

European University Institute  
Background Course on Mathematics  
Academic Year 2011 -12

Instructor: antonio villanacci, E-mail: antonio.villanacci@unifi.it  
Office Hours: usually after class  
Teaching Assistants: ...  
Teaching Assistant Office Hours: ...

**Prerequisites.**

Students are supposed to be familiar with the topics usually taught in basic course on Calculus and Linear Algebra. Those topics are covered in either of the following sets of books and notes:

1.

Apostol, T. M., (1967), *Calculus, Volume 1*, 2nd edition, John Wiley & Sons, New York, NY: Chapters 1-7 included, 9-10.

Clark, C., (1982), *Elementary Mathematical Analysis*, 2nd edition, Wadsworth Publisher of Canada, Ltd., Belmont, CA. Appendix 1.

Villanacci, A., (2011), Notes for the Background Course on Mathematics, available on line: Chapters 1, 2 and 3; Section 5.1.

2.

Spivak, M., (1980), *Calculus*, 2nd ed., Publish or Perish, Inc., Houston, TX: all but chapters 16, 20, from 23 to 29, included.

Clark, C., (1982), *Elementary Mathematical Analysis*, 2nd edition, Wadsworth Publisher of Canada, Ltd., Belmont, CA. Appendix 1 and Appendix 2.

Villanacci, A., (2011), Notes for the Background Course on Mathematics, Chapters 1, 2 and 3; Section 5.1.

**Content of the course**

Linear algebra. Some topology in metric spaces. Differential calculus in Euclidean spaces. Nonlinear programming.

**Reading material**

Mandatory. Villanacci, A., (2011), Notes for the Background Course on Mathematics, available on line at my webpage: <http://www.dmd.unifi.it/CMpro-v-p-73.html>

Students are supposed to have read and understood the content of Chapters 1, 2 and 3 and Section 5.1, before the beginning of the course.

**Main sources of the Notes.**

I. Linear algebra

Lang S. (1971), *Linear Algebra*, second edition, Addison Wesley, Reading.

Lipschutz, S., (1991), *Linear Algebra*, 2nd edition, McGraw-Hill, New York, NY.

II Some topology in metric spaces.

Lipschutz, S., (1965), *General Topology*, McGraw-Hill, New York, NY.

McLean, R., (1985), Class notes for the course of Mathematical Economics (708), University of Pennsylvania, Philadelphia, PA, mimeo.

Ok. E. A., (2007), *Real Analysis with Economic Applications*, Princeton University Press, Princeton NJ.

Simmons, G. F., (1963), *Introduction to Topology and Modern Analysis*, McGraw-Hill, New York.

### III Differential calculus in Euclidean spaces

Apostol, T. M., (1974), *Mathematical Analysis*, 2nd edition, Addison-Wesley Publishing Company, Reading, MA.

### IV Nonlinear programming.

Cass D., (1991), *Nonlinear Programming for Economists*, University of Pennsylvania, Class Notes.

### Other references

Bartle, R. G., (1964), *The Elements of Real Analysis*, John Wiley & Sons, New York, NY.

de la Fuente, A., (2000), *Mathematical Methods and Models for Economists*, Cambridge University Press, Cambridge, UK.

El-Hodiri, M. A., (1991), *Extrema of smooth functions*, Springer-Verlag, Berlin.

Hildebrand, W., (1974), *Core and equilibria of a large economy*, Princeton University Press, Princeton, NJ.

Lang, S., (1986), *Introduction to Linear Algebra*, 2nd edition, Springer-Verlag, New York, NY.

Mangasarian O. L. (1994), *Nonlinear Programming*, SIAM, Philadelphia.

McLean, R., (1985), Class notes for the course of Mathematical Economics (708), University of Pennsylvania, Philadelphia, PA, mimeo.

Moore, J. C., (1999), *Mathematical Methods for Economic Theory 1*, Springer-Verlag, Berlin.

Moore, J. C., (1999), *Mathematical Methods for Economic Theory 2*, Springer-Verlag, Berlin.

Rudin, W., (1976), *Principles of Mathematical Analysis*, 3rd edition, McGraw-Hill, New York, NY.

Simon C. S. (1986), Scalar and vector maximization: calculus techniques with economic applications, in Reiter S, *Studies in mathematical economics*, The Mathematical Association of America, p. 62-159

Simon, C.P. and L. Blume, (1994), *Mathematics for Economists*, Norton, New York.

Smith, L., (1992), *Linear Algebra*, 2nd edition, Springer-Verlag, New York, NY.

Sydsaeter, K., (1981), *Topics in Mathematical Analysis for Economists*, Academic Press, London, UK.

Taylor, A. E. and W. R. Mann, (1984), *Advanced Calculus*, 3rd ed., John Wiley & Sons, New York, NY.

### Teaching and Review Sessions

The course is organized on 12 lectures and 6 review sessions. Review sessions will be devoted to the discussion and solutions of exercises.

### Exam Requirements

There will be a final exam, weighted 80 per cent of the final grade, and 4 homework assignments, weighted 20 per cent.