

SCUOLA DI ECONOMIA E MANAGEMENT – UNIVERSITA' DI FIRENZE
MASTER OF SCIENCE IN ECONOMICS AND DEVELOPMENT
SYLLABUS FOR THE ADMISSION INTERVIEW
(for students who are not directly admitted)
Academic year 2026/27

Curriculum Development Economics

Students interested in the curriculum in Development Economics will be interviewed by professor Mario Biggeri (mario.biggeri@unifi.it) on the content of the the first 10 chapters of the book Development Economics, by Debraj Ray, Princeton University Press (1998). The interview will consist of open-ended questions and will assess the ability to interpret development economic phenomena.

Curriculum Economics

Students interested in the curriculum in Economics will be interviewed on one of the following subjects, preassigned by the admission committee on the basis of the student's BA study path.

MACROECONOMICS

Introduction to Macroeconomics and National Accounting. The Goods Market. Aggregate Demand and the Income-Expenditure Model. Investment and Interest Rates. Demand and Supply of Money. The IS-LM Model. Fiscal Policy and Monetary Policy. The AD-AS Model. The AD-AS Model: The Neoclassical Case The AD-AS / PS-WS Model. The Phillips Curve and the IS-MP-PC Model. Balance of Payments and the Foreign Exchange Market. Open Economy: The Mundell-Fleming Model.

Suggested Textbook

Rudiger Dornbusch, Stanley Fischer, Richard Startz. *Macroeconomics* 13th Edition, McGraw-Hill Education.

MICROECONOMICS

Consumption: budget constraint, preferences, utility, demand functions. Production: technology, cost curves, profit maximization, firm supply. Competitive market equilibrium, monopoly, oligopoly, game theory. Pareto efficiency, externalities, public goods.

Suggested Textbooks

Besanko D., Braeutigam R., *Microeconomics*, 6th ed, Wiley, 2020

Chapters: 1-14, 17

Varian H.L.- Melitz M., *Intermediate Microeconomics*, 10th ed., Norton, 2024.

Chapters: 1,2,3,4,5,6,14,15,16,19,20,21,22,23,24,25,27,28,29,35,36.

Bernheim D., Whinston M., *Microeconomics*, McGraw Hill, 2008.

Chapters: 2,4,5,6,7,8,9,12,14,16,17,18,19,20.

Besanko D. Brautigam R, *Microeconomia*, V edizione, McGrawHill, 2024

Capitoli: 1-14, 17

Bernheim D., Whinston M., *Microeconomia*, II edizione, McGraw Hill, 2013.

Capitoli: 2,3,4,5,6,7,8,11,13,15,16,17,18,19.

MATHEMATICS

Set theory: inclusion, intersection, union, complement, and the empty set. Real numbers. Operations and ordering. Geometric representation of real numbers. Absolute value. Intervals, upper and lower bounds of a

set, maximum and minimum of a set, sets bounded above and below, supremum and infimum, completeness. Neighborhood of a point, interior points, accumulation points, open sets, closed sets.

The concept of a function. Real-valued functions of a real variable. Domain and graph of a function. Set of definition. Image (range) of a function. Injective functions and inverse functions. Sum, product, quotient, and composition of functions. Restrictions of functions. Monotone functions, strict monotonicity, and invertibility. Functions bounded above and below, supremum and infimum of a function, maximum and minimum points of a function, maximum value and minimum value of a function. Elementary functions: exponential function, logarithmic function, power functions, absolute value function.

Piecewise-defined functions. Limit of a function at a point. Uniqueness theorem for limits. Sign preservation theorem. Right-hand limit and left-hand limit. Theorem on the limit of the sum of functions. Theorem on the limit of the product of functions. Theorem on the limit of the quotient of functions. Theorems on the limit of the composition of functions (change of variables). Infinite limits and limits at infinity. Horizontal and vertical asymptotes. Limits of elementary functions. Indeterminate forms and notable limits.

Definition of continuity of a function. Continuity of elementary functions. Theorem on the continuity of the sum of functions. Theorem on the continuity of the product of functions. Theorem on the continuity of the quotient of functions. Theorem on the continuity of the composition of functions. Zero theorem. Intermediate value theorem. Weierstrass theorem.

Definition of differentiability of a function. Derivative of a function. Tangent line to the graph of a function. Theorem on the relationship between differentiability and continuity. Theorem on the derivative of the sum of functions. Theorem on the derivative of the product of functions. Theorem on the derivative of the quotient of functions. Theorem on the derivative of

the composition of functions. Local maximum and local minimum points of a function. Stationary points. Relationship between local maxima/minima and stationary points (Fermat's theorem). Method for determining the maximum/minimum points of a function defined and continuous on a closed and bounded interval and differentiable in its interior. Rolle's theorem. Lagrange's theorem. Theorem on the relationship between the sign of the first derivative and the monotonicity of a function. de l'Hôpital's theorems.

Second derivative. Concave and convex functions. Theorem on the relationship between convexity/concavity of a function and the sign of the second derivative. Study of the graph of a function.

Integrable functions on an interval and the integral of a function. Theorem on the integrability of continuous and bounded functions. Theorem on the integrability of monotone and bounded functions. Fundamental theorem of integral calculus. Antiderivatives and indefinite integrals. Applications of integral calculus to the computation of areas.

Suggested textbooks:

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

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

The student will be required to pass an oral examination on some of the topics listed above.

STATISTICS

1) Random Variable (r.v.): definition; examples; domain (support) of a r.v.; discrete and continuous r.v.'s. Discrete r.v.: distribution of a discrete r.v. via probability mass function (p.m.f.); properties; examples. 2) Discrete r.v. The distribution of a discrete r.v. via cumulative distribution function (c.d.f.). Properties of the c.d.f. Examples. Expectations of discrete r.v.'s: mean, variance, standard deviation (s.d.). 3) Discrete r.v. The mean and the variance of some transformations of a r.v. X : mean and variance of a constant (c), of the demeaned r.v. ($X - \mu$), of the standardized r.v. $(X - \mu)/\sigma$, of a linear transformation ($a + bX$). Continuous r.v. Motivations: why the p.m.f. does not make sense while the c.d.f. can still play a role. Using the c.d.f. to compute probabilities. 4) Continuous r.v. Definition, interpretation and properties of the p.d.f. Link between c.d.f. and p.d.f. of the same r.v. Expectations of continuous r.v.'s, with a specific emphasis on the mean and on the variance. 5) Multiple r.v.: definition; examples; domain of a multiple r.v.; discrete, continuous and mixed multiple r.v.'s. Multiple discrete r.v.: definition of the joint p.m.f.; relationships with the marginal p.m.f. and the conditional p.m.f.; properties. 6) Multiple discrete r.v. Expectations involving multiple discrete r.v.'s: mean, variance and standard deviation of the marginal components; covariance and correlations between

couples of random variables and their interpretation. Multiple continuous r.v. Definition of the joint p.d.f. 7) Multiple continuous r.v. Properties of the joint p.d.f. Joint, marginal and conditional p.d.f.'s. Expectations involving multiple continuous r.v.'s: mean, variance and standard deviation of the marginal components; covariance and correlations between couples of random variables. Multiple r.v. Independence of r.v.'s; independence versus absence of correlation. Examples. 8) Multiple r.v. Properties of covariance and correlation coefficient. Mean and variance of a portfolio (linear combination) of random variables and some useful special cases. Special r.v.'s. Summary of the points touched in handling special r.v.'s: definition (in terms of p.m.f. or p.d.f.); main expectations (mean and variance); properties; some practical examples (when possible).

Suggested textbooks

Hogg, R. V., Tanis E. A., Zimmerman D. L., PROBABILITY AND STATISTICAL INFERENCE, Pearson, >= 9th edition or Mittelhammer, R. C. Mathematical Statistics for Economics and Business. Springer, >= 2nd edition (Chapters, 1 (all), 2.1, 2.2, 2.3, 3.1, 4,.1, 4.2, 4.3, 4.4).