will be able to apply knowledge of basic algebra, calculus and optimization to solve economic problems.

10. **Course requirements:** In order to pass the exam, it is expected from students to attend all the lessons, hand in solutions to all 3 problem sets, which will be given to them during the lectures at the end of each week, and score at least 50% of the final exam. Before the lectures start, on the 25th of August, students will take a mandatory assessment test which is designed to reveal gaps in students’ mathematical background which need to be addressed in this course. The assessment test will cover most of the topics outlined below. Students who score at least 90% on the assessment test will receive an unconditional waiver (a pass), so they don’t have to sit the final and submit homeworks. Students scoring between 50-90% will receive a conditional waiver, so they don’t have to sit the final, but have to submit the problem sets. Problem sets are not graded in principle, but failure of submission lowers the final exam grade by 1 point/problem.


12. **Honor Code:** In order to ensure high quality of the education process, we ask our students to familiarize themselves with and agree to the CEU Code of Ethics that can be downloaded from here (special attention should be paid to Annex 4, pp. 17-19, that states forms of academic misconduct strictly prohibited at the university):
The form of the Assessment test and the Final exam requires the student’s signature certifying their informed compliance with the CEU Code of Ethics.

**Detailed Course Outline**

1. Introductory topics
   1.1. Algebra (SH Chapter 1)
      - real line
      - fractions
      - powers
      - rules of algebra
      - intervals
      - absolute values
      - inequalities
   1.2. Equations (SH Chapter 2)
      - solving simple equations
      - equations with parameters
      - quadratic equations
      - linear equations in two unknowns
      - nonlinear equations
   1.3. Sums and a few aspects of logic (SH Chapter 3.1-3.4)

2. Functions
   2.1. Functions of one variable (SH Chapter 4)
      - basic definitions
      - graphs
      - linear functions
      - linear models
      - quadratic functions
      - polynomials
      - power functions
      - exponential functions
      - logarithmic functions
   2.2. Properties of functions (SH Chapter 5.1-5.4)
      - shifting graphs
      - new functions from old
      - inverse functions
      - graphs of equations
3. Differentiation (SH Chapter 6.1-6.4, 6.6-6.11, 7.2, 7.7)
   - slope
   - derivative
   - increasing and decreasing functions
   - rates of change
   - simple rules for differentiation
   - sums, products and quotients
   - table of derivatives
   - chain rule
   - higher-order derivatives
   - economic examples

4. Single-variable optimization (SH Chapter 8)
   - local and global extreme points
   - economic examples
   - extreme value theorem
   - inflection points

5. Integration (SH Chapter 9.1-9.4, 9.7)
   - indefinite integral
   - area and definite integral
   - properties of definite integrals
   - table of integrals
   - economic applications

6. Functions of many variables (SH Chapter 11.1-11.2, 11.7)
   - functions of two variables
   - partial derivatives with two variables
   - implicit differentiation
   - economic applications

7. Constrained optimization (SH Chapter 14.1, 14.3)
   - Lagrange multiplier method