PhD Economics Programs

Program Objectives

The PhD Economics program is designed with a comprehensive set of objectives to ensure the holistic development of its scholars. Firstly, it aims at *Advanced Knowledge Acquisition*, providing students with a deep and thorough understanding of the field of economics, encompassing its theoretical foundations, advanced methodologies, and insights into emerging trends. This foundational knowledge is the basis for the second objective, *Original Research Contribution*, where students are trained to conduct high-quality, independent research that generates new knowledge and insights within the discipline. The program also emphasizes *Scholarly Communication*, equipping students with the skills to effectively disseminate their research findings through well-written publications, presentations at academic conferences, and other scholarly platforms. In addition, it focuses on *Professional and Career Development*, preparing graduates for successful careers across academia, industry, government, and the non-profit sector by fostering professional skills, networking opportunities, and active engagement within scholarly communities. Finally, the program encourages *Interdisciplinary Collaboration*, promoting research that transcends traditional boundaries to address complex, multifaceted global challenges. Collectively, these objectives are designed to develop well-rounded economists capable of making significant contributions to both academia and society.

Admission Eligibility Criteria for PhD Program

- Candidates possessing MPhil/MS degree in Economics, Agricultural Economics, Environmental Economics, Health Economics, Economics and Finance, Econometrics, Development Studies, Business Administration, Demography, Public Policy, Mathematics, Statistics or Computer Science from an HEC recognized university/institution with at least a first division (annual system) or CGPA of 3.00 out of 4.00 (in the semester system or equivalent) shall be eligible to apply for admission.
- Candidates must hold an MPhil/MS degree obtained through research, rather than solely through coursework.
- Applicants will be selected based on their performance in the admission test, interview, academic record, research publications, research proposal, letters of recommendation, and statement of purpose.
- Students without relevant academic backgrounds need to take additional courses (non-credit) to make up for the deficiency.
- The in-service applicants will be required to submit the No Objection Certificate issued by their employers before the beginning of the academic session.

Academic Program of PhD Economics

Total Credit Hours	18
Core courses	9
Elective courses	9
Duration	3 – 6 years
Deficiency Courses Microeconomic Theory-I, Macroeconomic Theory-I, Advanced Mathematics, Econometric Methods-I	
Semester I	**Credit Hr.**
Advanced Microeconomic Theory -I	*P/F
Advanced Macroeconomic Theory -I	P/F
Advanced Mathematics	P/F
Semester II	
Advanced Microeconomic Theory -II	3
Advanced Macroeconomic Theory -II	3
Econometric Methods -I	P/F
Elective -I	3
**Comprehensive Examination in Micro & Macro Theory (two attempts)	
Semester III	
Econometric Methods -II	3
Elective -II & III (courses from the specialization fields offered)	3+3
Semester IV	
Research	
Work-Study Program	

*Pass or Fail (65% / less) basis.

** The comprehensive examination must be taken soon after completion of the required deficiency and core courses of Microeconomic Theory I & II and Macroeconomic Theory I & II in any two of three consecutive scheduled comprehensive examinations.

Complete List of Courses

Code	Title of Course	Credit Hours	Pre-Requisite
Core/Compulsory Courses			
E-600	Advanced Microeconomic Theory-I	3	
E-610	Advanced Macroeconomic Theory-I	3	
E-630	Advanced Mathematics	3	

E-640	Econometric Methods-I	3	
E-601	Advanced Microeconomic Theory-II	3	E-600
E-611	Advanced Macroeconomic Theory-II	3	E-610
E-641	Econometric Methods-II	3	E-640
Elective Courses			
E-700	Topics in Microeconomic Theory	3	
E-702	Topics in Macroeconomic Theory	3	
E-701	Mathematical Economics	3	
E-710	Public Finance	3	
E-711	Public Policy	3	
E-720	Monetary Economics	3	
E-721	Monetary Policy	3	
E-722	Financial Economics	3	
E-723	Topics in Financial Economics	3	
E-724	Financial Analysis	3	
E-725	Financial Risk Management	3	
E-730	International Economics	3	
E-731	International Finance	3	
E-732	Trade Policy	3	
E-740	Human Resource Development-I	3	
E-741	Human Resource Development-II	3	
E-742	Economics of Population	3	
E-745	Agent Based Modeling	3	
E-750	Industrial Economics	3	
E-751	Industrial Policy	3	
E-760	Development Economics	3	
E-761	Development Policy	3	
E-770	Applied Econometrics	3	
E-771	Topics in Advanced Econometrics	3	
E-774	Bayesian Econometrics	3	
E-776	Financial Econometrics	3	
E-777	Data Visualization	3	
E-778	Big Data Analysis	3	
E-780	Agricultural Development	3	
E-781	Agricultural Policy	3	
E-782	Resource Economics	3	
E-783	Applied Production Economics	3	
E-790	Economic Growth And Distribution	3	
E-800	Environmental Economics-I	3	
E-801	Environmental Economics-II	3	
E-803	Regulatory Economics	3	
E-805	Real Estate Economics	3	
E-807	Economics of Climate Change	3	
E-808	Economics of Environment and Natural Resources	3	
E-830	Advanced Mathematical Methods for Economists	3	

E-840	Economics of Governance	3	
E-841	Governance and Public Policy	3	
E-842	Public Policy Analysis	3	
E-843	Institutions and Development	3	
E-850	History of Economic Thought	3	
E-859	Experimental Economics	3	
E-860	Topics in Experimental Economics	3	
E-865	Health Economics	3	
E-866	Topics in Health Economics	3	

Field of Specializations

Sr. No.	Specializations	Course Code
1	Data Analytics	E-777, E-778, E-770, E-771,
2	Climate Change and Resilience	E-807, E-808,
3	Public Policy & Governance	E-840, E-841, E-842,
4	Financial Technology (Fin-Tech)	E-722, E-724, E-725
5	Development Economics	E-740, E-741, E-760, E-761, E-790,
6	Agriculture Economics	E-780, E-781, E-782, E-783,
7	Environmental Economics	E-800, E-801,
8	Industrial Economics	E-750, E-751,
9	International Economics	E-730, E-731, E-732,
10	Labour Economics	E-740, E-741,
11	Monetary Economics	E-720, E721,
12	Public Economics	E-710, E-711,
13	Financial Economics	E-722, E-723, E-776,
14	Health Economics	E-865, E-866,
15	Institutions and Governance	E-803, E-805, E-840, E-843,

CORE/COMPULSARY COURSES:

E-600 ADVANCED MICROECONOMIC THEORY-I

Consumer Theory (Preferences and Utility, Demand Functions, Duality, Slutsky Equation, Revealed Preference Theory); Producer Theory (Production Functions, Cost Minimization and Profit Maximization, Duality in Production, Input Demand Functions); Choice Under Uncertainty (Expected Utility Theory, Risk Aversion Measures, Insurance and Portfolio Choice, Alternative Models); General Equilibrium Theory (Exchange Economies, Existence and Uniqueness, Welfare Theorems, Core and Equilibrium); Market Structures and Game Theory (Perfect Competition, Monopoly and Monopolistic Competition, Oligopoly Models.

E-610 ADVANCED MACROECONOMIC THEORY-I

Classical and Keynesian frameworks, IS-LM model, consumption and investment theories, inflation and unemployment dynamics, monetary and financial markets, macroeconometric

modeling, rational expectations, information asymmetries, real business cycles, sectoral shifts, price rigidities, general disequilibrium, labor contracts, wage stickiness, and monopolistic competition.

E-630 ADVANCED MATHEMATICS

Real analysis (sequences, limits, continuity, differentiability), linear algebra (vector spaces, matrices, eigenvalues, eigenvectors), multivariable calculus (partial derivatives, multiple integrals), classical optimization (Lagrange multipliers, Kuhn-Tucker conditions), nonlinear programming, convex analysis (convex sets, convex functions), integral calculus, differential equations (ordinary and partial), dynamic optimization (Hamiltonian and Bellman equations).

E-640 ECONOMETRIC METHODS-I

Simple and multiple linear regression models, violations of classical assumptions (heteroscedasticity, autocorrelation, multicollinearity), generalized linear models (logit, probit), estimation of simultaneous equation systems (two-stage least squares), and application of instrumental variables for endogeneity correction; Non-linear Equation; Generalized Linear Regression Model and Its Application; Formulation and Estimation of Special Models e.g.; Qualitative Response Models; Simultaneous Equation Systems.

E-601: ADVANCED MICROECONOMIC THEORY- II

Theories of Choice and Production, Markets and Welfare; Equilibrium and Welfare, the efficiency of the competitive outcome; General Equilibrium Theory, the existence of equilibrium and efficiency, equilibrium in production and welfare, contingent plans, uncertainty, Walrasian equilibrium; Game Theory, strategic decision making, strategic form games, extensive form games, adverse selection and market outcomes, moral hazard and the principal-agent problem, Information and market performance; Fundamental Theorems of Welfare Economics, Problems of market failure in the presence of externalities and public goods, and Economics of information.

E-611: ADVANCED MACROECONOMIC THEORY- II

Simple Static Representative Agent Model, General Equilibrium (GE) Model with Microeconomic Foundations, A static model and competitive equilibrium, Pareto optimality and social planner's problem; Dynamic General Equilibrium (DGE) Model, Two-period model: Endowment Economy, Two-period model: production economy, Infinite horizon general equilibrium model; Solutions to Dynamic Models, Sequential Formulation, Recursive Formulation/Bellman's Equation; Dynamic Stochastic General Equilibrium (DSGE) Model, the importance of stochastic dynamics, incorporation of random behavior into the model, solutions of deterministic and stochastic models, Linear rational expectations model, Basics of log-linearization, Real Business Cycle (RBC) Model The baseline Model and its Analytics, Extensions in the baseline RBC models.

E-641: ECONOMETRIC METHODS-II

Introduction of time. series analysis, 'transformation of variables, decomposition analysis, Box-Jenkins Methodology; AR, MA, ARMA, ARIMA, Seasonal ARMA and Seasonal ARIMA models, unit root analysis, multiple time series, transfer functions, cointegration, dynamic specification, distributed lagged models, vector autoregression (VAR), impulse response function, testing of structural change, causality analysis, ARCH models, panel unit root and panel cointegration, forecasting; univariate and cointegrated system, testing forecasting accuracy, homogeneity-weak, strong, and super-analysis.

ELECTIVE COURSES:

E-701: MATHEMATICAL ECONOMICS

This course will focus on the mathematical underpinnings of the general equilibrium theory with a view to imparting an ability to formalise economic ideas in a precise and rigorous fashion. Different mathematical structures in general equilibrium theory will be analysed, including a detailed treatment of classical competitive and Cournot-Nash equilibria and extensions of these concepts to non-ordered preferences. Particular attention will be paid to the study of existence and optimality of these equilibria through the use of real analysis. In addition, the fundamental welfare and equivalence theorems will be discussed at some length.

E-710: PUBLIC FINANCE

Government Revenue and Expenditure; Public Debt; Taxation (including issues of ecotaxation); Feasibility and implications of Public Spending Policies; Financing or Government Spending: Finance through Taxation; Borrowing; and Money Creation. Major Issues Affecting each Tax System; the Issues of Equity, Efficiency, Stabilisation and Growth; Issues in Publicly Provided Goods; Public Debt Management; and Fiscal Transfer Systems; Fiscal Coordination; Vertical and Horizontal; Comparison of Systems; Developed and Underdeveloped Countries; Private Enterprise, and Socialist Economics.

E-711: PUBLIC POLICY

The key topics are: Measurements of Changes in Welfare; Economy-wide Incidence of Taxes; Taxation, Risk-taking, and Investments; Corporate Taxation; Effects of Taxation on Financial Markets; Taxation of Goods and Services; Taxation of Income, Taxation and Savings; Problems of Redistribution; Tax Arbitrage, Tax Avoidance, Tax Evasion, and the Underground Economy; Application of Social Cost-Benefit Analysis to Public Policy; Applied Capital Theory (with applications); Social Opportunity Cost of Capital and Labour, Social Cost of Unemployment, and the Inflation Tax.

E-720: MONETARY ECONOMICS

The course will include the following topics. Money and Interest Rates; Banking and Finance, Global Linkages; Money and Credit; Financial Liberalization and Globalization; Stabilization Policies; Dynamic Macroeconomic Models with Heterogeneous Agents; Business Cycle Models;

Vintage Capital and Technology Adoption Models; Firm Evolution and Industry Dynamics; Financial Markets; and Political Economy Models; Recent research papers on different issues using these techniques will also be discussed.

E-721: MONETARY POLICY

A Survey of Equilibrium Models of Money and Their Implications for Monetary and Fiscal Policies; Cash-in-Advance; Overlapping Generations Models; Turnpike, Search Models will be studied. Modigliani-Miller and Ricardian 'Irrelevance' Theorems; Exchange Rate Determinacy; Dynamic Laffer Curves and Arrangements for Coordinating Monetary and Fiscal Policies will be studied, as will the Problem of Optimal Taxation under Incomplete Markets.

E-722: FINANCIAL ECONOMICS

Foundations of Risk Analysis; Measuring Risk; Application of Risk Analysis; the Portfolio Selection Problem; the Capital Asset Pricing Model; the Arbitrage Pricing Theory; Common Stocks; Preferred Stocks; Bonds; Capital Structure Theories; the Goal of the Firm; the Economic Evaluation of Investment Proposals; the Traditional Mundell-Fleming Model; the Dynamic-Optimizing Model with Price Flexibility; Inter-temporal Model with Price Stickiness; Currency Crises; External Crises: Fiscal Policies and Taxation in the Open Economy; International Capital Flows under Asymmetric Information; and International Growth Convergence.

E-724: FINANCIAL ANALYSIS

Introduction to financial analysis and its role in assessing the health of businesses and markets, financial statement analysis (income statement, balance sheet, and cash flow statement), profitability, liquidity, and solvency ratios, valuation techniques (discounted cash flow, price/earnings ratios, and market multiples), financial forecasting and budgeting, performance measurement, capital budgeting techniques (NPV, IRR), working capital management, cost of capital and capital structure decisions, financial modeling and scenario analysis, risk-adjusted return metrics, and the role of financial analysis in investment decisions and corporate strategy.

E-725: FINANCIAL RISK MANAGEMENT

Introduction to financial risk management and its significance in managing risk exposures, types of financial risks (market risk, credit risk, operational risk, liquidity risk), risk measurement techniques (Value at Risk, stress testing, scenario analysis), derivatives for hedging risk (options, futures, swaps), portfolio theory and risk diversification, credit risk modeling and credit derivatives, risk management in banking and financial institutions, regulatory frameworks (Basel III, Dodd-Frank), financial crisis and risk management failures, risk management tools and strategies in corporate finance, and the role of financial institutions in managing systemic risk.

E-730: INTERNATIONAL ECONOMICS

Ricardian model of comparative advantage, Heckscher-Ohlin model of factor proportions, Specific Factors model, Many Goods and Factors model, economies of scale and monopolistic competition, non-traded goods model, trade policy instruments (tariffs, quotas, subsidies), theories of protectionism, international factor mobility (labor and capital), gains from trade, terms of trade, trade and income distribution, trade and economic growth, trade agreements and regional integration, trade and the environment, empirical methods in trade analysis, gravity model of trade, trade and development, global value chains and offshoring, political economy of trade, trade and financial crises, trade and technology transfer, trade and intellectual property rights, trade and migration, trade and economic sanctions, trade and geopolitics, and trade and global governance institutions (WTO, IMF, World Bank).

E-731: INTERNATIONAL FINANCE

Balance of payments, foreign exchange markets and exchange rate determination, international parity conditions (purchasing power parity, interest rate parity), international monetary systems and exchange rate regimes, capital flows (foreign direct investment and portfolio investment), international financial markets and instruments, currency risk and hedging strategies, multinational capital budgeting and corporate finance, sovereign debt and country risk analysis, international financial institutions and global financial governance, and offshore banking and financial centers.

E-732: TRADE POLICY

Tariffs and quotas, subsidies and countervailing measures, antidumping and safeguard measures, trade agreements (bilateral, regional, multilateral), World Trade Organization (WTO) rules and dispute settlement, trade policy instruments and their economic effects, political economy of trade policy, trade and development, trade and labor standards, trade and environmental regulations, intellectual property rights in trade, trade in services, and empirical methods in trade policy analysis.

E-740: HUMAN RESOURCE DEVELOPMENT-I

Labor supply and demand analysis, wage determination theories, efficiency wage models, compensating wage differentials and spatial equilibrium, principal-agent problems and employment contracts, assignment and matching theory, occupational dynamics and income distribution, human capital investment, labor market discrimination, unemployment and labor market policies, labor mobility and migration, labor market institutions and regulations, and empirical methods in labor economics.

E-741: HUMAN RESOURCE DEVELOPMENT-II

This course examines the following issues: Level and Composition of Employment; Job Search, Unemployment, Labour Mobility; Role of Public Policies like Unemployment Insurance; Welfare; Trade Policy; Tax Policy; Determination of Rent in the Employment Relationship; Efficiency Wage; Rent Sharing. Matching, and Specific Human Capital Models; the Economics of Intra-

household Allocation; Notions of Collective Choice; Co11ective Models of Household Behaviour; Collective Models of Labour Supply; the Role of Uncertainty in Household Decisions; Bargaining Approaches and Empirical Application.

E-742: ECONOMICS OF POPULATION

The topics include the Effects of Demographic Changes on: Markets for Labour and Capital, on Savings Rates and the Structure of Investment, on Pensions and Health-care Costs, on Taxes and Government Expenditure, and Household Behaviour; Population Planning with a view to the consequences of population changes, including methods of forecasting are considered. Additional topics include: Community Participation; Impact of Changes in population on Poverty and Distribution; and Environmental Sustainability.

E-745: AGENT-BASED MODELING

Introduction to agent-based modeling (ABM) and its applications in economics, understanding agents and their interactions in economic systems, designing and simulating agent behaviors, heterogeneous agents and decision-making processes, model calibration and validation, network effects and emergent phenomena, complexity and the role of feedback loops in economic systems, applications to market dynamics, financial systems, and economic growth, the role of social networks and information diffusion in ABM, applications in behavioral economics and decision-making under uncertainty, policy implications derived from ABM simulations, the use of ABM in understanding economic crises, and integrating ABM with other modeling techniques (e.g., econometrics, game theory).

E-750: INDUSTRIAL ECONOMICS

Topics include: Theory of the Firm, Multi-product Cost Functions; Natural Monopoly; Oligopoly; Strategic Behaviour; Monopolistic Competition; Network Externalities; Transaction Costs; and Technical Change; Development of Microeconomic Models to explain the Structure and Performance of Markets; Conditions under which Monopoly Power can be exercised; Relationship between Profit Rates and Concentration or Sizes; the Persistence of Profits Over Time; Industry Turnover and Inter-industry Comparisons; Game Theory and its Applications.

E-751: INDUSTRIAL POLICY

Technology and industrial structure, vertical integration and supply chains, oligopoly models (Cournot, Bertrand, and Stackelberg), cartels, collusion, and horizontal mergers, market power and monopolization, price discrimination and dynamic pricing, product differentiation and brand competition, innovation and R&D incentives, intellectual property rights, network effects and platform competition, market entry and exit dynamics, industrial clusters and agglomeration, state-owned enterprises and privatization, industrial regulation and antitrust policies, competition policy, imperfect information and signaling, externalities and public goods, environmental regulation and

green industrial policies, trade and industrial policies, comparative industrial policies across countries, industrial policy in developing countries, and industrial policy in Pakistan.

E-760: DEVELOPMENT ECONOMICS

Harrod-Domar and Neoclassical Models; Technical Progress; Optimum Savings, and the Golden Rule; Savings and Capital Accumulation Development Theories; Measuring Contributions to Growth; Population Growth; Labour and Employment; Investment in Human Capital; Entrepreneurship; Industrialization; the Choice of Technology; Agriculture and Agrarian Reforms; Development Strategies; Development, Equity, and Welfare; Food Aid, Saving Disincentives; Foreign Investment and MNCs; Decision Models; Balanced and Unbalanced Growth; Migration from LDCs; Political Economy of Trade and Development; North-South Models.

E-761: DEVELOPMENT POLICY

This course covers the following topics: Role of Institutions governing the Allocation of Resources (e.g., land, labour, credit, and insurance); Enforcement of Property Rights and Contracts in Developing Economies, and evaluation of their effect on economic efficiency. It will draw on recent research in Development Economics; Microeconomic Models of Household behaviour; Contract Theory; Game Theory; Planning Models, and the Experience of Developed and Developing Countries; East-Asian Growth Experience; Crisis of Governance; Role of NGOs.

E-770: APPLIED ECONOMETRICS

This course develops and applies the following econometric methods designed for analysing dynamic models of economic time series: Estimation Methods such as the Maximum Likelihood and Generalised Method of Moments; Models of Consumption and Investment; Models Connecting Asset Market data to Economic Aggregates and Models of the underlying Sources of Economic Fluctuations; the Estimation of Demand and Supply Equations; Estimation of Production Relationship; Estimation of Pricing Equations in Finance and Labour Economics; and Calibratron of General Equilibrium Models.

E-771: TOPICS IN ADVANCED ECONOMETRICS

Large-sample (asymptotic) theory, maximum likelihood estimation, generalized method of moments (GMM), discrete choice models (logit, probit), panel data models (fixed effects, random effects, dynamic panels), duration models, bootstrap methods, kernel estimation, nonparametric and semiparametric estimation techniques, instrumental variables estimation, limited dependent variable models (Tobit, selection models), simulation-based estimation, high-dimensional econometrics, regularization methods, machine learning applications in econometrics, causal inference methods (difference-in-differences, regression discontinuity), time series analysis (cointegration, state space models), and empirical applications using statistical software.

E-774: BAYESIAN ECONOMETRICS

Introduction to Bayesian econometrics and its foundational principles, prior and posterior distributions, Bayesian inference and estimation methods, Markov Chain Monte Carlo (MCMC) techniques, Bayesian model comparison and selection, estimation of parameters in dynamic models, the role of prior information in econometric models, applications of Bayesian methods in time series and panel data analysis, Bayesian approaches to causal inference, the use of Bayesian methods in forecasting, decision-making under uncertainty, model averaging and Bayesian prediction, and empirical applications in macroeconomics, finance, and labor economics.

E-776: FINANCIAL ECONOMETRICS

Introduction to financial econometrics and its techniques, time series analysis in finance, volatility modeling (ARCH, GARCH models), risk measurement and management, asset pricing models and empirical tests, the efficient market hypothesis and anomalies, forecasting financial markets and returns, portfolio optimization and asset allocation, cointegration and modeling long-run relationships in financial data, high-frequency data and microstructure models, panel data techniques in finance, event study methodology, the role of financial markets in economic modeling, the impact of macroeconomic variables on financial markets, and applications in market risk, credit risk, and financial stability analysis.

E-777: DATA VISUALIZATION

Introduction to data visualization and its importance in communicating complex data effectively, principles of data visualization design (clarity, simplicity, and accuracy), types of data visualizations (bar charts, line graphs, scatter plots, heat maps, histograms, etc.), tools and software for visualization (Tableau, Power BI, Python libraries like Matplotlib, Seaborn, Plotly), best practices for visualizing different types of data (qualitative, quantitative, time series), data storytelling and its role in making data-driven decisions, visualizing multivariate data and relationships, interactive visualizations and dashboards, and ethical considerations in data presentation.

E-778: BIG DATA ANALYSIS

Introduction to big data and its significance in economics and business, characteristics of big data (volume, variety, velocity, and veracity), big data processing frameworks (Hadoop, Spark), data storage and retrieval methods (NoSQL databases, data lakes), tools for big data analysis (Python, R, SQL, and machine learning libraries), data cleaning and preparation techniques for large datasets, statistical methods for analyzing big data (regression analysis, clustering, classification), big data visualization techniques, predictive analytics and machine learning applications in big data, challenges in big data analysis (privacy, security, computational costs), and applications of big data analysis in marketing, finance, health care, and public policy.

E-780: AGRICULTURAL DEVELOPMENT

Models of agricultural growth, determinants of urban-rural disparity, role of technology in agricultural growth, interdependence between agricultural and economic growth, models for the analysis of food security and sustainable agriculture, hunger and poverty, agricultural sustainability, food security and food safety, effects of exchange rate regimes on agricultural development, interdependence of the agriculture and non-agriculture sectors, regional population growth issues, measuring and impacts of undernutrition, seasonality of undernutrition, economic-related causes of hunger, nutrition policy implications, factors affecting income distribution, impact of demographic changes on food demand, determinants of changes in demand for food in low-income countries, effects of the Green Revolution, and the role of free markets in addressing hunger.

E-781: AGRICULTURAL POLICY

Review of agricultural systems and policies in Pakistan, agricultural supply topics including product and factor prices, analysis of policy options, price support and input subsidies, price policy and adoption of new technologies, interrelated commodities, water pricing and project evaluation principles applicable to third-world countries, agricultural trade policies, food security and nutrition policies, environmental regulations affecting agriculture, land use and property rights, rural development strategies, and the role of international organizations in shaping agricultural policy.

E-782: RESOURCE ECONOMICS

Introduction to resource economics and the economic principles behind the use of natural resources, the theory of resource allocation and scarcity, renewable vs. non-renewable resources, the economics of resource extraction and depletion, optimal resource extraction models (Hotelling's rule), resource pricing and market mechanisms, resource management and sustainability, the role of property rights and regulations in resource management, the economics of environmental degradation, the concept of sustainable development, natural resource policy and international trade in resources, intergenerational equity in resource use, the impact of technological change on resource utilization, and empirical case studies on energy, water, and land resources.

E-783: APPLIED PRODUCTION ECONOMICS

Introduction to production economics and the relationship between inputs and outputs, production functions and their estimation, cost functions and cost minimization, economies of scale and scope, technology and its impact on production, resource allocation in production processes, the role of capital, labor, and materials in production, production techniques and technological change, efficiency measurement (technical, allocative, and economic efficiency), short-run vs. long-run production decisions, the economics of supply chains and production planning, data analysis methods for production economics, empirical applications in agriculture, manufacturing, and

services, and the role of government policies and market conditions in shaping production decisions.

E-790: ECONOMIC GROWTH AND DISTRIBUTION

Harrod-Domar growth model, Solow-Swan neoclassical growth model, Ramsey-Cass-Koopmans model, endogenous growth theories (AK model, Romer model, Lucas model), increasing returns to scale, human capital accumulation, research and development and innovation, technological progress and total factor productivity, convergence and divergence theories, empirical studies on productivity determinants, cross-country growth comparisons, sectoral and regional growth analysis, income and wealth distribution, inequality and growth dynamics, Kuznets curve, and policy implications for sustainable and inclusive growth.

E-800: ENVIRONMENTAL ECONOMICS-I

Introduction to Environmental Economics, market failures and externalities, property rights and the Coase Theorem, public goods and the free rider problem, environmental valuation techniques (contingent valuation, hedonic pricing, travel cost method), the role of government in environmental policy, cost-benefit analysis for environmental policies, environmental regulation and policy tools (taxes, subsidies, quotas), the economics of pollution (air and water pollution), environmental policy and international trade, climate change economics and the economics of global warming, and sustainable development and its economic implications.

E-801: ENVIRONMENTAL ECONOMICS-II

Advanced topics in environmental economics, environmental and resource economics theories (Hotelling's Rule), market-based environmental policy instruments (emissions trading, carbon taxes), natural resource economics (renewable vs. non-renewable resources), economics of biodiversity and conservation, natural resource depletion and economic growth models, intergenerational equity and sustainable resource management, the economics of energy (fossil fuels, renewable energy, energy transitions), environmental justice and economic impacts on low-income communities, global environmental governance and international environmental agreements (Kyoto Protocol, Paris Agreement), and measuring and addressing the economic impacts of climate change.

E-803: REGULATORY ECONOMICS

Introduction to regulatory economics, market failures and the need for regulation, government intervention in markets, regulatory objectives and principles, price regulation (cost-plus pricing, price cap regulation), natural monopolies and public utilities, economic analysis of antitrust and competition policy, regulation of network industries (telecommunications, electricity, transport), environmental regulation and its economic impact, risk regulation and management, regulation of health and safety standards, deregulation and market liberalization, the role of regulatory agencies and their effectiveness, and the economics of regulation in developing economies.

E-805: REAL ESTATE ECONOMICS

Introduction to real estate economics, supply and demand in the real estate market, factors influencing real estate prices, housing market cycles, real estate valuation methods (comparative market analysis, income approach, cost approach), real estate development and investment analysis, the role of credit and mortgage markets, land use regulations and zoning, the economics of urbanization and property development, real estate market dynamics (local, national, and international), real estate market efficiency, government policies and housing subsidies, taxation and its impact on real estate markets, commercial real estate markets, and economic implications of real estate bubbles and financial crises.

E-807: ECONOMICS OF CLIMATE CHANGE

Introduction to the economics of climate change, scientific foundations and economic implications of global warming, the role of greenhouse gases and carbon emissions in climate change, the economic impacts of climate change on sectors such as agriculture, health, and infrastructure, mitigation strategies (carbon pricing, emissions trading, carbon taxes), adaptation strategies and their costs, the role of technological innovation in combating climate change, the economics of renewable energy sources and energy transition, international climate agreements (Paris Agreement), the economics of climate justice and equity, modeling the costs and benefits of climate action, and the role of governments and international organizations in addressing climate change.

E-808: ECONOMICS OF ENVIRONMENT AND NATURAL RESOURCES

Introduction to the economics of environmental issues and resource management, market failures and environmental externalities (pollution, biodiversity loss), the role of property rights and public goods in environmental economics, valuation of natural resources and ecosystem services, sustainable resource use and management, environmental regulation and policy tools (taxes, subsidies, quotas), cost-benefit analysis in environmental decision-making, the economics of conservation and biodiversity, non-renewable and renewable resource economics, water economics and management, the role of international environmental agreements, and the economic impact of environmental degradation and climate change.

E-830: ADVANCED MATHEMATICAL METHODS FOR ECONOMISTS

Introduction to mathematical tools in economics, real analysis and optimization techniques, linear algebra and matrix theory, differential equations and dynamic systems, calculus of variations, constrained optimization (Lagrangian and Kuhn-Tucker conditions), convexity and concavity in economics, fixed-point theorems and applications, equilibrium analysis and game theory, dynamic programming, Fourier and Laplace transforms in economic modeling, stochastic processes and their economic applications, integral equations, and numerical methods for solving economic models.

E-840: ECONOMICS OF GOVERNANCE

Introduction to governance and its economic implications, theories of political economy, institutional economics and governance structures, public choice theory and the role of government, the economics of corruption and anti-corruption policies, the relationship between governance and economic development, market failure and government intervention, property rights and legal frameworks, regulatory institutions and their impact on economic outcomes, decentralization and fiscal federalism, the role of institutions in policy design and implementation, governance in developing economies, accountability, transparency, and the economics of democratic governance, and international perspectives on governance reforms.

E-841: GOVERNANCE AND PUBLIC POLICY

Introduction to governance and its relationship with public policy, the role of government institutions in policy formulation and implementation, political economy of policy decisions, governance structures and their impact on policy outcomes, policy design and effectiveness, regulatory frameworks and the economics of regulation, the role of transparency, accountability, and corruption in governance, institutional capacity and the delivery of public goods, public-private partnerships and their role in policy implementation, the influence of international organizations on national policy, the politics of policy change, and the role of civil society in shaping public policy.

E-842: PUBLIC POLICY ANALYSIS

Introduction to public policy analysis and its methodologies, policy problem identification and framing, objectives and criteria for evaluating policies, quantitative and qualitative methods for policy analysis, cost-benefit analysis and its application in policy decisions, policy modeling and simulations, the role of stakeholders in policy formulation, economic tools for analyzing policy impacts (market failure, externalities, public goods), policy evaluation and performance measurement, policy design and implementation challenges, comparative analysis of public policies across different countries, the role of political and institutional factors in policy outcomes, and ethical considerations in policy analysis.

E-843: INSTITUTIONS AND DEVELOPMENT

Introduction to the role of institutions in economic development, theories of institutional economics, the relationship between formal and informal institutions, property rights, legal systems, and economic growth, the impact of political institutions on development outcomes, economic systems and development paths, the role of corruption, state capacity, and governance in development, the evolution of institutions and their impact on development trajectories, institutional change and reform, culture, social norms, and development, institutional frameworks for poverty alleviation, the role of international institutions (e.g., IMF, World Bank) in development, and the challenges of building institutions in developing countries.

E-850: HISTORY OF ECONOMIC THOUGHT

Introduction to the development of economic ideas and schools of thought, classical economics and the contributions of Adam Smith, David Ricardo, and John Stuart Mill, the marginal revolution and the rise of neoclassical economics (William Stanley Jevons, Carl Menger, Leon Walras), Keynesian economics and the Great Depression, Marxist economics and critiques of capitalism, the Austrian school of economics, institutional economics and the role of institutions in economic development, monetarism and the rise of Milton Friedman, modern behavioral economics and challenges to rationality, the development of economic methodology, economic thought in developing economies, and the influence of economic ideas on policy and global economic systems.

E-859: EXPERIMENTAL ECONOMICS

Introduction to experimental economics and its role in understanding economic behavior, design and methodology of laboratory experiments, controlled field experiments and natural experiments, game theory and strategic interaction experiments, behavioral economics and deviations from rationality, testing market efficiency and auction designs, public goods experiments and the free-rider problem, bargaining and negotiation experiments, social preferences, trust, and reciprocity in economic decision-making, the role of incentives and information in decision-making, applications to labor markets, environmental economics, and policy evaluation, ethical considerations in experimental design, and the contribution of experimental economics to economic theory and real-world policy.

E-860: TOPICS IN EXPERIMENTAL ECONOMICS

Introduction to experimental economics, laboratory and field experiment design, game theory and experimental testing of strategic behavior, market experiments and efficiency, auctions and bidding behavior, public goods experiments and the free rider problem, bargaining experiments and negotiation strategies, social preferences and behavioral anomalies (e.g., fairness, trust, reciprocity), risk preferences and decision-making under uncertainty, the role of incentives and information in economic behavior, reputation and trust in economic transactions, the economics of cooperation and competition, experiments on monetary policy and taxation, environmental and resource economics experiments, experimental approaches to labor markets and wage setting, and the use of experiments in policy evaluation and development.

E-865: HEALTH ECONOMICS

Introduction to health economics and its key concepts, demand for health care and health-related goods, supply of health care services, health care financing (insurance markets, government interventions), the economics of health behaviors and lifestyle choices, economic evaluation of health interventions (cost-effectiveness, cost-benefit analysis), the role of information asymmetry in health care markets, market failures in the health care system, health inequalities and their economic implications, the economics of health care providers (hospitals, physicians,

pharmaceuticals), the role of health policies and regulations, the impact of public health policies on economic outcomes, and health care systems around the world (universal health coverage vs. private systems).

E-866: TOPICS IN HEALTH ECONOMICS

Advanced theories and models in health economics, the economics of health care reform, health insurance markets and risk pooling, the economics of aging populations and long-term care, health production functions and the economics of medical technology, market power and competition in health care, behavioral economics and its applications to health, health care expenditures and their macroeconomic impact, empirical methods in health economics (econometric models, randomization techniques), public health interventions and their economic evaluation, global health challenges and the economics of disease control, policy design for addressing health disparities, and the economics of infectious diseases and pandemics.