4. **The New Classical School**
   a. Three Underlying Hypotheses: Rational expectations; Continuous market clearing; Aggregate supply hypothesis.
   b. Important Policy Conclusions: Policy ineffectiveness proposition; Real costs of disinflation; Dynamic time inconsistency; Credibility and monetary rules; Lucas' critique of econometric policy evaluation.
   c. An Overall Assessment of the New Classical Models
5. **The Real Business Cycle School**
   a. Theoretical and Empirical Weaknesses of the New Classical Models: From monetary to real business cycle theory; Cycles vs. random walks; Supply side shocks; Technological shocks; Intertemporal labor substitution; Real business cycle AD and AS model; Econometric vs. calibration method.
   b. Policy Implications of RBC Theory
6. **The New Keynesian Economics**
   a. Core Propositions
   b. Nominal wage and price rigidity; Real rigidities and their sources; New Keynesian business cycle theory; Hysteresis and Unemployment
   c. Criticisms and assessment
7. **The Economy in the Very Long Run**
   Overview of long-run economic growth, Growth accounting, Solow growth model, Harrd-Domar model.

Basic Text

Branson, W. H. (2006). *Macroeconomic Theory and Policy*. New Delhi: A.I.T.B.S.

Books Recommended

1. Dornbusch, R., Fischer, S., & Startz, R. (2018). *Macroeconomics*. New York: McGraw-Hill Education.
2. Phelps, E. S. (2015). *Seven Schools of Macroeconomic Thought*. Oxford: Oxford University Press.
3. Greenaway, D. (1992).*Current Issues in Macroeconomics*. Basingstoke: MacMillan.
4. Snowdon, B., Vane, H., Wynarczyk, P., & Sesselmeier, W. (January 01, 1995). A Modern Guide to Macroeconomics. *Kyklos; InternationaleZeitschriftFürSozialwissenschaften, 48,* 4, 624.
5. Leslie, D. (1993). *Advanced Macroeconomics: Beyond IS/LM*. London: McGraw-Hill.
6. Heijdra, B. J., & Ploeg, F. V. D. (2009). *The Foundations of Modern Macroeconomics*. Oxford: Oxford University Press.
7. Romer, D. (2012). *Advanced Macroeconomics* (4th ed.). New York: McGraw Hill.

ECON 303: Mathematical Economics — *Credit Hours: 04*

Rationale: Tools learned in mathematical economics help present economic theories in elegant ways. Optimizing behavior of households and firms, both from static and dynamic viewpoints, cannot be understood well without proper knowledge of mathematical economics.

Prerequisite: Mathematics for Economists

Course Objectives: The purpose of this course is to introduce a variety of mathematical concepts used in economic analysis including integration, difference and differential equations, linear and non-linear programming, calculus of variations and set theory.

Intended Learning Outcomes: After successful completion of the course, students will be able to:

1. solve constrained optimization problems faced by both households and firms;
2. apply rules of integration to recover the parent function from a given function;
3. solve dynamic economic problems involving difference and differential equations;

4. find equilibrium time path of variables from difference and differential equations; and
5. present arguments in terms of set theory.

Course Content:

1. **Constrained Optimization:** Free Optimization vs. Constrained Optimization, Lagrangian Method; Constrained Utility Maximization; Constrained Output Maximization and Constrained Cost Minimization.
2. **Review of Matrix Algebra**: Application to Market Model, National Income Model; Leontief's Input-Output Model- Input Coefficient, Output Matrix, Final Demand Vector, Specific Input-Output Matrix Equation, Correct Levels of Output.
3. **Homogeneous Functions**: Definition of Homogeneous Functions; Homothetic functions; Properties of homogeneous functions; Linear vs. linearly homogeneous production functions; Properties of a Linearly Homogeneous Production Function; Euler's theorem; Elasticity of Substitution.
4. **Integration:** Definition; Geometric interpretation; Definite vs. indefinite integral; Use of definite integrals; Computing consumer and producer surplus.
5. **Differential Equation**: Definition of Differential Equation, First Order Linear Differential Equation With Constant Coefficient and Constant Term, With Variable Coefficient and Variable Term, General Solution, Definite Solution, Applications to Market Model.
6. **Difference Equation**: Difference Between Differential and Difference Equation; First Order Difference Equation; General Solution of a Difference Equation, Definite Solution of Difference Equation; Time Path; Cobweb Model; Inventory Model.
7. **Linear Programming and Non-Linear Programming:** Classical vs. Nonclassical Technique of Solving Optimization Problem; Elements of a Linear Programming Problem-Objective Function, Inequality Constraint, Nonnegativity Restrictions, Basic Feasible Solutions, Graphical Method of Solving Optimization Problem, Simplex Method of Solving Optimization Problem; Duality; Nonlinear Programming: Kuhn-Tucker Conditions.
8. **Elementary Notions of Calculus of Variations:** Functional necessary conditions for optimal values; Boundary conditions; Economic applications – Inter-temporal consumption decision, Efficient paths of capital accumulation, Optimum growth and Turnpike Theorem.
9. **Sets:** Elements of a set; The empty set symbolism; Inclusion; Set operations; Set union; Intersection; Complementation; Venn diagrams; Laws of set operations. Properties of relations; Domain and converse domain; Equivalence relations; Ordering relations; Pre-ordering; Weak ordering; Strong ordering; Economic applications: Theory of consumer behavior, Preference and indifference relations, Complete and partial ordering.

Basic Text

Chiang, A. C., & Wainwright, K. (2013). *Fundamental Methods of Mathematical Economics*. Boston: McGraw Hill.

Recommended References

1. Allen, R. G. D. (2009). *Mathematical Analysis for Economists*. Delhi: Macmillan.
2. Dowling, E. T. (2012). *Introduction to Mathematical Economics*. New York: McGraw Hill.
3. Arrow, K. J., & Intriligator, M. D. (eds.) (2010). *Handbook of Mathematical Economics*. Amsterdam: North-Holland.
4. Intriligator, M. D. (2013). *Mathematical optimization and economic theory*. Delhi: PHI Learning Private Limited.
5. Hoy, M., Livernois, J., McKenna, C., Rees, R., & Stengos, T. (2011). *Mathematics for Economics*. Cambridge, Massachusetts; London, England: The MIT Press.