Core Syllabus

ECON 216: MATHEMATICS FOR ECONOMISTS I

Prerequisites

Math 100 is a recommended prerequisite for students with no sufficient background in mathematics.

Catalogue Description

Calculus of a single variable. Composite functions, limits and asymptotes, continuity, differentiation, Taylor’s theorem, maxima and minima and points of inflection, logarithmic and exponential functions, integration. Applications to economic theory and business finance.

Course Learning Outcomes

After completion of this course, the student should be able to:

- Acquire calculus tools and solve single-variable optimization problems and basic integrals.
- Mathematically formulate and competently use mathematical tools to solve basic economic and business applications.
- Relate the quantitative skills and analytical thinking to concrete economic cases.

Recommended Text


Required Topics

- Algebra Review
  - Inequalities.
  - Intervals.
  - Laws of exponents.
  - Common terms and quotient simplification.
  - Factoring polynomials and quadratic formula.
  - Systems of equations (two equations with two unknowns, substitution and elimination methods).
Functions

- Definition of a function, independent and dependent variables, domain and range of a function.
- Linear functions: general form of a line, slope of a line, intercept form of a line, relations among lines.
- Non-linear functions: slope of a non-linear function, famous non-linear functions in economics (parabola, hyperbola).
- Economic applications: demand functions, supply functions, total revenue functions, total cost functions (fixed cost and variable cost), average cost functions, derivation of profit function from demand and cost functions, production functions.
- Functional models: market equilibrium, break-even analysis, Cobb-Douglas production function.

Exponential and Logarithmic Functions

- Definition of exponential and logarithmic functions, the base “e” and the base “10”.
- Properties of exponential and logarithmic functions.
- Sketching exponential and logarithmic functions.
- Economic applications: interest (simple, compound, continuously compounded), depreciation, learning curve, per-capita GDP growth.

Single-Variable Calculus: Limits and Continuity

- Limits: definition of left limit, definition of right limit, definition of limit of a function with numerical and graphical illustration, computing limits, limits of quotients of polynomials as variable approaches ± infinity.
- Horizontal and vertical asymptotes with numerical and graphical illustration.
- Economic application: behavior of average cost with production for linear cost functions.
- Continuity: definition of continuity, numerical and graphical illustration.
- Economic application: average poverty line.

Single-Variable Calculus: Differentiation

- First derivative using the limit definition, increasing and decreasing functions.
- Rules of differentiation.
- First derivative: intervals of increase and decrease and critical points.
- Second derivative: concave and convex functions and inflection points.
- High order derivatives and Taylor expansion of a function.
• Implicit differentiation with economic applications to production functions.
• Single-variable optimization: maxima and minima of a function with necessary and sufficient conditions.
• Sketching curves using maxima, minima, inflection points and asymptotes.
• Economic applications: marginal analysis (marginal cost, marginal revenue, marginal profit), profit maximization, cost minimization.

**Integral Calculus**

• Indefinite integration: the indefinite integral as an anti-derivative, basic rules, economic applications (cost, revenue, profit).
• Definite integration: the definite integral as an area under a curve, main properties of definite integration, economic applications (consumer surplus and producer surplus).