University of Delhi

Master of Arts (Economics)

(Effective from Academic Year 2019-20)

Programme Brochure

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Department of Economics

Reckoning from the appointment of V. K. R. V. Rao as Professor in 1942, the Department of Economics of the Delhi School of Economics (henceforth, the Department) is one of the oldest departments of the University of Delhi. The Delhi School of Economics was set up in 1949 as an institution for advanced studies and research in economics, on the initiative of the Founder-Director Professor Rao, with Prime Minister Jawaharlal Nehru as its President. Since then, the Department has been at the forefront of postgraduate teaching and research in economics. At present, it is one of the three constituent departments of the Delhi School of Economics, the other two being Geography and Sociology.

The Department supports postgraduate programmes (M. A., M. Phil., and Ph. D.) in Economics, which draw a huge number of applicants from all over the country and many from abroad. These programmes have a strong theoretical and quantitative focus with an emphasis on empirical applications. Their hallmark is the dynamic curriculum offered, which is continuously reviewed and updated in line with the latest developments in the discipline.

The Department is proud of its many past faculty members who have made significant contributions to the Economics discipline. Among them is the Nobel laureate Amartya Sen and many Fellows of the Econometric Society, a much coveted honour in the field of Economics.

The Department is also proud of its numerous alumni who have gone on to distinguished academic careers, including many Fellows of the Econometric Society. Department alumni can be found in most major Economics, Business, and Public Policy departments worldwide, very often as members of the faculty, and even more commonly, as doctoral students.

Apart from purely academic distinctions, members of the Department have contributed to the task of institution-building in various capacities. The founder, Professor Rao, went on to become the Vice Chancellor of Delhi University, served as the Education minister in the central government, and also founded other important academic institutions. Another former member of the Department, Professor Manmohan Singh, served as Governor of the Reserve Bank of India, union Finance Minister, and later Prime Minister of India. Numerous other members of the Department served the nation as high-level economic officials or advisers to the government and international bodies, as members of the Planning Commission, and as regulators or members of important government Commissions and committees. Others have served as public intellectuals and as public-spirited activists.

While the Department's alumni have traditionally found jobs and attained considerable eminence in academia, the civil services, NGOs, international organisations and the media, the number of alumni in finance, consultancy and other areas of the private sector has grown

manifold in the past two decades.

In 1965, the Department was the first economics department in the country to be recognised by the University Grants Commission as a Centre for Advanced Studies, a distinction that it continues to hold to the present day. The present Department is building on this evolving tradition and continues to perform the functions of academic research, teaching and public service. Current faculty have published their research in leading Indian and international professional journals, and have won prestigious international and Indian awards and fellowships. Their specialisations span a wide range of areas in economics. For many years, the Department has been ranked the highest amongst university economics departments in India by RePEc (Research Papers in Economics), a global electronic archive of working papers and publications in Economics and Finance (`http://ideas.repec.org/top/top.india.html`). Apart from pursuing their individual research programmes, several members of the faculty also serve on committees of various government departments and public sector organisations, and on the governing bodies or academic councils of important academic institutions.

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Choice based credit system

2.1 Introduction

The Choice based credit system (henceforth, CBCS) provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective, and skill-based courses. The courses can be evaluated following the grading system, which is considered to be better than the conventional marks system. Grading system provides uniformity in the evaluation and computation of the Cumulative Grade Point Average (CGPA) based on student's performance in examinations which enables the student to move across institutions of higher learning. The uniformity in the evaluation system also enables the potential employers to assess the performance of the candidates.

2.2 Definitions

1. 'Academic programme' means the entire course of study comprising its structure, course details, evaluation schemes, etc.

2. 'Course' means a segment of a subject that is part of an Academic programme.

3. 'Programme structure' means a list of courses (Core, Elective, open Elective) that makes up an Academic programme, specifying the syllabus, credits, hours of teaching, evaluation and examination schemes, minimum number of credits required for successful completion of the programme, etc., prepared in conformity with Delhi University rules.

4. 'Core course' means a course that a student admitted to the M. A. Economics programme must successfully complete to receive the degree and which cannot be substituted by any other course.

5. 'Elective course' means an optional course that is to be selected by a student out of a menu of such courses offered by the Economics department.

6. 'Open Elective' means an elective course that is available for students of all programmes, including students of the Economics department. Students of other departments may opt for these courses, subject to fulfilment of eligibility criteria as laid down by the Economics department.

7. 'Credit' means the value assigned to a course indicating the level and quantity of instruction as measured by instructor-student interaction.

8. 'SGPA' means Semester Grade Point Average calculated for individual semester.

9. 'CGPA' is the Cumulative Grade Points Average calculated for all courses completed by the students at any point of time. CGPA is calculated each year for both the semesters clubbed together.

10. 'Grand CGPA' is calculated in the last year of the course by clubbing together the CGPA of two years, i.e., four semesters. Grand CGPA is given in Transcript form. A formula for conversation of Grand CGPA into percentage marks is given in the Transcript.

2.3   Programme

Objectives

The Master of Arts (M. A.) programme in Economics reflects new developments in the Economics discipline. The curriculum has a strong theoretical and quantitative focus with all students being trained in the use of computers and statistical software that they find useful in their professional careers in academia, research institutions, government, and industry. The programme is semester-based and includes a large number of elective courses which allow students to pursue their varied interests and to specialise in their fields of choice.

Entry into the programme requires superior analytical, mathematical, and quantitative skills. The ability to write coherently and analytically in English is very important. The programme will further hone these skills in the context of the Economics paradigm. At the end of the programme, the student should be able to bring to bear these skills to the modelling and analysis of a wide range of theoretical and applied problems in Economics and to the understanding and solution of real world economic and social problems.

Structure

The M. A. Economics programme is spread over two years. Each year is divided into two semesters. The programme requires students to take a combination of Core courses, Elective courses, and Open Elective courses. A student is required to complete a minimum of 80 credits for the completion of the programme and the award of the M. A. Economics degree.

Depending on the nature of the course, instruction consists of lectures combined with computer labs, tutorials, and preceptorials. The labs provide students the opportunity for hands-on learning of programming, statistical, and econometric techniques. Tutorials are small-group interactions in a classroom setting that complement the lectures and support problem-solving related to the lectures. Preceptorials are small-group or individual interactions meant for intensive problem-solving (possibly beyond the lecture material), supervision of guided reading and research, and discussions ranging beyond the lecture material.

The semester-wise distribution of courses and credits is as follows:

Core courses and credits

Semester	Core Courses	Credits per course	Credits per semester
I	EC001, EC002, EC003	6	18
II	EC004, EC005, EC006	6	18
III	Nil	Nil	Nil
IV	Nil	Nil	Nil

Elective courses and credits

Semester	Elective Courses	Credits per course	Credits per semester
I	Nil	Nil	Nil
II	One elective course from those available for this semester	5	5
III	Four elective courses from those available for this semester; one of these may be an Open Elective	5	20
IV	Four elective courses from those available for this semester; one of these may be an Open Elective	5	20

Semester	Open Elective Courses	Credits per course	Credits per semester
I, II, III, IV	One open elective course from those available for this semester	4	4

Selection of elective courses

A student's choice of elective courses in each semester will be limited to those announced by the Department at the beginning of that semester. Each student is required to finalise his/her choice of elective courses within two weeks of the start of each semester.

On account of infrastructural constraints, the Department may limit the number of students in an elective course, typically on the basis of performance in a designated prior course. Such requirements will be announced at least one semester in advance.

Elective courses may have prerequisites, which may be Core courses or Elective courses.

Teaching

The faculty of the Department is responsible for organising lecture and tutorial work for the M. A. programme. There shall be 90 instructional days, excluding examinations, in a semester.

Eligibility for admission

All admissions are done *via* the Direct/Merit mode or the Entrance test mode. The eligibility conditions for **Indian students (unreserved category)** *via* these modes are

- Direct/Merit mode: At least 60% or equivalent CGPA in the aggregate of the B. A. Economics (Hons.) of the University of Delhi.

- Entrance test mode: At least 60% or First Division or equivalent CGPA in any graduate/post-graduate degree in any subject from the University of Delhi or any Indian University recognised by the University of Delhi.

Relaxations of these conditions for **categories other than the Unreserved category** are as *per* the rules stated in the Information Bulletin of Delhi University.

Although the University does not require **foreign students** to take the entrance test, foreign nationals are advised to, either take the Department's entrance test, or submit their GRE scores along with recommendation letters from two academic referees, in order for the Department to evaluate their suitability for the M. A. programme. Those who choose to take the entrance test must apply on the prescribed on-line form by the due date. Those who do not wish to take the entrance test should familiarise themselves with the material covered in the textbooks recommended for the entrance test, so as to ensure that they have the aptitude and training for the M. A. courses offered by the Department. No matter which option they choose, all foreign nationals must route their applications through

Foreign Students' Registry Office
Room No. 11, First Floor
Conference Centre
University of Delhi
Delhi 110007

Telephone: 011-27666756
Web: `http://fsr.du.ac.in/`
Email: `fsr_du@yahoo.com`, `fsr@du.ac.in`

Admission test

Candidates are expected to be familiar with the material contained in the current syllabus of the B. A. (Honours) Economics programme of the University of Delhi. The examination will test a candidate's ability to *understand and apply* concepts in four basic areas in Economics: (a) microeconomic theory, (b) macroeconomic theory, (c) mathematical techniques used by economists, and (d) probability, statistics, and elementary econometrics. Apart from these, some general questions testing the reasoning and quantitative abilities of the students may also be asked.

Some indicative, but not exhaustive, references that may be used to prepare for the test are:

O. Blanchard: *Macroeconomics, 5th ed.*, Pearson Education (2009)

W. Branson: *Macroeconomic Theory and Policy, 3rd ed.*, East-West Press (2005)

J. Devore: *Probability and Statistics for Engineers, 8th ed.*, Cengage Learning (2012)

R. Dornbusch, S. Fischer, R. Startz: *Macroeconomics, 11th ed.*, McGraw-Hill (2010)

C. Dougherty: *Introduction to Econometrics, 4th ed.*, Oxford University Press (2011)

R. Gordon: *Macroeconomics, 12th ed.*, Prentice-Hall (2011)

D. Gujarati, D. Porter: *Essentials of Econometrics, 4th ed*, McGraw-Hill (2010)

C. Jones: *Introduction to Economic Growth, 2nd ed.*, W. W. Norton (2002)

N. Mankiw: *Macroeconomics, 6th ed.*, Worth Publishers (2010)

F. Mishkin: *Macroeconomics: Policy and Practice*, Pearson Education (2012)

C. Snyder, W. Nicholson: *Fundamentals of Microeconomics*, Cengage Learning (2010)

K. Sydsaeter, P. Hammond: *Mathematics for Economic Analysis*, Pearson Education (2002)

H. Varian: *Intermediate Microeconomics, 8th ed.*, W. W. Norton (2010)

Please consult the University's Bulletin of Information at
`http://www.du.ac.in/adm2019/postgraduate.html`
for detailed instructions regarding the Admission test.

Assessment and examinations

English shall be the medium of instruction and examination.

Assessment of a student's performance in a course shall be based on marks for Internal Assessment and the Final Examination in the relevant course, as *per* Delhi University's rules.

Pass percentage and promotion criteria

These will be specified by Delhi University.

Marks, grades, and classes

Conversion of marks in courses into grade points, SGPA, CGPA, grand CGPA, and class will be done as *per* Delhi University rules.

Span period

No student shall be admitted as a candidate for the examination for any of the Parts/Semesters after the lapse of four years from the date of admission to the Part-I/Semester-I of the M. A. Economics Programme.

Internal assessment marks

Internal assessment will be based on multiple mid-term examinations, presentations, or projects. The appropriate mode of assessment for a course is chosen by the course instructor.

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Core courses

3.1   Microeconomic Theory: EC001

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 6 hours.

- **Credits** : 6.

- **Course Objectives**

  The purpose of this course is to give students a rigorous introduction to modern microeconomic theory.

- **Course Learning Outcomes**

  Three main learning outcomes are envisaged. First, the student should develop a sound understanding of the core concepts that economists use to understand the world of business, trade and public policy. By the end of the course, thinking like an economist should become second nature. Second, the course will familiarize students with the mathematical techniques that economists routinely use in their analysis. Modern economics makes heavy use of mathematics and statistics that advanced students must master. Finally, we will try to illustrate the usefulness of the abstract ideas and concepts introduced in the course with the aid of suitable applications to real world problems.

- **Content: Unit-wise**

  1. Prices, Markets and Efficiency - Voluntary exchange, Pareto efficiency, quasilinear utility, cost functions, demand and supply, market equilibrium, comparative statics, taxes and subsidies, public goods, externalities.

  2. Choice theory and Consumer Demand - The axiomatic approach, utility representation, demand and expenditure functions, duality, Slutsky decomposition, testable implications.

  3. Production, Costs and the Firm - Production possibility sets, cost minimization and profit maximization, input demand and output supply, non-profit motives.

  4. Monopoly - Profit maximization, dead-weight loss, price discrimination, monopolistic screening.

5. Choice under Uncertainty - The von-Neumann-Morgenstern axioms and expected utility theory, risk aversion, portfolio choice.

6. General Equilibrium Analysis: Barter; Core of Exchange economy; Market exchange; General equilibrium models of exchange and production; Existence of competitive equilibria; Competitive equilibrium as Core allocation Uniqueness and Stability of Competitive equilibrium; Comparative statics.

   Welfare Properties of Competitive Equilibria - First and Second Fundamental Theorems of Welfare Economics; Efficiency and fairness of Market wage; Factor Price Equalization Theorem.

7. Welfare Economics: Welfare Criteria - Fairness; Pareto optimality; Kaldor efficiency; Scitovsky Criterion; Samuelson Criterion; Cost Benefit Analysis.

   Social Choice; Social Welfare Function; Arrow's Impossibility Theorem and the related results.

8. Market Failures: Market failure; Sources of market failure and their implications Externalities; Public Good.

- **Suggested Readings**

Bolton, P. and M. Dewatripont (2005): *Contract Theory.* MIT Press.

Diamond P. and Stiglitz J. (1974): Increases in risk and in risk aversion, *Journal of Economic Theory* 8, 337-360.

Jehle, G. and P. Reny (2001): *Advanced Microeconomic Theory*, Addison Wesley.

Laffont, J-J, and D. Martimort (2002): *The Theory of Incentives - the Principal Agent Model*, Princeton University Press.

Laffont, J-J and J. Tirole (1986): Using Cost Observation to Regulate Firms, *Journal of Political Economy*, 94(3): 614-41.

Mas-Collel, A., M. Whinston and J. Green (1995): *Microeconomic Theory*, 2nd ed. Oxford University Press

Maskin, E. and J. Riley (1984): Monopoly with Incomplete Information, *Rand Journal of Economics*, 15: 171- 96.

Mirrlees, J. (1971): An exploration in the theory of optimum income taxation,*Review of Economic Studies* 38: 175-208.

Pratt, J. (1964): Risk aversion in the small and in the large, *Econometrica* 32, 122-136.

3.2   Mathematics for Economics: EC002

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 6 hours.

- **Credits** : 6.

- **Course Objectives**

  The objective is to rigorously introduce and teach several areas of mathematics that are widely-used in Microeconomics, Macroeconomics and Econometrics.

- **Course Learning Outcomes** The approach of the course will be analytical, so that we expect as a learning outcome that students can go beyond cookbook procedures when modelling and analyzing economic problems. A second learning outcome will be the acquisition of some mathematical sophistication, in understanding and writing proofs. These will be complemented by a basic learning outcome, which is to understand the main optimization and other tools used in a variety of economic applications.

- **Content: Unit-wise**

  1. Preliminaries: Sets, relations, functions.
  2. Linear Algebra:
     Vector spaces, subspaces.
     Convex sets, concave and quasiconcave functions, their characterisations.
     Linear independence. Linear mappings and matrix representation. Range, null space, rank-nullity theorem.
     Projection mappings and inverse mappings. Solutions of linear equations.
     Inner product and normed spaces. Orthogonality. Orthogonal projectors and distance-minimising property. Symmetric matrices. Quadratic forms.
     Spectrum of matrix, diagonalisation, similarity of matrices.
  3. Basic Real Analysis:
     In normed spaces, notions of open, closed and compact sets, continuous functions, their optima and their existence.
     Notions of differentiability of mappings between Euclidean spaces, chain rule, higher order derivatives.
     Implicit and inverse function theorem, comparative statics.
  4. Optimization:
     Characterisations of differentiable concave and quasiconcave functions. Characterisation of interior optima.
     Lagrange characterisation of optima subject to equality constraints.
     Karush-John-Kuhn-Tucker characterisation of optima subject to inequality constraints.
  5. Differential Equations: First-order and systems of first-order differential equations (linear and nonlinear); some stability theory.

- **Suggested Readings**

  Abbott, S. (1997): *Understanding Analysis*, Springer.

  Apostol, T. (1991): *Calculus, Volumes 1 and 2*, Wiley.

Simmons, G. and Krantz, S. (2006): *Differential Equations*, McGraw Hill.

Strang, G. (2006):*Linear Algebra and its Applications*, Thomson Brooks/Cole.

Sundaram, R. (1996): *A First Course in Optimization Theory*, Cambridge University Press.

3.3   Introductory Econometrics: EC003

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 6 hours.

- **Credits** : 6.

- **Course Objectives**

  The first half of the course covers basic concepts in probability and mathematical statistics that are needed for the study of econometrics. The second half introduces basic econometric techniques commonly used in the empirical analysis of economic relationships and other social sciences.

- **Course Learning Outcomes**

  Students would acquire theoretical knowledge of statistics and basic econometric techniques used in the empirical analysis of economic relationships. They will undergo hands-on training in the use of software to select random samples, compute numerical counterparts of theoretical results and estimate empirical models.

- **Content: Unit-wise**

  1. Probability, Random Variables, Distributions:
     Sample spaces, Counting methods, Conditional Probability, Bayes' Theorem.
     Discrete, continuous and mixed random variables, marginal and conditional distributions, multivariate distributions, distributions of functions of random variables. Expectations, conditional expectations and other moments.

  2. Estimation: Properties of estimators, sufficient statistics, maximum likelihood estimation.

  3. Sampling Distributions, Aymptotic Distribution Theory:
     Large Sample Results: Laws of large numbers and central limit theorems.
     Sampling Distributions of Estimators: The Chi-square, t and F distributions.

  4. Hypothesis Testing: Definition of a statistical test. Size, significance and power. Likelihood ratio tests and the Neyman Pearson Lemma. Uniformly most powerful tests, t and F tests for moments of a distribution.

  5. Linear Regression:
     Simple Linear Regression - Ordinary Least Squares (OLS) Estimation; Desirable properties of least squares estimators; Goodness-of-Fit; Normality assumption for the errors; Maximum likelihood estimation.

Multiple Linear Regression: Ordinary Least Squares (OLS) Estimation; Underlying assumptions; Goodness-of-Fit.

Dummy variables in regression models: Qualitative regressors; qualitative and quantitative regressors; interaction terms.

Multicollinearity, Heteroscedasticity, Autocorrelation: Nature; implications; detection; remedies

6. Dynamic Models:
   ARIMA models: AR, MA, and ARMA processes
   Distributed lag models

7. Model specification: Model selection criteria

8. Panel data regression: Fixed effects LSDV model; Fixed effects within-group model; Random effects model.

- **Suggested Readings**

DeGroot, Morris H. and Schervish, Mark. J. (2012): *Probability and Statistics*, 4th edition, Addison-Wesley.

Gujarati, D.N. and Porter, D.C. (2008): *Basic Econometrics*, McGraw-Hill, New York.

Hogg, Robert V.; Makean, J and Craig, Allen T. (2014): *Introduction to Mathematical Statistics*, Prentice Hall, 7th edition

Hwang, Jessica and Blitzstein, Joseph (2014): *Introduction to Probability*, CRC Press.

Stock, James H. and Watson, Mark W. (2011): *Introduction to Econometrics*, Pearson Education Inc.

Wooldridge, Jeffrey (2012):*Introductory Econometrics: A Modern Approach*, South-Western.

3.4 Macroeconomic Theory: EC004

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 6 hours.

- **Credits** : 6.

- **Course Objectives**

The objective of the course is to familiarise the students with (a) the concepts and issues in modern macroeconomics, as is applied in theory and practice across the world; (b) the major mathematical tools used in modern macro analyses.

The course has two modules of 4 units each. The first module begins with a brief discussion of the short run (static) aggregative macro frameworks and explore the implications of different policy changes for the macroeconomy. It then focuses on long run output dynamics, i.e., issues related to economic growth. The second module focuses on medium run dynamics as captured by business cycles, paying special attention to the Real Business Cycles theory and the New Keynesian framework.

- **Course Learning Outcomes**

Two central questions that motivate Macroeconomics are: (i) What causes aggregate output and employment levels in an economy to fluctuate/change over time? (ii) how effective are government policies in stabilizing the economy and/or generating steady growth? This course will provide the students with a deeper understanding of both these issues in the context of the real economy and will enable them to evaluate various macroeconomic policies and their implications on the basis of coherent theoretical frameworks.

- **Content: Unit-wise**

    1. Aggregative Macro Models: The classical system; the Keynesian system; Role of expectations in the aggregative framework; various theories of expectation formation; solving aggregative macro models with different assumptions about expectation formation and their policy implications.

    2. Mathematical Preliminaries:

       Methods of solving Ordinary Difference Equations; Systems of first-order difference equations; Steady states, Stability, Phase Diagrams, Linearization.

       Infinite Horizon Optimization in Discrete Time: Stationary Dynamic Programming with Discounting; Euler Equations and Transversality Condition; Solution techniques.

    3. Microfounded Macro Models:

       Lucas Critique and the need for microfoundations; the Dynamic General Equilibrium (DGE) approach to macro analysis: optimization problem of a representative household; optimization problem of a representative firm.

    4. Growth and Overlapping Generations models:

       Neoclassical Growth Models - The Solow model; The Ramsey-Cass-Koopmans model; The Samuelson-Diamond Overlapping Generations model.

       Endogenous Growth Models - the Basic AK-Model; Models with Externalities.

    5. Basic Factors of Business Cycles: Evidence and Issues

    6. Stochastic difference equations: First-Order Linear Systems; Scalar Linear Rational Expectations Models; Multivariate Linear Rational Expectations Models.

    7. Real Business Cycle Theory - basic structure with and without labour; Money in utility; Effectiveness of Monetary Policy.

    8. New Keynesian Model - basic framework, price stickiness (Calvo and Rottenberg), optimum pricing, dynamic IS and new Philips curve, monetary policy effectiveness. Monetary Policy Design: Rule vs Discretion. Sticky Wages and Unemployment.

- **Suggested Readings**

Acemoglu, D. (2009): *Introduction to Modern Economic Growth*, Princeton University Press.

Gali, Jordi (2015): *Monetary Policy, Inflation, and the Business Cycle*, 2nd Edition, Princeton University Press.

Galor, O. (2010): *Discrete Dynamical Systems*, Springer-Verlag.

Minford, P. and Peel. D. (2019): *Advanced Macroeconomics: A Primer*, 2nd Edition, Edward Elgar.

Romer, D. (2012): *Advanced Macroeconomics*, 4th edition, New York: McGraw Hill.

Sorensen, P.B. and Whitta-Jacobsen, H.J. (2010): *Introducing Advanced Macroeconomics: Growth and Business Cycles*, 2nd Edition, McGraw-Hill.

Wickens, M. (2011): *Macroeconomic Theory*, 2nd edition, Princeton University Press.

3.5 Introduction to Game Theory: EC005

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 6 hours.

- **Credits** : 6.

- **Course Objectives**

  Game theory, which systematically studies strategic interactions, is an important tool for economists. The main goal of this course is to introduce the basic concepts of Game theory and to illustrate its importance in explaining various kinds of economic and social phenomena.

- **Course Learning Outcomes**

  To learn static and dynamic game models with complete and incomplete information. Learn and apply the main equilibrium concepts of noncooperative game theory, as well as learn procedures of iterated dominance. Learn some major applications such as Auctions, Bargaining, Repeated Games, Signaling and Screening.

- **Content: Unit-wise**

  1. Games with perfect information
     (a) Strategic form games: Dominated strategy, Nash and mixed strategy Nash equilibrium, Iterated elimination
     (b) Extensive form games: Action and strategy, Nash Equilibrium, Subgame perfect Nash equilibrium, One-deviation property and backward induction
     (c) Repeated games: Finitely and infinitely repeated game,
     (d) Bargaining: Alternating offers bargaining: Finite and infinite horizon

  2. Games with Imperfect Information
     (a) Imperfect information and Subgame perfection: Information Set, Mixed and behavioural strategies
     (b) Static games of incomplete information: Bayesian Nash equilibrium, Harsanyi transformation, Auction

(c) Dynamic games of incomplete information: Perfect Bayesian Equilibrium, Signaling games, Reputation games, Intuitive Criterion

(d) Information Economics: Adverse selection, Monopolistic Screening, Moral hazard

- **Suggested Readings**

Fudenberg, D. and Tirole, J. (1991), *Game Theory*, MIT Press.

Gibbons, R. (1992), *A Primer in Game Theory*, Prentice-Hall.

Mas-Colell, A.; Whinston, M. and Green, J. (2006): *Microeconomic Theory*, Oxford University Press.

Osborne, M. (2004): *An Introduction to Game Theory*, Oxford University Press.

Osborne, M. and Rubinstein, A. (1994): *A Course in Game Theory*, MIT Press.

3.6   Economic Development and Policy in India: EC006

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 6 hours.

- **Credits** : 6.

- **Course Objectives**

  The aim of this course to familiarise students with recent research on issues concerning economic development and policy in India, with an emphasis on contemporary debates, and to train them in the conduct of policy analysis using the tools of economics. In particular, the course will help students to understand the application of economic theory, and the statistical and econometric techniques that they are taught in other courses. The approach is modular, and will vary with time, depending on the nature of current policy discourse and the expertise of the instructor.

- **Course Learning Outcomes** Students will have the tools to understand current policy debates and contribute to policy making in an informed way. They will also learn how to conduct independent research in these areas.

- **Content: Unit-wise**

  1. Poverty and inequality
  2. Food and nutrition
  3. Economic reforms and industrial performance
  4. Agriculture

- **Suggested Readings**

  Aghion,P.; Burgess, R.; Redding, S.J. and Zilibotti F. (2008): The Unequal Effects of Liberalization: Evidence from Dismantling the License Raj in India, *American Economic Review*.

  Birthal, P.; Negi, D.; Khan, Md. and Agarwal, S. (2015): Is Indian agriculture becoming resilient to droughts? Evidence from rice production systems, *Food Policy*.

  Chaurey, R. (2015): Labor regulations and contract labor use: Evidence from Indian firms, *Journal of Development Economics*.

  Das, S.; Ghate, C. and Robertson, P. (2015): Remoteness, urbanization and India's unbalanced growth, *World Development*.

  Fishman, R.; Lall, U.; Modi, V. and Parikh, N. (2016): Can electricity pricing save India's groundwater? Evidence from a novel policy mechanism in Gujarat, *Journal of the Association of Environmental and Resource Economists*.

  Gaiha, R.; Jha, R. and Kulkarni, V. (2015): Affluence, Obesity and Non-communicable diseases in India, in Gaiha et al., Diets,*Malnutrition and Disease*, Oxford University Press.

  Gangopadhyay, S. Lensink, R. and Yadav, B. (2015): Cash or in-kind transfers? Evidence from a randomised control trial in Delhi, India, *Journal of Development Studies*.

  Kaushal, N. and Muchomba, F. (2015): How consumer price subsidies affect nutrition, *World Development*.

  Mukim, M. (2015): Coagglomeration of formal and informal industry: Evidence from India, *Journal of Economic Geography*.

  Sanga, P. and Shaban, A. (2017): Regional divergence and inequalities in India, *Economic and Political Weekly*.

4

Elective Courses

4.1   Microeconomics

4.1.1   Mathematical Economics: EC101

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours.

- **Credits** : 5.

- **Course Objectives**

  This course is designed for students who plan to do further graduate level work in economic theory, especially those with a keen interest in creating, as opposed to consuming, pure theory.

- **Course Learning Outcomes** The course aims for students to learn the following: (1) a rigorous exposure to a selection of basic mathematical tools that are used by economic theorists, and (2) applications of these methods to some areas of economic theory including duality theory, game theory, the Arrow-Debreu model and comparative statics.

- **Content: Unit-wise**

  1. Set theory and preliminaries
  2. Topological Spaces:
     Metric spaces, topological spaces and continuous functions; various useful constructions, e.g., projective and inductive topologies
     Countability and separability properties
     Compactness, completeness, connectedness, etc.
     Topologies on function spaces; linear spaces, weak topologies; topologies on space of probability measures
     Convex analysis; separation theorems
     Set-valued mappings, fixed point theorems
  3. Arrow-Debreu model: existence and optimality

    4. Debreu-Scarf theorem

    5. Duality theory

    6. Nash's existence theorem

    7. Lattices, supermodularity and comparative statics

- **Suggested Readings**

  Aliprantis, C., Brown, D. and Burkinshaw, O. (1990): *Existence and Optimality of Competitive Equilibria*, Springer-Verlag.

  Berge, C. (1963): *Topological Spaces*, Macmillan.

  Debreu, G. (1959): *Theory of Value*, Yale University Press.

  Hildenbrand, W. and Kirman, A. (1988): *Equilibrium Analysis*, North-Holland (1988).

  Munkres, J. (1975): *Topology: A First Course*, Prentice-Hall.

4.1.2   Contract Theory: EC102

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours.

- **Credits** : 5.

- **Course Objectives**

  Contracts are the bedrock for functioning of the market as well as non-market economic systems. Unsurprisingly, the study of contracts and the associated incentive structures has been a major preoccupation of thinking and research in Economics. Most of the real world contractual settings are characterized by conflict of interests as well as asymmetry of information among the individuals involved. Accordingly, this course examines the incentives and outcomes for various contractual settings, covering contracts used by the market as well as non-market economic systems.

- **Course Learning Outcomes**

  The learning outcomes of the course are as follows: First, students successfully completing this course will enhance their skill to develop formal analytical framework to examine the contractual settings and the economic systems covered in the course. Second, they will learn about incentive structures for the individuals and firms involved. Finally, they will learn to draw policy conclusions about optimal contracts for various settings covered in the course.

- **Content: Unit-wise**

  1. Decision Making Under Uncertainty:
     The Expected Utility Theorem; Money Lotteries; Measure of Risk aversion; Comparing Risk aversion; Comparison of risky alternatives, Insurance.

2. Hidden Information and Adverse Selection:

   The first-best versus the second-best in presence of informational asymmetry; Single-crossing condition and monotonicity of choice; The Revelation Principle; The Rent Extraction versus Allocative Efficiency Tradeoff; Screening and its applications - Credit Rationing, Regulation, Insurance; Signalling and its applications.

3. Hidden Action and Moral Hazard:

   The basic principal-agent problem; Rent Extraction-Efficiency Tradeoffs, The first-order approach; Linear and Non-linear Contracts; Insurance Contracts; Value of information; Adverse selection with Moral hazard; Multi-task moral hazard; Relational Contracts.

4. Competition and Moral hazard in Teams:

   Competition among agents; Symmetric and Asymmetric Competitions; Relative performance evaluation; Multi-agent moral hazard; Moral hazard in teams; Firm as a team.

5. Incomplete Contracts:

   Basic framework; Verifiability; Hold-up problem and its consequences; Market and Non-market Organizations; Markets and contracts; Foundations of Incomplete Contracts; Procurement Contracts for Public Goods; Short-term versus Long-term Procurement Contracts; Public versus Private ownership; Public Private Partnerships.

- **Suggested Readings**

  The detailed reading list will contain those below along with several papers for each section.

  Bolton, P. and Dewatripont, M. (2005): *Contract Theory*, MIT Press.

  Hart, O. (1995): *Firms, Contracts and Financial Structure*, Oxford University Press.

  Laffont, J. and Martimort, D. (2002), *The Theory of Incentives*, Princeton University Press.

  Mas-Collel, A.; Whinston, M. and Green, J. (1995): *Microeconomic Theory*, Oxford University Press

  Singh, R. (2018): 'Public-private Partnerships vs. Traditional Contracts for Highways', *Indian Economic Review*, Vol. 2, 29-64.

4.1.3 Game Theory: EC103

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours.

- **Credits** : 5.

- **Course Objectives**

  The primary objective of this course is to make the student familiar with some of the core ideas, methods and results of noncooperative game theory; a secondary objective is to show the theory in use in substantive economic applications.

- **Course Learning Outcomes**

  The student will learn the rigorous language of game theory, and the important theorems that underpin noncooperative game theory. By the end of the course, the student is expected to be able to develop the facility of using some of these tools to model and analyze situations of conflict and cooperation.

- **Content: Unit-wise**

  1. Formal representation of a non-cooperative game in extensive form. Important notions: information; pure, mixed, and behaviour strategies; Kuhn's theorem; equivalence notions.
     Normal form games. Agent-normal form. Connections with extensive form games. Interpretation of mixed strategies.
  2. Equilibrium notions. Dominant strategy equilibrium, iterated domination arguments, rationalisability. Nash equilibrium: Nash's existence theorem. Subgame perfect equilibria.
  3. Special classes of games: perfect information games and constant-sum games.
  4. Supermodular games, monotone comparative statics.
  5. Economic applications: oligopoly theory, some dynamic games applications.
  6. Incomplete information games. Mechanism design and implementation theory. Revelation principles.
  7. Economic applications, including auction theory and regulation theory.

- **Suggested Readings**

  Fudenberg, D. and Tirole, J. (1991): *Game Theory*, MIT Press.

  Mas-Colell, A.; Whinston, M. and Green, J. (1995): *Microeconomic Theory*, Oxford University Press.

  Myerson, R. (1991): *Game Theory: Analysis of Conflict*, Harvard University Press.

  Osborne, M. and Rubinstein, A. (1994): *A Course in Game Theory*, MIT Press.

4.1.4   Game Theory II: EC104

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours.

- **Credits** : 5.

- **Course Objectives**

  The objective is to discuss selected topics in game theory in some depth. These can vary across different years, depending upon the instructor's choice. They may include, but are not restricted to, the topics listed below.

- **Course Learning Outcomes**

  It is evident that there is overlap between the listed topics. So, for instance, if mechanism design is taught, its unifying framework can be used to study auctions, matching and so forth as well. The student is expected to learn individual topics in some depth, as well as learn some of their interconnections, as in the illustration above.

- **Content: Unit-wise**

  1. Auction Theory and Applications.
  2. Bargaining Theory and Applications.
  3. Matching Theory and Applications.
  4. Mechanism Design and Applications.
  5. Repeated Games and Applications.
  6. Global Games and Applications.
  7. Evolutionary Game Theory.
  8. Epistemic Game Theory.

- **Suggested Readings**

  Relevant papers will be an important part of the references in any given year. In addition, the following books and materials are good sources.

  Battigalli, P. (2018): *Analysis of Strategic Thinking-Part I*, didattica.unibocconi.edu

  Borgers, T. (2015): *An Introduction to the Theory of Mechanism Design*, Oxford University Press.

  Krishna, V. (2009): *Auction Theory*, Elsevier-Academic Press.

  Mailath, G. and Samuelson, L. (2006): *Repeated Games and Reputations*, Oxford University Press.

  Milgrom, P. (2017): *Discovering Prices: Auction Design in Markets with Complex Constraints*, Cambridge University Press.

  Morris, S. and Shin, H. (2003): Global games: theory and applications, in: *Advances in Economics and Econometrics (Eighth World Congress of the Econometric Society*, Cambridge University Press.

  Muthoo, A. (1999): *Bargaining Theory with Applications*, Cambridge University Press.

  Roth, A. and Sotomayor, M. (1990): *Two-sided Matching*, Cambridge University Press.

  Sandholm, W. (2010): *Population Games and Evolutionary Dynamics*, MIT Press.

  Vulkan, N.; Roth, A. and Neeman, Z.(2013): *The Handbook of Market Design*, Oxford University Press

4.1.5   Social Choice Theory: EC105

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours.

- **Credits** : 5.

- **Course Objectives**

  Social choice theory studies group decisions that are achieved by aggregating individual preferences. Aggregations may be guided by notions of justice, fairness and efficiency, which are also subjects of political philosophy, making this topic inherently interdisciplinary. The subject has evolved in economics by the systematic modelling of individual preferences and axiomatic structures, and more recently by using Game theory to provide a framework for considering strategic interactions and information revelation in this context. The goal of this course is to introduce students to basics of social choice theory and mechanism design.

- **Course Learning Outcomes**

  The student will learn a set of formal tools with which to analyze economic and social outcomes, as well as ongoing work on mechanism design or design of institutions to implement social choice functions.

- **Content: Unit-wise**

  1. Preference aggregation:
     Arrow's impossibility theorem; Welfare functional; Utilitarianism; Liberal paradox.
  2. Fairness:
     Rawlsian justice; Capability; Equality of opportunity; Envy freeness.
  3. Axiomatic bargaining, Axiomatic cost/surplus allocations, Matching.
  4. Measures:
     Inequality; Poverty; Mobility; Vulnerability.
  5. Mechanism design:
     Strategy proof mechanism, Nash and Bayes-Nash implementation, Auction, Regulation.

- **Suggested Readings**

  Krishna, V. (2009): *Auction Theory*, Elsevier.

  Mas-Colell, A.; Whinston, M. and Green, J. (1995): *Microeconomic Theory*, Oxford University Press.

  Moulin, H. (2004): *Fair Division and Collective Welfare*, MIT Press.

  Sen, A. (1999): *Choice, Welfare and Measurement*, Harvard University Press.

4.1.6 Topics in Economic Theory: EC106

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours.

- **Credits** : 5.

- **Course Objectives**

  The objective is to discuss topics of significance in economic theory at some length. The topics will vary over different years and depend on the instructor's choice, who may choose them from any of a variety of fields, ranging from Micro to Macro.

- **Course Learning Outcomes**

  As a salient illustration, dynamic economics plays a significant role across a wide spectrum of Micro- and Macro- theory. A possible outline for such a course is given below. By the end of the course, students would learn the economics and mathematics of recursive models, modeling individual intertemporal choice, as well as repeated games with exponential discounting, and some of their many economic applications. They would also learn the problems and pitfalls when one models hyperbolic discounting.

- **Content : Unit-wise**

  1. Metric spaces. Contraction mapping theorem. Correspondences. Theorem of the maximum. Blackwell's conditions for a contraction. Dynamic programming and applications from job search, theory of investment, growth.

  2. Repeated games with perfect and imperfect monitoring. Applications to repeated moral hazard (and adverse selection): e.g., collusive repeated oligopoly, relational labour contracts.

  3. Behavioural models of time discounting and applications: Time inconsistency. Hyperbolic discounting model. Dual-self model.

     Applications: consumption-saving choices. Behavioural industrial organisation applications.

- **Suggested Readings**

  Besides papers, the following readings are suggested.

  Dhami, S. (2016): *The Foundations of Behavioural Economic Analysis*, Oxford University Press.

  Mailath, G. and Samuelson, L. (2006): *Repeated Games and Reputations*, Oxford University Press

  Stokey, N.; Lucas, R. and Prescott, E. (1989): *Recursive Methods in Economic Dynamics*, Harvard University Press.

4.1.7   International Trade Theory: EC107

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours.

- **Credits** : 5.

- **Course Objectives**

  This course is designed to make familiarise students with discussions in the area of international trade and trade policy, reviewing traditional theories of international trade and recent developments in the economic literature based on the New trade theory and on the analysis of FDI and global production chains.

- **Course Learning Outcomes**

  The student will be able to analyze historical as well as contemporary issues in trade theory and policy using a variety of lenses provided in the course: classical theories of comparative advantage, imperfect competition, political economy of trade agreements and protectionism. The analytical tools relating to the issues of migration, trade and capital formation will be updated.

- **Content : Unit-wise**

  1. Classical trade theories on comparative advantage (Ricardo and Heckscher-Ohlin frameworks), gains from trade, international equilibrium with continuum

  2. Specific factor models, empirical approaches, HOV and paradox

  3. Trade in intermediate inputs and wages: outsourcing, trade in tasks and sub-modularity

  4. Imperfect Competition:
     Imperfect competition, homogeneity: Krugman, Brander-Spencer models
     Monopolistic competition, heterogeneity
     Generalised oligopoly framework, heterogeneity

  5. FDI and global production, FDI vs. exports

  6. Political economy of trade agreements and upcoming issues of protections

  7. Trade and growth; immiserizing growth; endogenous growth with homogeneity and heterogeneity

  8. Migration, international trade and capital formation

- **Suggested Readings**

  Antras, P. (2016): *Global Production: Firms, Contracts, and Trade Structure*, Princeton University Press

  Dornbusch, R.; Fischer, S. and Samuelson, P. (1977): Comparative advantage, trade, and payments in a Ricardian model with a continuum of goods, *American Economic Review* 67, 823-39

Dornbusch, R.; Fischer, S. and Samuelson P. (1980): Heckscher-Ohlin trade theory with a continuum of goods, *The Quarterly Journal of Economics* 95, 203-224.

Feenstra, R. (2015): *Advanced International Trade: Theory and Evidence*, Princeton University Press.

Feenstra, R. (2010): Measuring the gains from trade under monopolistic competition, *Canadian Journal of Economics*, 1-28.

Feenstra, R. (2016): Gains from trade under monopolistic competition, *Pacific Economic Review* 21.

Felbermayr, G.; Grossmann, V. and Kohler, W. (2015): Migration, international trade, and capital formation: Cause or effect?, in R. Barry, Chiswick, P. Miller (eds.), *Handbook of the Economics of International Migration*, North Holland.

Freund, C. and Ozden, C. (2008): Trade policy and loss aversion, *American Economic Review* 98, 1675-1691

Gopinath, G.; Helpman, E. and Rogoff, K. (2014) (eds.): *Handbook of International Economics, Vol. 4*, Elsevier

Limao, N. and Tovar, P. (2011): Policy choice: Theory and evidence from commitment *via* international trade agreements, *Journal of International Economics* 85, 186-205.

4.2 Macroeconomics

4.2.1 Dynamic Macroeconomics: EC201

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours.

- **Credits** : 5.

- **Course Objectives**

  Dynamic models and approaches to policy making are integral to modern macroeconomics. This course emphasizes the use of recursive methods to analyze macroeconomic models. Applications involve building on the models introduced in compulsory macro, such as deterministic and stochastic growth and OLG models, as well as search models and dynamic public finance.

- **Course Learning Outcomes**

  This course will enable students to understand and apply dynamic programming methods to analyze macroeconomic problems and policy.

- **Content: Unit-wise**

1. Competitive Equilibria in Dynamic Economies:

   Stochastic difference equations; Markov processes; Dynamic Programming, Complete Markets; sequential trading and Arrow securities; Recursive competitive equilibrium; examples of incomplete markets.

2. Optimal Fiscal Policy

3. Optimal Taxation with and without commitment

4. Search, Matching and Unemployment

   McCall's model of intertemporal job search, A lake model, A model of career choice, Jovanovic's matching model

5. The savings problem and Bewley models

- **Suggested Readings**

  Ljungqvist, L. and T. Sargent: *Recursive Macroeconomic Theory*, Fourth Edition, MIT Press, 2018.

  Adda, J. and R. Cooper: *Dynamic Economics: Quantitative Methods and Applications*, MIT Press, 2003.

  Farhi, E., C. Sleet, et al. (2012): "Non-linear Capital Taxation without Commitment." *Review of Economic Studies* .

  Taylor, John B. and Uhlig, Harald (2016): *Handbook of Macroeconomics*, North-Holand: Elsevier

4.2.2   Computational Macroeconomics: EC202

- **Marks**: Assignments - 50, Exam - 50

- **Duration (per week)**: 5 hours.

- **Credits** : 5.

- **Course Objectives**

  The objective is to teach the analytical and numerical tools for solving dynamic macroeconomics models. This includes relevant software (Matlab, Dynare).

- **Course Learning Outcomes**

  The student will understand recursive methods to express dynamic macro models, as well as gain facility in solving them numerically using Dynare (a software package written on Matlab). In particular, they will learn the formulation and solution of DSGE models, and their Bayesian estimation.

- Content: Unit-wise

  1. Introduction of coding the dynamical Systems: Deterministic and stochastic difference equations, Markov Process, Ergodic Theory, basic programming with Dynare.

2. Dynamic Optimisation: Markov Decision Process Model, Finite-Horizon Dynamic Programming, Infinite-Horizon Dynamic Programming, Applications, hands-on exercise in dynare, Linear-Quadratic Models, Control under Partial Information, Numerical Methods.

3. Application of RBC and New Keynesian models and simulation, and Bayesian Estimation of DSGE Models Using Dynare.

4. Application of standard New Keynesian in open economy with informal sector

5. Estimating non-linear models with states and with filtering states

6. Dynamic programming and projection methods

7. Heterogeneous models and estimations
   Aiyari model and Krusell-Smith models and their extensions.

- **Suggested Readings**

  Judd, Kenneth L., 1998, Numerical Methods in Economics, Cambridge: MIT Press.

  Hommes, Cars and LeBaron, Blake (2018), Handbook of Computational Economics, Vol 4, Elsevier.

  Miao, Jianjun (2013), Economics Dynamics: A Discrete Time, Boston University.

4.2.3 International Macroeconomics: EC203

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours.

- **Credits** : 5.

- **Course Objectives** The course is aimed at providing students with a comprehensive knowledge of modern macroeconomic theory in a way that develops intuition and technical ability to apply macroeconomic theory in practice in an open economy environment. This is the study of how trade between countries in goods, services, and assets changes over time, both over the business cycle and the long run. The course offers important concepts, empirical facts, and puzzles in international macro and builds models to make sense of them (or not, in some cases!) Students will be equipped with the key tools needed to formulate and solve problems analytically and provided with an appreciation of how these tools can be used to understand real world events and policy.

- **Course Learning Outcomes**

  On successful completion of this course, students will be able to:

  (a) Recognise key concepts, theories and models of macroeconomics in open economy environment

  (b) Apply macroeconomic tools to the analysis of a variety of real world events, empirical trends and policy.

  (c) Communicate concepts, graphically, mathematically and in writing, to a professional standard.

(d) Evaluate real world events and illustrate their arguments in terms of relevant macroeconomic models.

- **Content: Unit-wise**

  1. Preliminaries and basic models:

     Business-Cycle Facts Around the World, Global imbalances and balances of payment accounting; An Open Endowment Economy; An Open Economy with Capital; The Open Economy Real-Business-Cycle Model.

  2. Standard New Keynesian model with open economy

  3. Business Cycles, Trade, Exchange Rates and Unemployment:

     Business Cycles in Emerging Countries: Productivity Shocks Versus Financial Frictions; Interest-Rate Shocks; Importable Goods, Exportable Goods and the Terms of Trade; Nontradable Goods and The Real Exchange Rate; Nominal Rigidity, Exchange Rates and Unemployment.

  4. Policy:

     Exchange Rate Policy And Capital Controls; Financial Frictions And Aggregate Instability.

  5. Sovereign debt, default and crises:

     Sovereign Default; Government debt in international macroeconomics; sovereign debt crises; International capital flow puzzles.

  6. Modeling joint dynamics of the current account and the real exchange rate under currency paradigms

- **Suggested Readings**

  Gopinath, G.; Helpman, E. and Rogoff, K. (2014)(ed): *Handbook of International Economics*, Vol. 4. Amsterdam: Elsevier.

  Schmitt-Grohe, S.; Uribe, M. and Woodford, M. (2016): *International Macroeconomics*, Princeton University Press.

  Uribe, M. and Schmitt-Grohe, S. (2017): *Open Economy Macroeconomics*, Princeton University Press.

4.2.4   Monetary Theory and Policy: EC204

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours.

- **Credits** : 5.

- **Course Objectives**

  This course aims to acquaint the students with the role played by monetary policy and the impact of introducing money in standard economic theory models. The course covers money-in-the-utility function model and the New Keynesian model of monetary

policy. The course also includes a discussion on the role played by monetary policy in the open economy context. The course also delves on discretionary policy vs rules and monetary policy strategies.

- **Course Learning Outcomes**

  On successful completion of this course, students will be able to:

  1. Understand monetary models
  2. Analyse transmission mechanism of monetary policy
  3. Comprehend and analyse the impact of monetary policy on the economy
  4. Compare impact of monetary rules vs discretionary policy
  5. Understand monetary policy strategies

- **Content: Unit-wise**

  1. Money-in-the-Utility Function
     MIU model; steady state equilibrium; Nonsuperneutrality; Dynamics.
  2. New Keynesian Models of Monetary Policy
     Basic New Keynesian model; Monetary policy analysis in the New Keynesian model
  3. Monetary Policy in an Open Economy
     Two-country model; Policy coordination; Small open economy models
  4. Discretionary Policy and Rules
     Policy Objectives; Targeting rules; Taylor Principle; Inflation Targeting framework; Commitment vs. Discretion
  5. Monetary Policy Operating Procedures
     Instruments and goals; Effects of operating procedures; policy measures; Role and strategies of Central Bank communication in Monetary Policy; Forward guidance; Unconventional monetary policy

- **Suggested Readings**

Gali, J. (2015): *Monetary Policy, Inflation, and the Business Cycle*, Princeton University Press.

Walsh, C. (2017): *Monetary Theory and Policy*, 4th Edition, MIT Press

Woodford, M. (2003): *Interest and Prices: Foundations of a Theory of Monetary Policy*, Princeton University Press

Bianchi, F., and Melosi, L.(2018): "Constrained Discretion and Central Bank Transparency", *Review of Economics and Statistics*, 100 (1), 187-202.

Hansen, S., McMahon, M., and Tong, M.(2019): "The Long-run Information Effect of Central Bank Communication", CEPR Discussion Paper 13438.

4.2.5   Macroeconomics of Development: EC205

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours.

- **Credits** : 5.

- **Course Objectives**

  The course is motivated by two fundamental queries: (i) What explains the vast divergence in growth patterns across the world? (ii) What is an appropriate government policy (if any) in a low income-low growth country which can usher in a "high growth" regime? Modern growth theory has moved beyond the neoclassical framework to provide answers to these set of questions. This course takes a closer look at these alternative theories.

- **Course Learning Outcomes**

  This course will enable students to understand, evaluate and compare various policies that promote growth. It will also help them understand the deeper institutional and cultural characteristics that might be the root cause of underdevelopment in many poor countries.

- **Content: Unit-wise**

  1. Proximate Causes of Growth:

     (a) Human Capital: The Ben Porath model of human capital accumulation; The Nelson-Phelps model of skill-technology complementarity.

     (b) Technology: Distance to the frontier and technology diffusion; Directed technological change; Appropriate versus inappropriate technologies.

  2. Deeper Causes of Growth:

     (a) Imperfect Markets: Credit Market Imperfection and Indivisibility of investment; Risk, diversification and financial institutions.

     (b) Political Economy: Inequality, Taxation and Growth; Democracy versus Oligarchy.

     (c) History versus Expectations: Underdevelopment as coordination failure; Multiple equilibria in technology adoption.

     (d) Culture: Culture, risk and entrepreneurship; Culture, patience and occupational choice.

- **Suggested Readings**

  This course is primarily based on journal articles too numerous to list here. A broad overview of the topics can be found in the following text books:

  Acemoglu, D. (2009): *Introduction to Modern Economic Growth*, Princeton University Press

  Aghion, P. and Howitt, P. (2009): *The Economics of Growth*, MIT Press

  A few representative articles are listed:

Acemoglu, Daron (2002): "Directed Technical Change." Review of Economic Studies 69: 781–809.

Acemoglu, Daron, and Zilibotti, Fabrizio (1997) "Was Prometheus Unbound by Chance? Risk, Diversification and Growth." Journal of Political Economy 105: 709–751.

Adsera, Alicia and Ray, Debraj (1998) "History and Coordination Failure", Journal of Economic Growth 3(3) 267–276.

Alesina, Alberto, and Rodrik, Dani (1994) "Distributive Politics and Economic Growth." Quarterly Journal of Economics 109: 465–490.

Ben-Porath, Yoram (1967) "The Production of Human Capital and the Life Cycle of Earnings." Journal of Political Economy 75: 352–365.

Doepke, Matthias and Zilibotti, Fabrizio (2008), "Occupational Choice and the Spirit of Capitalism", The Quarterly Journal of Economics, 123 (2), 747–793.

Galor, Oded and Zeira, Joseph (1993), "Income Distribution and Macroeconomics." Review of Economic Studies 60: 35–52.

Greenwood, Jeremy and Smith, Bruce (1997), "Financial markets in development, and the development of financial markets", *Journal of Economic Dynamics and Control*, 1997, 21(1), 145-181

Nelson, Richard R.,and Edmund S. Phelps (1966): "Investment in Humans, Technological Diffusion,and Economic Growth." American Economic Review 56: 69–75.

4.3 Economic History/History of Economic Thought

4.3.1 Contemporary Issues in Historical Perspective: EC301

Marks: Assignments - 30, Exam - 70

Duration (per week): 5 hours.

Credits : 5.

- **Course Objectives**: This course aims to connect contemporary issues in economics with their historical counterparts to better understand the evolution of ideas and the empirical patterns that accompany them. Many of the questions that are the centre of charged and polarized discussions today have interesting histories whose reading can provide sharpness and context to current debates. Each year, a few of these issues will be selected. The readings given below are therefore indicative. They are an example of what will be used for two broad topics: Environmental Change and Group Inequality.

- **Course Learning Outcomes:** The class will be a mixture of lectures and seminar-type discussions based on assigned material that is read before coming to class. Students will learn how to combine historical argument with the tools of modern microeconomic analysis.

- **Content: Unit-wise**

    1. Historical facts about our changing environment:
        Trends in population, GDP, energy use and pollution. Milestones in environmental regulation since the early twentieth century.

    2. The commons problem:
        Community institutions and collective action.

    3. Environmental regulation:
        Types of international agreements that have emerged to avoid environmental degradation. Game-theoretic analysis of the stability of such agreements. Price versus quantity regulation.

    4. Discrimination:
        Evidence on the practice of discrimination, correspondence studies, Models of statistical and preference-based discrimination. Segregation.

    5. Social policy to address group inequalities:
        Affirmative action in historical and cross-national perspective.

- **Suggested Readings**

    Adida,Claire; Laitin, David D. and Valfort, Marie-Anne (2010): "Identifying barriers to Muslim integration in France." PNAS 107(52), 22384-22390.

    Dirks, Nicholas (2001): *Castes of Mind: Colonialism and the making of modern India*, Princeton University Press .

    Barrett, Scott (2006): *Environment and statecraft: the strategy of environmental treaty-making.* Oxford University Press

    Guha, Ramachandra (2001): *The unquiet woods: ecological change and peasant resistance in the Himalaya.*

    Henderson, Vernon J. (1996) "Effects of air quality qegulation." *The American Economic Review* pp. 789-813.

    McNeil, J.R. (2000): *Something new under the sun: An environmental history of the twentieth- century world.* W.W. Norton.

    Ostrom, Elinor (2010): *Governing the commons: The evolution of institutions for collective action.* Cambridge University Press.

    Loury, Glenn C. (2002): *The anatomy of racial inequality.* Harvard University Press.

    Galanter, Mark (2004): "Competing equalities: law and the backward classes in India," University of California Press

    Weisskopf, Thomas E.(2004): *Affirmative action in the United States and India: a comparative perspective.* Routledge

4.3.2 Topics in Economic and Social History: EC302

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours.

- **Credits** : 5.

- **Course Objectives**

  This course critically examines the mainstream characterisation of global migration flows. After discussing the impulses that led to the massive movement of people across continents in the 19th century, the course focuses attention on plantations, a sector that was one of the largest employers of migrant labour.

- **Course Learning Outcomes** The student will understand the diverse recruitment strategies used on the plantations in this period, and also, in depth, the causes and consequences of the variety of labour contracts (including indenture) under which workers were employed. Additionally, they will develop an understanding of gender dimensions of migration and work are discussed in a separate sub-section.

- **Content : Unit-wise**

  1. Global migration flows in the 19th century

  2. Plantations in the colonies: indentured labour

  3. Other types of labour contracts

  4. Women workers in the 19th century

  5. Role of plantations in the colonial economy

- **Suggested Readings** Breman, J. (1990): *Taming the Coolie Beast: Plantation Society and the Colonial Order in Southeast Asia*, Oxford University Press.

  Carter, M. (1994): Lakshmi's legacy: the testimonies of Indian women in 19th century Mauritius, *Editions de l'océan Indien*

  Carter, M. (1996): *Voice from Indenture: Experiences of Indian Migrants in the British Empire*, Leicester University Press

  Lal, B. (1983): Girmitiyas: the origins of the Fiji Indians, *Journal of Pacific History*

  Mintz, S. (1985): *Sweetness and Power: The Place of Sugar in Modern History*, Penguin

  Tinker, H. (2001): *A New System of Slavery: The export of Indian labour overseas 1830-1920*, Hansib Educational Books

4.3.3   History of Economic Analysis: EC303

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours

  Credits : 5

  Course Objectives: This course traces the development of the ideas that have led to the methods of economic analysis that are considered best practice in the discipline. It will also expose students to non-mainstream paradigms that have emerged in the discipline.

- **Course Learning Outcomes:** Students will follow the evolution of the techniques they are taught in many of their compulsory courses. This will help them critically evaluate economic techniques and link them to the challenges of economic environment that led to their emergence.

- **Content: Unit-wise**

  1. Classical political economy:
     The development and growth of nations and the distribution of income across the owners of labour, capital and land.
  2. Neoclassical microeconomics:
     Demand theory, welfare economics and general equilibrium analysis.
  3. Information economics and game theory:
     The effects of missing information and strategic behaviour on the functioning of markets.
  4. Macroeconomics and financial markets:
     Origins of macroeconomics in the Great Depression and its subsequent development.
  5. The development of empirical methods:
     Statistical thinking and causal inference in economics.
  6. Endogenous preferences and behavioral economics:
     The move beyond traditional notions of preferences and maximizing behavior.

- **Selected Readings**

  J. Angrist and J. S. Pischke (2010): "The credibility revolution in empirical economics: How better research design is taking the con out of econometrics", *Journal of Economic Perspectives*, 24(2): 3-30.

  Blaug, M. (1987): *Economic Theory in Retrospect.* Cambridge, Cambridge University Press (1987).

  Bowles, S.: *Microeconomics: Behavior, Institutions, Evolution.* New Delhi, Oxford University Press (2004).

  Galbraith, J.: *The Affluent Society.* Boston, Houghton Mifflin (1958).

R. L. Heilbroner: *The Worldly Philosophers.* New York, Simon & Schuster (1986).

J. R. Hicks (1946). *Value and Capital.*

J. M. Keynes (1936). *The general theory of employment, interest and money.*

Krugman, P.: *The return of depression economics and the crisis of 2008.* WW Norton & Company (2009).

Mankiw, N. (1990): "A Quick Refresher Course in Macroeconomics." *Journal of Economic Literature*, 28(4): 1645-1660.

O. Rogeberg and H. O. Melberg (2011). "Acceptance of unsupported claims about reality: a blind spot in economics." *Journal of Economic Methodology*, 18(01): 29-52.

N. Scheiber (2007). "Freaks and geeks: How freakonomics is ruining the dismal science." *The New Republic*, 2: 27-31.

T. Scitovsky (1986). *Human Desire and Economic Satisfaction.* New York, Wheatsheaf.

Shleifer, A. (2000). *Inefficient markets: an introduction to behavioral finance.* Oxford University Press.

A. Smith. (1776). *An Inquiry Into the Nature and Causes of the Wealth of Nations.*

J. E. Stiglitz. *Whither Socialism?* Cambridge, Massachusetts, MIT Press.

4.4 Econometric Methods and Applications

4.4.1 Econometric Methods: EC401

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours.

- **Credits** : 5.

- **Course Objectives**

  This course provides the theoretical underpinnings for conducting applied econometric studies. It provides the conceptual framework on which such analyses are based, supplemented by illustrative empirical applications. Students will need to have passed course 003 in order to be eligible to take this course.

- **Course Learning Outcomes**

  The ability to conduct empirical analyses and data analytics are increasingly valued in the job market. This course will enable students to understand why and how questions are to be framed and answered. It will also equip them to learn more advanced topics on their own.

- **Content: Unit-wise**

1. Ordinary Least Squares, Hypothesis Tests and Model Selection.

2. Nonlinear, Semiparametric and Nonparametric Regression Models.

3. Endogeneity and Instrumental Variable Estimation.

4. Systems of Equations and Panel Data.

5. Simulation Based Inference.

6. Discrete Choice Models, Truncation and Censoring.

7. Special topic (will vary each year)

- **Suggested Readings**

Greene, William H. (2018): Econometric Analysis, Pearson India Education Services.
Supplementary material for empirical applications will also be provided.

4.4.2 Impact Evaluation Methods: EC402

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours.

- **Credits** : 5.

- **Course Objectives**

  The objective of this course is to introduce students to techniques used to evaluate the impact of programmes and policies on design outcomes. It will underline the need for context-specificity, but in each case, the focus will be on uncovering causal impact. It will review various techniques used to achieve identification, and discuss their limitations. It will use examples from India and overseas to anchor discussion of each of these methods.

- **Course Learning Outcomes**

  Impact assessment tools are being increasingly used in public, private and NGO sectors to evaluate which interventions and programmes work, and how cost-effective they are. This course will therefore be of benefit to students in a wide range of careers.

- **Content: Unit-wise**

  1. Randomized Control Trials

  2. Control Function Approaches

  3. Matching Methods

  4. Regression Discontinuity

  5. Mixed Methods

- **Suggested Readings**

  Rosenbaum, P. (2017): *Observation and Experiment: An Introduction to Causal Inference*, Harvard University Press

Morgan, S. and Winship, C. (2010): *Counterfactuals and Causal Inference: Methods and Principles for Social Science Research.* Cambridge University Press

J. Angrist, J-S Pischke: *Mostly Harmless Econometrics: An Empiricist's Companion*, Princeton University Press (2014)

S. Athey, G. Imbens (2016): The State of Applied Econometrics: Causality and Policy Evaluation.

4.4.3 Time Series Analysis: EC403

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours.

- **Credits** : 5.

- **Course Objectives**

  This course familiarizes students with advanced modelling techniques using time series data. The course primarily focuses on acquainting students with technical skills along with implementation of time series models using software. Students can apply time series econometrics to a wide variety of macro and financial data problems.

- **Course Learning Outcomes**

  On successful completion of this course, students will be able to: (a) Relate to the key concepts in time series econometrics. (b) Apply time series methods to analyse various situations using time series econometrics software. (c) Evaluate real world problems by formulating and utilizing the appropriate time series models.

- **Content: Unit-wise**

  1. Unit Roots, Cointegration and ARDL:
     Deterministic and stochastic trend, trend stationary and difference stationary process; Random walk model; Testing for unit roots, structural change, multiple unit roots, seasonal unit roots; Cointegration, error correction; Testing for cointegration; ARDL Bounds Testing Approach.

  2. Box-Jenkins Methodology:
     Stationarity, invertibility; Autoregressive models, moving average models, mixed autoregressive and moving average models; Identification, estimation, diagnostic checking; Forecast function.

  3. ARCH/GARCH:
     ARCH Processes; GARCH Processes; ARCH-M and GARCH-M Models.

  4. VAR Models:
     Estimation and identification; Impulse response function; Variance decomposition.

  5. Panel Data Methods:
     Panel Data Unit Root Tests; Panel Data Cointegration Test; Panel Estimation (FMOLS and DOLS).

- **Suggested Readings**

  Box, G.; Jenkins,G.M. and Reinsel, G.C. (2008): *Time Series Analysis: Forecasting and Control*, 4th Edition, John Wiley

  Enders, W. (2015): *Applied Econometric Time Series*, 4th Edition, John Wiley.

  Greene, W. (2018): *Econometric Analysis*, 8th Edition, Pearson.

  Pesaran, M. H. (2015): *Time Series and Panel Data Econometrics*, Oxford University Press.

  Pindyck, R. and Rubinfeld, D. (2000): *Econometric Models and Economic Forecasts*, Fourth Edition, McGraw-Hill.

  Rao, B. Bhaskara (2007): *Cointegration for the Applied Economist*, 2nd Edition, Palgrave Macmillan.

  Tsay, R.(2010): *Analysis of Financial Time Series*, Third Edition, Wiley.

4.4.4   Forecasting Methods and Applications: EC404

- **Marks**: Assignments - 50, Exam - 50

- **Duration (per week)**: 5 hours

- **Credits** : 5

- **Course Objectives**

  This course covers various quantitative and judgmental techniques used in economic and business forecasting. The course also examines techniques for the evaluation of performance of forecasting methods and combination of forecasts. Practical applications of forecasting using forecasting/econometric software packages are undertaken.

- **Course Learning Outcomes**

  On successful completion of this course, students will be able to:

  1. Understand qualitative and quantitative methods for forecasting in business and economics
  2. Apply time series econometric forecasting methods to practical forecasting settings
  3. Use standard econometric/forecasting software for forecasting
  4. Work on real world forecasting applications

- **Content : Unit-wise**

  1. Overview of Forecasting and Forecast Evaluation
     Applications of forecasting; Forecasting methods and forecast horizons; Nowcasting and backcasting; Measures and tests of accuracy; Choosing between forecasting methods; Unbiasedness and Rationality

2. Combination of Forecasts

   Forecast Encompassing; Optimal combining weights

3. Univariate Models: Smoothing Techniques and Box-Jenkins Methodology

   Averaging methods; Exponential smoothing methods; Decomposition methods; Unit roots; Autoregressive models, moving average models, mixed autoregressive and moving average models; Identification, estimation, diagnostic checking; Forecast function

4. Multivariate Models: Regression Models, Simultaneous Equations Models, VAR models

   Multivariate regression model; Implications of violation of OLS assumptions for forecasting; Observational Equivalence, reduced form representation; Estimation, forecasting and simulation with simultaneous equation model; VAR models; Cointegration

5. Judgmental Forecasting

   Jury of executive opinion; Delphi approach; Sales force composite methods; Anticipatory surveys and market research-based assessments

- **Suggested Readings**

Box, G.E.P., G.M. Jenkins, and G.C. Reinsel (2008), Time Series Analysis: Forecasting and Control, 4th Edition, John Wiley & Sons Inc.

Brooks, C. (2019): *Introductory Econometrics for Finance*, 4th Edition, Cambridge University Press.

Diebold, F.X. (2006): Elements of Forecasting, 4th Edition, South-Western Publishers.

Diebold, F.X. (2017): *Forecasting: Economics, Business, Finance and Beyond.*
https://www.sas.upenn.edu/ fdiebold/Teaching221/Forecasting.pdf

Delurgio, S.A. (1998): *Forecasting Principles and Applications*, McGraw-Hill Publishers.

Enders, W. (2015): *Applied Econometric Time Series*, 4th Edition, John Wiley & Sons, Inc.

Hanke, J.E. and D. Wichern (2008): *Business Forecasting*, 9th Edition, Pearson Publishing.

Makridakis, S.G.; Wheelwright, S.C. and Hyndman, R.J. (1998): *Forecasting: Methods and Applications*, 3rd Edition, John Wiley & Sons, Inc.

Newbold, P. and Bos, T. (1994): *Introductory Business & Economic Forecasting*, 2nd Edition, South-Western Publishers.

Pesaran, M.H. (2015): *Time Series and Panel Data Econometrics*, Oxford University Press.

Pindyck, R.S. and Rubinfeld, D.L. (1997): *Econometric Models and Economic Forecasts*, Fourth Edition, McGraw-Hill.

4.4.5 Applied Production Analysis: EC405

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours.

- **Credits** : 5.

- **Course Objectives**

  This is an applied course intended to equip students with relevant skills and competences to analyse production technologies and producer behaviour with appropriate applied methods/tools.

- **Course Learning Outcomes**

  The student will develop a thorough understanding of production theories, estimation techniques for efficiency and productivity measurement.

- **Content : Unit-wise**

  1. Primal approaches in production economics: theory and econometric estimation

  2. Dual approaches in production economics - cost minimization and cost function, profit maximization and profit function: theory and econometric estimation

  3. Multi-output technologies and their estimation: input, output and directional distance functions

  4. Functional forms used in applied production analysis: Cobb-Douglas, translog, quadratic etc. Unit V: Efficiency and Productivity Analysis: concepts and measurements (stochastic frontier analysis (SFA), DEA etc.)

- **Suggested Readings**

  Chambers, R.(1988): *Applied Production Analysis: A Dual Approach*, Cambridge University Press

  Färe, R.; Grosskopf, S. and Primont, D. (2007): *Aggregation, Efficiency and Measurement*, Springer.

  Färe, R. and Primont, D. (1995): *Multi-Output Production and Duality: Theory and Applications*, Kluwer Academic Publishers.

  Grifell-Tatjé, E.; Lovel, C. Knox and Sickles, R. (2018): *The Oxford Handbook of Productivity Analysis*, Oxford University Press.

  Kumbhakar, S.; Wang, H.-J. and Horncastle, A.(2014): *A Practitioner's Guide to Stochastic Frontier Analysis*, Cambridge University Press.

  Moreover, readings in the form of journal articles and working papers

4.4.6 Applied Consumption Analysis: EC406

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours.

- **Credits** : 5.

- **Course Objectives**

  The objective of this course is to familiarize students with analyzing issues related to consumer demand using appropriate econometric tools.

- **Course Learning Outcomes**

  The student will learn how to analyze demographically-extended demand systems, as well as dynamic demand systems, using maximum likelihood, and nonparametric estimation techniques.

- **Content: Unit-wise**

  1. Review of Theory: Duality and Separability Concepts, Theoretical Restrictions.
  2. Single-equation approaches: Engel functions, Demand for durable goods.
  3. System Estimation: Functional forms, Estimation procedures, Assumption about error structures, Testing.
  4. Dynamic Demand Systems: Habit formation models, Modelling changes in taste.
  5. Demographically-Extended Demand Systems: Translation, Scaling approaches.
  6. Non-parametric (Regression) Approaches. Applications of Demand Analysis: Food and Nutrition; Demand for non-marketed goods; Welfare applications.

- **Suggested Readings**

  Deaton, A. and Muellbauer, J. (1980), *Economics and Consumer Behaviour*, Cambridge University Press.

  Deaton, A. (1997): Analysis of Household Surveys: A Microeconometric Approach to Development Policy, The John Hopkins University Press.

  Hardle, W. (1992): Applied Nonparametric Regression, Cambridge University Press.

  Pollak, R. and Wales, T. (1992), Demand System Specification and Estimation, Oxford University Press.

  Philips, L. (1983): *Applied Consumption Analysis*, North Holland.

4.4.7 Semi- and Nonparametric Estimation: EC407

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours.

- **Credits** : 5.

- **Course Objectives**

  This course is aimed at giving a brief introduction to the statistical theory of nonparametric density and regression function estimation. The focus is on kernel-based nonparametric estimation and inference. This includes nonparametric kernel density estimation, tests associated with densities, nonparametric kernel regression, tests for correct specification of functional forms, nonparametric sieve estimation, and semi-parametric estimation of single-equation models (including partially linear models, single-index models, additive models, etc.). Several statistical and econometric applications with cross-sectional data will be discussed. A brief discussion of nonparametric and semi-parametric estimation of panel data models will be touched upon.

- **Course Learning Outcomes**

  Students will acquire some understanding and skills in nonparametric estimation, an area that is increasingly important in today's data-rich contexts.

- **Content : Unit-wise**

  1. Parametric vs. nonparametric statistical models. The histogram and the kernel density estimator.
  2. Statistical properties of the kernel density estimator. Bias-variance tradeoff.
  3. Further statistical properties. Bandwidth choice in theory and practice. Kernel choice.
  4. Multivariate kernel density estimator. Curse of dimensionality.
  5. Some direct statistical applications of kernel density estimation.
  6. Nonparametric regression: kernel estimator (Nadaraya-Watson) and local linear regression estimator.
  7. Statistical properties of the Nadaraya-Watson and local linear regression estimator. Series estimation.
  8. Some direct applications of nonparametric regression.
  9. Application: estimating conditional average treatment effects.
  10. Application: estimating regression discontinuity models.
  11. Application: estimating sample selection models.

- **Suggested Readings**

  Abrevaya, J.; Hsu, Y.C. and Lieli, R.(2015): Estimating conditional average treatment effects, *Journal of Business and Economic Statistics* 33, 485-505.

  Calonico, S.; Cattaneo, M. and Titiunik, R.(2014): Robust nonparametric confidence intervals for regression discontinuity designs, *Econometrica* 82, 2295-2326

  Das, M.; Newey, W. and Vella, F. (2003): Nonparametric estimation of sample selection models, *Review of Economic Studies* 70, 33-58

  Pagan, A. and Ullah, A. :(1999) *Nonparametric Econometrics*, Cambridge University Press.

Silverman, B. (1986): *Density Estimation for Statistics and Data Analysis*, Chapman and Hall.

Su, L. (2011): *A Brief Introduction to Nonparametric Econometrics*, Lecture notes, Singapore Management University.

4.4.8 Topics in Econometrics: EC408

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours.

- **Credits** : 5.

- **Course Objectives**

  This course is meant to acquaint students with some advanced techniques in econometric estimation.

- **Course Learning Outcomes**

  Students would become conversant with technical derivations and practical applications in the areas of microeconomics and macroeconomics.

- **Content: Unit-wise**

  1. Linear regression models:
     Instruments, 2SLS estimator, Generalized Instrumental Variables estimator; Simultaneous equations.
  2. Generalised Method of Moments estimator:
     Efficient GMM estimation; Over-identifying restrictions.
  3. Panel Data Models:
     Fixed effects models, Random effects models, Arellano-Bond estimator in dynamic panel data models.
  4. Quantile regression estimation.
  5. Nonlinear Models:
     probit models, logit models (including their multivariate forms), Tobit models, models for count data, censored and missing data schemes.

- **Suggested Readings**

  Wooldridge, Jeffrey M.(2010): *Econometric Analysis of Cross Section and Panel Data*, Second Edition, MIT Press.

4.4.9 Applied Environmental Analysis: EC409

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours

- **Credits** : 5

- **Course Objectives**

  This course focuses on empirical applications in environmental and natural resource economics. It comprises applied optimal control and dynamic optimization problems; computable general equilibrium (CGE) models; and applied econometrics?cross section, panel data (static, dynamic and non-linear models) and discrete choice (limited dependent variable) models.

- **Course Learning Outcomes**

  The emphasis is on understanding tools and techniques and applying them in a hands-on manner with environmental and natural issues as the context.

- **Content : Unit-wise**

  1. Non-market valuation techniques: revealed and stated preferences.
  2. Quasi-experimental methods in environmental economics
  3. Environmental valuation at firm level: environment as an input in production; multi-output production technologies; emission generating production technologies.
  4. Environmental valuation at the macro level: reduced form and computable general equilibrium models.
  5. Environment and technological progress: econometric studies.
  6. Dynamic applications: renewable and non-renewable resources; stock pollutants.

- **Suggested Readings** J. Angrist, J.-S. Pischke: *Mastering Metrics: the Path from Cause to Effect*, Princeton University Press (2016)

  J. Conrad: *Resource Economics, 2nd ed.*, Cambridge University Press (2010)

  R. Färe, D. Primont: *Multi-output production and duality: theory and applications*, Kluwer (1995)

  D. Phaneuf, T. Rquate: *A Course in Environmental Economics: theory, policy and practice*, Cambridge University Press (2016)

  Moreover, readings in the form of journal articles and working papers.

4.4.10   Coding Basics with Economic Applications: EC410

- **Marks**: Assignments - 50, Exam - 50

- **Duration (per week)**: 5 hours

- **Credits** : 5

- **Course Objectives**

  This course will introduce the basics of writing code and applying it to economics. As designed, it will work with the Python programming language. It will begin with an

introduction to data types in Python, basic techniques (iteration, defining functions, branching etc.), some of the Python libraries, and object-oriented programming. It will then introduce basic numerical methods (numerically solving nonlinear equations, optimisation, integration, Monte Carlo and simulation, numerical dynamic programming) and discuss their implementation in Python. The instructor will then have a choice of alternative modules. She can apply these techniques to relatively simple but modern macroeconomic models (Part 3 below), or industrial organisation models (Part 4). Or she can spend more time developing applications to probability and statistics (Part 5). If this last option is chosen, Part 2 of the course, on numerical methods, will have to be reduced and reorganised appropriately.

- **Course Learning Outcomes**

  The students will develop programming and computing skill on simulation and numerical dynamic programming

- **Content : Unit-wise**

  1. Coding in Python: Loops, Lists, Functions, Branching, Curve Plotting, Error Handling, Strings, basics of data handling and web scraping, object-oriented programming. Various Python libraries introduced alongside: Numpy, Scipy, Matplotlib, Pandas, BeautifulSoup, Regular Expressions.

  2. Numerical methods for solving nonlinear equations, fixed points, optimisation, integration, simulation, dynamic programming.

  3. Applications from macroeconomics: job search, stochastic optimal growth, rational expectations equilibrium, asset pricing.

  4. Applications from Industrial Organisation: Estimating demand in differentiated product static oligopoly, estimating single agent dynamic models.

  5. Applications from probability and statistics: generating random numbers and computing probabilities and distributions from first principles, Monte Carlo sampling methods, using the Scipy and Sympy statistics modules to illustrate types of convergence, estimation, confidence intervals, hypothesis testing, Bootstrapping, kernel density estimation, connections with machine learning using the Scikit-learn module.

- **Suggested Readings** V. Aguirregabiria: *Empirical Industrial Organization: Models, Methods and Applications*, Mimeo, University of Toronto (2012)

  J. Guttag: *Introduction to Computation and Programming Using Python*, MIT Press (2016)

  K. Judd: *Numerical Methods in Economics*, MIT Press (1998)

  H. Langtangen: *A Primer on Scientific Programming with Python*, Springer (2016)

  J. Rust: Numerical dynamic programming in economics, in: *The Handbook of Computational Economics*, North-Holland (1996)

  T. Sargent, J. Stachurski: *QuantEcon.lectures-python3*, `https://quantecon.org` (2018)

M. Shum: *Econometric Models for Industrial Organization*, World Scientific (2017)

A. Sweigart: *Automate the Boring Stuff with Python: Practical Programming for Total Beginners*, No Starch Press (2015)

J. Unpingco: *Python for Probability, Statistics and Machine Learning*, Springer (2016)

4.4.11   Environmental Econometrics: EC411

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours.

- **Credits** : 5.

- **Course Objectives**

  This course will provide students with practical applications of econometric and other quantitative techniques to environmental problems especially for developing countries. These techniques include, but are not limited to, panel data regression, semi-parametric and nonparametric estimation, experimental and quasi-experimental techniques, numerical computational methods and machine learning. Ideally, students in this course should have prior exposure to econometric methods and impact evaluation at the level of Courses EC401, EC 402. Any new technique introduced in this course will only be covered in a practical how-to manner. The emphasis in this course will not be on the techniques, per se, but on how they are applied to environment problems especially in developing countries. The pedagogy will be through hands-on learning and projects.

- **Course Learning Outcomes**

  1. Students will become aware of the limitations of conventional, associational studies and the need for more varied empirical techniques.

  2. They will acquire familiarity with policy-oriented research in the field of environment.

  3. They will get hands-on experience in applying these techniques using real-world datasets and statistical software.

- **Content: Unit-wise**

  1. Review of econometric and impact evaluation methods.
  2. Introduction to numerical computational methods, machine learning and Python.
  3. Applications of impact evaluation methods: Environmental policies and programs.
  4. Environmental applications of numerical computational methods and machine learning.
  5. Spatial Econometrics application in environmental and urban economics

- **Suggested Readings**

  Angrist, J. and Pischke, J-S.: *Mostly Harmless Econometrics: An Empiricist?s Companion*, Princeton University Press (2008).

Train, K.: *Discrete choice methods with simulation*, Cambridge University Press (2009).

Gibbons, S. and Overman, H. (2012): "Mostly Pointless Spatial Econometrics?", *Journal of Regional Science*, 52(2), 172-191.

Atak, A., Linton, O. and Xiao, Z.(2011): "A semiparametric panel model for unbalanced data with application to climate change in the United Kingdom", *Journal of Econometrics*, 164(1), 92-115.

Athey, S. (2018). "The impact of machine learning on economics", in *The Economics of Artificial Intelligence: An Agenda*. University of Chicago Press.

Athey, S. and Imbens, G. (2017): "The state of applied econometrics: causality and policy evaluation", *Journal of Economic Perspectives* 31, no. 2 (2017): 3-32.

Blanc, E. and Schlenker, W.(2017): "The use of panel models in assessments of climate impacts on agriculture", *Review of Environmental Economics and Policy*, 11(2):258-279.

Cai, Y. (2018): "Computational methods in environmental and resource economics", *Annual Review of Resource Economics*, 11.

Deschenes, O. and Meng, K. (2018): "Quasi-experimental methods in environmental economics: opportunities and challenges", NBER WP No. 24903.

Hsiang S. (2016): "Climate econometrics", *Annual Review of Resource Economics* 8:43-75.

Larsen, A., Meng, K. and Kendall, B. (2019): "Causal analysis in control?impact ecological studies with observational data", *Methods in Ecology and Evolution*, 10(7):924-934.

Olden, J., Lawler, J. and Poff, N. (2008): "Machine learning methods without tears: a primer for ecologists", *The Quarterly Review of Biology*, 83(2):171-193.

Other readings from journal articles and working papers.

4.5 Finance: Theory, Institutions and Modelling

4.5.1 Corporate Finance: EC501

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours.

- **Credits** : 5.

- **Course Objectives**

The course will mainly focus on the interaction of firms and financial markets, and corporate governance. The study of corporate finance focuses on how firms raise finance and structure their liabilities. In the presence of agency problems, raising finance is

fraught with moral hazard and adverse selection problems. The course will study different aspects of lender-borrower relationships and their market outcomes. Theoretical models will be taught to the students with the help of game theory and information economics. The course would have journal articles and some textbooks as readings.

- **Course Learning Outcomes**

  The students will be familiarised with the advanced theory and practices in corporate finance.

- **Course Content**

  1. Credit rationing
  2. Capital structure
  3. Capital acquisition and initial public offering
  4. Dividend policy
  5. Market for corporate control
  6. Takeovers and acquisitions
  7. Financial intermediation
  8. Corporate governance and corporate board

- **Suggested Readings**

  Amaro de Matos, J. (2001): *Theoretical Foundation of Corporate Finance*, Princeton University Press

  Freixas, X. and Rochet, J.C. (2008): *Microeconomics of Banking*, MIT Press

  Tirole, J. (2006): *The Theory of Corporate Finance*, Princeton University Press

4.5.2   Real Estate Economics and Finance: EC502

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours.

- **Credits**: 5.

- **Course Objectives**

  This course is an introduction to the theoretical and practical functioning of urban real estate markets using concepts from urban economics, finance and real estate economics.

  Starting with the productive and consumption advantages of urban areas and location patterns within cities, we study the implications for demand and supply of residential and commercial real estate, and for real estate asset prices. Subsequently, the objective is to understand valuation techniques for real estate, financial leverage and portfolio considerations, and the impact of policy, particularly taxation and urban planning.

- **Course Learning Outcomes**

This course will be particularly relevant for students interested in understanding real estate related fields in the public or private sector; or for students who are considering further education in this field. The students will draw on theory to assess the impact of a shift in supply and demand on residential and commercial property markets.

- **Course Content: Unit-wise**

  1. Real Estate values over space and time
  2. Why do cities exist? Agglomeration economies and urban consumption
  3. Monocentric City Model and spatial equilibrium City Systems, city size and prices
  4. Real estate supply
  5. Public policy and real estate
  6. Real estate price measurement: median price, hedonic regression, repeat sales
  7. Valuation and risk-assessment of income-producing properties
  8. Financial leverage Real estate investment trusts
  9. Optimal portfolio theory Dynamics of the last housing boom and bust
  10. Emerging market forces in commercial real estate

- **Suggested Readings**

Archer, Wayne R., and David C. Ling, "The three dimensions of real estate markets (1997): Linking space, capital, and property markets", *Real Estate Finance* 14.3 : 5-11.

Brueggeman, W. B. and J. D. Fisher (2005), *Real Estate Finance & Investments*, (13th edition or newer), New York City, NY: McGraw-Hill/Irwin.

Gunnelin, Ake, et al. (2004): "Determinants of cross- sectional variation in discount rates, growth rates and exit cap rates", *Real Estate Economics* 32.2 : 217-237.

O'Sullivan, Arthur (2007): *Urban Economics*, McGraw-Hill/Irwin.

McDonald, J. F. and McMillen, D. P. (2011), *Urban Economics and Real Estate, Theory and Policy*, (2nd edition), Blackwell.

4.5.3 Financial Markets: EC503

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours

- **Credits**: 5

- **Course Objectives**

This course aims to familiarize the students with the concepts and theories related to financial markets. The course focuses on the money market, credit market, stock market, financial derivatives and foreign exchange market. The course also includes a discussion on the interlinkages between the various financial markets.

- **Course Learning Outcomes**

  On successful completion of this course, students will be able to: 1. Understand the basic concepts and working of financial markets.

  2. Relate to the theories pertaining to financial markets and their link with monetary policy.

  3. Use econometric software to analyse financial data (optional).

- **Content: Unit-wise**

  1. Money Market:

     Analytics of Monetary Policy; Rules v/s Discretion; Optimal Instruments of Monetary Policy; Transmission Channels of Monetary Policy; Unconventional Monetary Policy.

  2. Credit Market:

     Imperfect Information in Credit Market; Market Failure.

  3. Stock Market:

     Portfolio Selection-Markowitz Approach, Feasible and Efficient Set; New Portfolio Theory-Capital Asset Pricing Model, Arbitrage Pricing Theory; Consumption Capital Asset Pricing Model, Equity Premium Puzzle.

  4. Financial Derivatives Market:

     Options and Futures, Pricing of Options-Black-Scholes Model and Binomial Option Pricing Model; Pricing of Futures.

  5. Foreign Exchange Market:

     Exchange Rate-Portfolio Balance Model; Monetary Model; Dornbusch Model of Overshooting Exchange Rates; Asian Financial Crisis; Global Financial Crisis.

- **Suggested Readings**

  Bernanke, B. and Blinder, A. (1998): "Credit Money and Aggregate Demand", *American Economic Review.*

  Blanchard, O. and Fischer, S.: *Lectures on Macroeconomics*, MIT Press (1989).

  Bodie, Z., Kane, A. and Marcus, A.: *Investments*, 11th Edition, McGraw Hill Education (2017).

  Dornbusch, R. (1976): "Expectations and Exchange Rate Dynamics", *Journal of Political Economy.*

  Gandolfo, G.: *International Finance and Open Economy Macroeconomics*, Springer (2016).

  Fischer, S. (1990): "Rules v/s Discretion in Monetary Policy", in *Handbook of Monetary Economics*, vol. 2, Friedman, B. and Hahn, F. (ed.) North Holland.

  Jaffee, D. and Stiglitz, J. (1990): "Credit Rationing" in *Handbook of Monetary Economics*, vol. 2, Friedman, B. and Hahn, F. (ed.) North Holland.

Pilbeam, K.: *International Finance*, 4th Edition, Macmillan (2013).

Romer, D.: *Advanced Macroeconomics*, 5th Edition McGraw-Hill (2018).

Sharpe, W., Alexander, G. and Bailey, J.: *Investments*, 6th Edition Prentice Hall (1998).

Stiglitz, J. and Guzman, M. (ed.): *Contemporary Issues in Macroeconomics: Lessons from the Crisis and Beyond*, Palgrave Macmillan (2016).

Walsh, C.: *Monetary Theory and Policy*, 4th Edition, MIT Press (2017).

4.6   Public Policy: Theory and Institutions

4.6.1   Public Economics I: EC601

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours.

- **Credits** : 5.

- **Course Objectives**

  Public Economics is a large and rapidly expanding field of research. It is concerned with normative and positive aspects of a government's activities in an economy. Normative analysis is concerned with how a government should behave to improve social welfare and positive analysis studies the implications of government activities on the behavior of individuals and communities. Governments intervene through regulation, taxation, redistributive transfers, and the provision and production of private and public goods. This course will focus on public spending on public goods, regulation in the presence of externalities and redistributive policy. It will cover important theoretical results in the field and a number of case studies from across the world.

- **Course Learning Outcomes**

  By the end of the course, students will be familiar with important theoretical results in this area and with empirical trends in public spending across the world. They will also be guided in developing their writing skills to express ideas within this field to popular readers.

- **Content: Unit-wise**

  1. The emergence of a social state:
     The evolution of social spending across the world since the early twentieth century.
  2. Efficiency in the provision of public goods:
     The types and quantities of public goods that should be provided.
  3. Externalities and their regulation:
     Sources of externalities, their relationship to contracts and markets and their regulation.

4. Inequality and Distributive Justice:

   Theories of justice. Discrimination. Public policies to tackle group inequalities.

5. Preference Aggregation and Public debate:

   How do we determine provision when we do not know preferences? Voting and other forms of information aggregate in democracies.

- **Suggested Readings**

  Anthony Atkinson and Joseph E Stiglitz: *Lectures on public economics*, Princeton University Press (2015)

  Peter Lindert: *Growing public: Volume 1, the story: Social spending and economic growth since the eighteenth century*, Cambridge University Press (2006)

  Glenn Loury (1994): Self-censorship in public discourse: a theory of political correctness and related phenomena. *Rationality and Society* 6(4), 428 – 461

  Robert Nozick: *Anarchy, state, and utopia*, Basic books (2013)

  Thomas Piketty: *Capital in the 21st century*, Cambridge: Harvard University Press (2014)

  J. Rawls: *Justice as fairness: A restatement*, Harvard University Press (2001)

  J. Roemer: *Equality of opportunity*, Harvard University Press (2009)

4.6.2   Public Economics II: EC602

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours.

- **Credits** : 5.

- **Course Objectives**

  This course covers several topics in Public Economics at an advanced level. The course contents draw upon the recent theoretical and empirical research on the issues covered. The focus of the course is on the following areas: Taxes, Land Markets, Procurement of Public Goods, and Public vs. Private organizations. Each area covered starts with a mathematical model that serves as a basic framework of analysis. The analytical framework is then is extended to cover results from contemporary research works. The reading material and classroom lectures make use of mathematical tools of economic analysis, especially the optimization techniques, and the basic results from the game-theory and information economics.

- **Course Learning Outcomes**

  The learning outcomes of the course as follows: First, students successfully completing this course will enhance their skill to develop formal analytical framework to examine the settings and areas covered in the course. Second, they will learn about the incentive

structure for the individuals and firms involved. Finally, they will learn to draw the policy conclusions related to Taxes, Land Markets, Procurement of Public Goods, and Public vs. Private organizations.

- **Content: Unit-wise**

  1. Taxation:

     Direct Tax, Optimal Taxation; Property and Wealth Taxes; Stamp-Duty Tax; Indirect Tax and Goods and Services Tax (GST); Taxation in India; Tax Evasion and Black Income; Income Inequalities.

  2. Land Markets:

     Land as a Factor of Production; Market in land property, Anti-commons and Land Assembly Problem; Compensation-Efficiency Paradox; Economics and Politics of Land Acquisition; Land supply regulations.

  3. Public Goods and Public Procurement:

     Public Goods; Public versus Private Provisions; Public versus Private Investment; Procurement Contracts; Public Private Partnerships (PPPs) versus Privatization; Incentives and Outcomes under PPP Contracts; Theories of neighborhood development.

  4. Public versus Private Organization:

     Basics of Contract Theory; Risk allocation and Moral Hazard; Incentives in Private and Public versus Private organizations; Bureaucrats versus Managers; Multitasks, etc.

- **Suggested Readings**

  Bolton, P. and M. Dewatripont: *Contract Theory*, MIT Press (2005)

  Stiglitz, J. and Rosengard, J.: *Economics of the Public Sector*, 4th edition, W. W. Norton and Company (2015)

  Bernard Salanie: *Economics of Taxation* 2nd Ed. MIT Press (2011)

  Mirrlees, James et al. (2011). *Tax by Design*, Oxford University Press. Available at $https://www.ifs.org.uk/publications/5353$

  Miceli, Thomas J.: *The Economic Theory of Eminent Domain: Private Property, Public Use*, 1st Edition. Cambridge University Press (2012)

  Anthony B. Atkinson, Joseph E. Stiglitz: *Lectures on Public Economics - Updated Edition.* Princeton University Press (2015)

4.6.3 Environmental Economics: EC603

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours.

- **Credits** : 5.

- **Course Objectives**

  The objective of this course is to present an economic approach to environmental problems such as air and water pollution. Alternative methods of addressing pollution, namely, direct regulation and market based instruments (taxes and tradable permits) are compared and contrasted, especially in the presence of asymmetric information. This is followed by techniques for measuring the benefits of environmental improvements and their applications.

- **Course Learning Outcomes**

  A logical, coherent and sensible understanding of the reasons for (and solutions to) environmental problems. In particular, an ability to apply economic theory to environmental issues with a view to developing effective and rational environmental policies.

- **Course Content: Unit-wise**

  1. Externalities and public goods
  2. Corrective mechanisms (taxes, subsidies, permits)
  3. Regulation with moral hazard and adverse selection
  4. Valuation of non-market goods and amenities: overview and basic theory.
  5. Revealed preference (indirect market methods); health valuation; constructed markets (direct market methods).
  6. Cost-benefit analysis: measuring the cost of environmental policy; estimation of abatement cost functions; damage function assessment; discounting.

- **Suggested Readings**

  K. G. Mäler, J. Vincent: *Handbook of Environmental Economics*, Elsevier (2005)

  Phaneuf and Requate: *A Course in Environmental Economics: Theory, Policy and Practice*, Cambridge University Press (2017)

  Freeman, Herriges and Kling: *The Measurement of Environmental and Resource Values: Theory and Methods*, 3rd ed. RFF Press/Routledge (2014)

  W. Baumol, W. Oates: The Theory of Environmental Policy. Cambridge University Press (1988)

  Champ, Boyle and Brown: *A Primer on Nonmarket Valuation.* Springer (2003)

  Articles from journals and working papers.

4.6.4 Law and Economics: EC604

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours.

- **Credits** : 5.

- **Course Objectives**

  This course examines how the legal and regulatory rules shape rules of the game in a market economy which, in turn, shape the incentive structure for private individuals, firms and other economic agents, and affect the allocation of resources, efficiency and equity.

- **Course Learning Outcomes**

  This course will educate students about how to apply an economic approach toward thinking about the law and regulatory rules. Students will learn how the law is an important organizing force that influences actions of the private citizens as well as various official and regulatory agencies. Students will also learn how the law can support and, at times, can conflict with the functioning of the market and the government, the latter are other organizing forces important for functioning of an economy. The course will enhance critical thinking and inter-disciplinary approach towards law and economics. Thereby, the course will help develop inter-disciplinary approaches and skills and enhance the employability of the students.

- **Content: Unit-wise**

  1. Introduction:
     Efficiency criteria in Law and Economics.
  2. Contract Law:
     Need for a contract; Legal contract; Role of Contracts for functioning of markets; Efficient contracts; Complete and Incomplete Contracts; Reliance; Damages measures and their efficiency properties; Contracts as instrument of risk-allocation and information revelation; Regulatory Contracts; Contracts and Courts.
  3. Property Law and Eminent Domain:
     Property Rights and their role in resource allocation; Transaction costs and Coase theorem; Legal remedies for breach of property rights; Intellectual Property Rights; Eminent Domain and Compulsory acquisition of land and other private property.
  4. Civil Liability and Criminal Law:
     Tort law; liability rules versus property rights; accident law; product liability; efficiency properties of liability rules; efficiency-compensation trade-off; Rational crimes; Crime and Punishment; Severity versus Certainty of punishment
  5. Litigation and Arbitration:
     Litigation and Arbitration; Litigation under asymmetric information; Litigation over compensation under eminent domain; .
  6. Topics in Law and Economics in India:
     Topics and Debt Contracts; Insurance Contracts; Insolvency and Bankruptcy Code.

- **Suggested Readings**

  Jain, S K and Ram Singh (2002), 'Efficient liability rules: Complete characterization', *Journal of Economics*, 2002, Vol. 75, pp. 105-124.

  Miceli, Thomas J.: *The Economic of the Law*, Oxford University Press (1997)

Polinsky, A. Mitchell and Steven Shavell (Editors) (2007), *Handbook of Law and Economics*, Volumes 1 and 2, North Holland, Amsterdam.

SchÃd'fer, H-B and Singh Ram. (2018) 'Takings of Land by Self-interested Governments: Economic Analysis of Eminent Domain', Journal of *Law and Economics*, pp 427-459.

In addition to the above readings, the course will use several research papers.

4.6.5   Natural Resource Economics: EC605

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours.

- **Credits** : 5.

- **Course Objectives**

  The objective of this course is to examine the allocation of renewable and non-renewable resources over time from positive and normative points of view. The role of markets and institutions is examined.

- **Course Learning Outcomes**

  Students will acquire the ability to delve into the Microeconomic foundations of resource management, and the use of public policy to encourage the optimal use of natural resources.

- Content : Unit-wise

  1. Dynamic optimisation: deterministic discrete-time and continuous-time models. Stochastic models.
  2. Renewable resources: optimal management. Common property and open access. Fishery: Models of growth with open and regulated open access. Optimal harvest. Stochastic growth. Forestry: Optimal stopping rules.
  3. Non-renewable resources: The Hotelling rule and social welfare. Variations on the Hotelling rule: exploration, uncertainty in demand and reserves, entry and exit.
  4. Growth with exhaustible resources, concepts and measures of resource scarcity. Natural resource accounting.

- **Suggested Readings** J. Conrad: *Resource Economics, 2nd ed.*, Cambridge University Press (2010)

  L. Karp: *Natural Resources as Capital: Theory and Policy*, (2015)

  M. Murty, S. Kumar: *Environmental and Economic Accounting for Industry*, Oxford University Press (2004)

  R. Perman, Y. Ma, J. Mcgilvray: *Natural Resource and Environmental Economics*, Pearson (2011)

D. Phaneuf, T. Rquate: *A Course in Environmental Economics: theory, policy and practice*, Cambridge University Press (2016)

Moreover, readings in the form of journal articles and working papers.

4.6.6 Energy Economics: EC606

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours.

- **Credits** : 5.

- **Course Objectives**

  This course would explore theoretical and empirical perspectives on the topics related to energy demand, energy supply, energy markets, environmental consequences of energy use, and policies and regulatory mechanism for the sector. Main topics of the course would be illustrated with the relevant global regulatory experiences of the energy sector.

- **Course Learning Outcomes** This course would intends to provide theoretical and empirical perspectives on the topics related to energy demand, energy supply, energy markets; environmental consequences of energy use, and policies and regulatory mechanism for the sector.

- **Content : Unit-wise**

  1. Energy demand analysis and forecasting
  2. Economics of energy supply
  3. Energy markets
  4. Economics of energy-environment interaction
  5. Regulation and governance of energy sector
  6. Energy efficiency and innovations

- **Suggested Readings** S. Bhattacharyya: *Energy Economics*, Springer (2011)

  L. Hunt, J. Evans (eds.): *International Handbook on the Economics of Energy*, Edward Elgar (2011)

  A. Kneese, J. Sweeney (eds.): *Handbook of Natural Resource and Energy Economics, Vol. III*, Elsevier Science Publishers (1993)

  J. Shogren: *Encyclopaedia of Energy, Natural Resource, and Environmental Economics*, Newnes (2013)

  Moreover, readings in the form of journal articles and working papers.

4.6.7   Welfare Economics: EC607

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours.

- **Credits** : 5.

- **Course Objectives**

  The aim of the course is to examine alternative ways in which microeconomic theory might be applied to analyse collective decision making. A normative approach based on the assumption that government is benign assumes government will maximise social welfare. By comparison, a positive approach (premised on analysis of the objectives and constraints faced by actors in decision-making processes) offers an alternative application of microeconomic theory.

- **Course Learning Outcomes**

  1. Learn economic models that study how policy makers and governments take decisions.
  2. Develop the ability to: apply microeconomic theory to analyse collective action and public policy; assess reform of public spending and taxation against a set of criteria (which includes efficiency and equity), and explain why there is dissonance between analysis of what governments and policymakers should do and what they actually do.

- **Content: Unit-wise**

  1. Reasons for collective choice:
     Public goods, Externalities, Redistribution.
  2. Public choice in direct and representative democracies:
     Collective decision making and voting rules; Voting and median voter model; Rent seeking, Lobbying and corruption.
  3. Some applications:
     Fiscal policies and taxation; Local public goods; Market failure vs. Government failure.

- **Suggested Readings**

  Mueller, D.: *Public Choice III*. Cambridge University Press (2003).

  Kosfeld, Okada and Riedl (2009), Institution formation in public goods games, *American Economic Review*, 99(4), 1335-1355.

  Krupka and Weber (2013): "Identifying social norms using coordination games: Why does dictator game sharing vary?", *Journal of the European Economic Association*, 11(3):495-524.

  Black, D. (1948): "On the Rationale of Group Decision Making'", *Journal of Political Economy*, 56(1), 23-34.

Meltzer and Richard (1981): "A Rational Theory of the Size of Government", *Journal of Political Economy*, 89(5), 914-927.

Besley, T. and Coate, S. (2003): "Centralized versus Decentralized Provision of Local Public Goods", *Journal of Public Economics*, (87): 2611-2637.

Articles from journals and working papers.

4.6.8 Economics of Regulation: EC608

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours.

- **Credits** : 5.

- **Course Objectives**

  The objective of this course is to introduce the role of government in altering market outcomes when either competitive forces are weak or competitive equilibrium fails. It draws from areas such as welfare economics, public economics, and industrial organisation.

- **Course Learning Outcomes** Student learning will focus on competition policy and economic regulation. They will also be introduced to a growing area of study and policy design, that of the introduction of market m.echanisms into formerly regulated industries.

- **Content : Unit-wise**

  1. The role of government. The making of a regulation. Possible instrument choices. Why one instrument over another? Social cost-benefit analysis. Consequences of regulation.

  2. Introduction to economic regulation. Motivation behind economic regulation. Potential instruments for regulation. Goals of regulation. Historic background.

  3. Theories of regulation: normative and positive analysis, interest groups theory.

  4. Public Enterprise. The origins of public ownership as a way to regulate economic activity. Public vs. private ownership. Does the threat of nationalisation/municipalisation discipline private firms?

  5. Regulating natural monopolies:

     (a) Pricing strategies, rate structure, peak load pricing. Averch-Johnson model.
     (b) Sustainability of natural monopolies and contestability

  6. Regulating natural monopolies under asymmetric information: Problems of natural monopoly and theory of regulatory policy solutions.

     Incomplete information games. Mechanism design and implementation theory. Revelation principles.

  7. Franchise bidding: The case of cable television. Using franchise bidding as an alternative to regulation in the case of a natural monopoly.

8. Regulation of innovation and patents.

- **Suggested Readings** W. Viscusi, J. Vernon, J. Harrington: *Economics of Regulation and Antitrust*, MIT Press (2005).

  P. Joskow: *Regulation of Natural Monopolies*, Handbook of Law and Economics (2006)

  M. Armstrong, D. Sappington: *Recent Developments in the Theory of Regulation*, (2003)

  M. Motta: *Competition Policy: Theory and Practice*, Cambridge University Press (2004)

  R. Sherman: *Regulation of Monopoly*, Cambridge University Press (1989)

  J.-J. Laffont, J. Tirole: *A Theory of Incentives in Procurement and Regulation*, MIT Press (1993)

  H. Averch, L. Johnson: Behavior of the firm under regulatory constraint, *American Economic Review* 52, 1053-1069 (1962)

  J. Willner: Privatisation and liberalisation in an industry with network externalities, *Economics Letters* 91, 197-203 (2006)

  J. Vickers, Yarrow: Privatization: an economic analysis, in Privatization: An Economic Analysis. MIT Press (1988)

  P. Klemperer: How (not) to run auctions: The European 3G telecom auctions, *European Economic Review* 46, 829-845 (2002)

  M. Pollitt, A. Smith: The restructuring and privatisation of British Rail: Was it really that bad?, *Fiscal Studies* 23, 463-502 (2002)

  P. Joskow: California's electricity crisis, *Oxford Review of Economic Policy* 17, 365-388 (2001)

4.6.9   Climate Change Economics: EC609

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours.

- **Credits** : 5.

- **Course Objectives**

  The objective of this course is to analyse climate change from an economic perspective. The problem is characterised as one of regulating a global stock externality in an intertemporal setting and in the presence of uncertainty and irreversibility.

- **Course Learning Outcomes** (1) A logical, coherent and sensible understanding of the reasons for (and solutions to) climate change. (2) Develop the ability to apply economic theory to climate issues with a view to developing effective and rational policies to address climate change.

- **Content: Unit-wise**

  1. Overview:
     Basics of climate science; international response to climate change.
  2. Integrated Assessment Models (IAMs) and the social cost of carbon; choice of discount rate for climate policy; declining discount rate (DDR).
  3. Technical change and fossil energy consumption: responses to climate change in an endogenous growth model with clean and dirty technologies; implications of a transition to clean technologies in an IAM.
  4. Stern Review on the economics of climate change: analytical foundations, findings and policy implications.
  5. ?Tipping points? and non-linearities in the climate system and their role in formulating climate policy: fat tail probability distributions and Weitzman Dismal Theorem.
  6. Mitigation (tradable permits and carbon taxes); economic impacts and adaptation.
  7. Green paradox and carbon leakage.
  8. Environmental treaties; applying non-cooperative and co-operative game theory.

- **Suggested Readings**

  F. Ackerman, E. Stanton: *Climate Economics: State of the Art.* Routledge (2013)

  W. Nordhaus: *A Question of Balance.* Yale University Press (2008)

  D. Acemoglu, P. Aghion, Leonardo Bursztyn, D Hemous. (2012). "The environment and directed technical change," American Economic Review, 102(1): 131-166.

  M. Weitzman, M.L. (2009). "On modeling and interpreting the economics of catastrophic climate change." The Review of Economics and Statistics, 91(1), pp.1-19.

  Articles from journals and working papers.

4.7 Development Economics

4.7.1 Topics in Development Economics: EC701

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours

- **Credits** : 5

- **Course Objectives**

  This course intends to acquaint students with knowledge about some important development issues.

- **Course Learning Outcomes**

  Knowledge about development issues, both from a theoretical as well as empirical perspective.

- **Content: Unit-wise**

  1. International debt and development

     Two-gap models; transfer paradox; international debt issues; loan pushing; debt forgiveness; loan buybacks; debt-equity swaps; empirical studies

  2. Intellectual property rights and development

     TRIPs Agreement; innovation systems; IPR and technology transfer, problems with IPR

  3. Wage Rigidity and Unemployment

     Theory of implicit cooperation; labour turnover model; nutrition-based efficiency theory of wages

  4. Rural Credit Markets

     Lender's risk hypothesis; monopolistic markets; implicit interest charges; credit as insurance; micro-finance

  5. Interlinkage in Rural Markets

     Potential risk; models of interlinked markets; implications for theory and policy; moral hazard and interlinkage

  6. Inequality and Development

     Reasons for a direct relation; reasons for an inverse relation; empirical studies

- **Suggested Readings**

Basu, Kaushik (2003): *Analytical development economics: The less developed economy revisited*, MIT Press Cambridge.

Eaton, Jonathan (1993): Sovereign debt: A primer, *World Bank Economic Review*, 7(2), 137-172.

Maskus, Keith E. (2000): Intellectual Property Rights and the Global Economy, Institute for International Economics, Washington, D.C.

Kanwar, Sunil (2012): Intellectual Property Protection and Technology Licensing: The Case of Developing Countries, *Journal of Law and Economics*, 55(3), 539-564.

Ivus, Olena (2010): Do stronger patent rights raise high-tech exports to the developing world?, *Journal of International Economics*, 81(1), 38-47.

Javorcik, Beata S. (2004), The Composition of Foreign Direct Investment and Protection of Intellectual Property Rights: Evidence from Transition Economies, *European Economic Review*, 48(1), 39-62

Watal, Jayashree (2000): Pharmaceutical Patents, Prices and Welfare Losses: Policy Options for India Under the WTO TRIPS Agreement, **The World Economy**, 23(5), 733-752.

Morduch, Jonathan (1999): The Microfinance Promise, **Journal of Literature**, 37(4), 1569-1614 (omit sections 5.2, 6, 7)

Banerjee, Abhijit; E. Duflo, R. Glennerster, and C.G. Kinnan (2015): The Miracle of Microfinance? Evidence from a Randomized Evaluation, *American Economic Journal: Applied Economics*, 7(1), 22-53.

Bell, Clive and T.N. Srinivasan (1989): 'Interlinked transactions in rural markets: An empirical study of Andhra Pradesh, Bihar and Punjab', *Oxford Bulletin of Economics and Statistics*, 51(1), 73-83

4.7.2 Trade and Development: EC702

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours

- **Credits** : 5

- **Course Objectives**

  Flow of international trade and capital can create employment, enhance access to technology and knowledge, raise productivity, increase the variety and quality of goods available to consumers, stimulate capital inflows, increase foreign exchange earnings, and generate resources for sustainable development and poverty reduction. However, this positive relationship is not automatic and does not necessarily take place in all countries and contexts. This course is designed to make the students familiar with application of the existing trade theories and policies on the emerging debates in relation to the growth and development. Specifically, the impact of trade policies on welfare gains, employment, pro-poor growth, inequality and environment would be discussed along with role of WTO.

- **Course Learning Outcomes**

  The students will be exposed to standard empirical tools applied for estimating welfare gains from trade, gravity modelling, productivity analysis and pro-poor growth. It will update the understand the effects of tariffs and subsidies on trade patterns and the welfare of trading nations, explain how international negotiations and agreements have promoted world trade as well as Identify and measure the sources of economic growth using conventional and advanced methods.

- **Content: Unit-wise**

  1. Trade policies (tariff and non-tariff barriers) and implications
  2. Analytical Approaches to Global Institutions (Public and Private) and Trade Policy
  3. Trade creation and diversion and gravity modelling
  4. Political economy of trade agreements and role of WTO
  5. Issues in Trade, Welfare and Growth
     - Trade - gains and methods
     - Trade, FDI and growth (immiserating growth, spillovers, competition effects)
     - Trade, inequality, distributive conflict, pro-poor growth

– Fair trade and industrial policy - labor standards, environment

6. Emigration, trade and development

7. Global production and issues

- **Suggested Readings**

Bagwell, K. and Staiger, R.W. (2018): Handbook of Commercial Policy, Vol 1A and 1B, North-Holland: Elsevier.

Irwin, Douglas (2015): *Free Trade Under Fire*, Princeton University Press.

Feenstra, Robert C. (1992): "How Costly is Protectionism?" *The Journal of Economic Perspectives* 6(3): 159-78.

Baldwin, Robert E. (1989): "The Political Economy of Trade Policy." The *Journal of Economic Perspectives* 3(4) : 119-35.

Krugman, Paul R.(1987): "Is Free Trade PassÃl'?" *The Journal of Economic Perspectives* 1(2): 131-44.

Brown, Drusilla, Alan Deardorff, and Stern, Robert (2012): "Issues of Environmental and Labor Standards in the Global Trading System." In Black, Stanley W. (ed.) *Globalization, Technological Change, and Labor Markets*, Springer.

Costinot A., and A. Rodriguez-Clare (2013): "Trade Theory with Numbers: Quantifying the Consequences of Globalization." NBER Working Paper no. 18896

Anderson, James E, and Van Wincoop (2004): "Trade Costs." *Journal of Economic Literature* 42 : 691-751.

Grossman,G. and Helpman, E. (1994): "Protection for Sale" *American Economic Review* 84(4): 833-50.

Bagwell, Kyle, and Staiger, R. W. (1999): "An Economic Theory of GATT." *American Economic Review* 89(1) : 215-48.

Grossman, G., and E. Helpman. (1995): "Trade Wars and Trade Talks." *Journal of Political Economy* 103, 675-708. (NBER Working Paper no. 4280)

Maggi, G., and A. RodrÃ■guez-Clare (1998): "The Value of Trade Agreements in the Presence of Political Pressures." *Journal of Political Economy* 106(3) : 574-601.

Horn, Henrik, G. Maggi, et al. (2010): "Trade Agreements as Endogenously Incomplete Contracts." *American Economic Review* 100(1) : 394-419.

Feenstra, Robert C. (2015): *Advanced International Trade: Theory and Evidence.* Princeton University Press

Falkner, Robert (ed.) (2016): The Handbook of Global Climate and Environment Policy, Cheltenham: John Wiley and Sons.

Harman, Sophie and Williams, David (eds), Governing the World? Cases in Global Governance, London: Routledge, .

4.7.3 Environment and Development: EC703

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours

- **Credits** : 5

- **Course Outline**

  The objective of this course is to examine the interaction between environmental and natural resources and economic development with a focus on South Asia. The emphasis is on analysing environmental problems associated with economic development using the tools of economic analysis.

- **Course Learning Outcomes**

  The course will provide an understanding of the underlying causes of environmental problems such as deforestation and pollution. It will also enable students to operationalise the concept of sustainable development through concepts such as green accounting.

- **Content: Unit-wise**

  1. Overview: Eenvironmental problems and economic development in South Asia. Inter linkages between poverty, population and environmental degradation.

  2. Sustainability:
     Concepts and measures of sustainability and whether sustainable development is desirable and feasible.

  3. Economic growth and environment:
     Does economic growth inevitably result in environmental degradation? Is there a turning point beyond which increases in income lead to better environmental quality?

  4. Institutions for management of common pool natural resources; applications in the context of deforestation and water.

  5. Interlinkage in Rural Markets
     Potential risk; models of interlinked markets; implications for theory and policy; moral hazard and interlinkage

  6. Urban/industrial environmental problems:
     Dimensions, special features (small-scale industries and informal sector), regulatory approaches, alternatives (judicial, market-based instruments).

  7. International dimensions:
     Trade and environment: South Asian perspective, climate change: impacts, mitigation and adaptation strategies.

- **Suggested Readings**

  Stevenson, G.G. (1991): *Common Property Economics: General Theory and Land Use Applications*, Cambridge University Press.

Baland, J-M. and Platteau, J-P. (1996): *Halting Degradation of Natural Resources: Is there a Role for Rural Communities?* Clarendon Press, Oxford.

Greenstone, M., and Jack, B. (2015): "Envirodevonomics: A research agenda for an emerging field", *Journal of Economic Literature*, 53(1), 5-42.

Ostrom, E. (2000): "Collective Action and the Evolution of Social Norms", *Journal of Economic Perspectives*, 14(3): 137-158.

Perman, R., Ma, Y., McGilvray, J. and Common, M. (2013): *Natural Resource and Environmental Economics*, Pearson, 4th edition.

Articles from journals and working papers.

4.7.4   Agricultural Economics: EC704

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours

- **Credits** : 5

- **Course Outline**

  The aim of this course to provide students with an in-depth understanding of the issues relating to Indian agriculture and farmers' welfare. The focus is on analyzing structural patterns in Indian agriculture, and how policies have influenced farmers' choices and incomes. The approach is modular, and will depend on the policy discourse.

- **Course Learning Outcomes**

  Students will be able to participate in decision making related to the agricultural sector, and to have sufficient background to undertake independent research in this area.

- **Content: Unit-wise**

  1. Agricultural productivity trends and climate change
  2. Input-use efficiency and climate-related risk-mitigation strategies:
     Seeds; Water (and electricity); Fertilizer; Labour.
  3. Agricultural insurance
  4. Market infrastructure
  5. Price policy
  6. Agriculture and nutrition

- **Suggested Readings**

  Given the nature of the course, readings may be updated annually.

  Binswanger, H. (2012): "Is There Too Much Hype about Index-based Agricultural Insurance?" *Journal of Development Studies*.

Chand, R.; Saxena, Raka and Rana, S. (2015): "Estimates and Analysis of Farm Income in India", *Economic and Political Weekly*, May 30.

Chatterjee, S. and Kapur, D. (2016): "Understanding Price Variation in Agricultural Commodities in India: MSP, Government Procurement, and Agriculture Markets", *India Policy Forum*.

Emerick, K.; de Janvry, A.; Sadoulet, E. and Dar, M. (2016): "Technological Innovations, Downside Risk and the Modernization of Agriculture", *American Economic Review*.

Fishman, R. (2018): " Groundwater Depletion Limits the Scope for Adoption to Increased Rainfall Variability in India", Climatic Change.

Fishman, R.; Kishore, A.; Rothler, Y.; Ward, P.; Jha, S. and Singh, R.K.P. (2016): "Can Information Help Reduce Imbalanced Application of Fertilizer in India? Experimental Evidence from Bihar".

Gill, S.S. and Nehra, K.(2018): "Subsidy and Efficiency of Groundwater Use and Power Consumption in Haryana". *Economic and Political Weekly*, December 2018.

Ministry of Agriculture (2018): Report of the Committee for Doubling Farmer Incomes, selected section.

Negi, D.S. and Ramaswami, B. (2019): Basis Risk in Index Insurance: Lower Tail Dependence and the Demand for Weather Insurance.

Ramaswami, B.C. and Lalitha, N. (2012): "The Spread of Illegal Transgenic Cotton Varieties in India: Biosafety Regulation, Monopoly and Enforcement", *World Development*.

Roy, D.; Joshi, P.K. and Chandra, R. (2017): Pulses for Nutrition in India: Changing Patterns from Farm to Fork.

Sekhri, S. (2013): Sustaining Groundwater: Role of Policy Reforms in Promoting Conservation in India.? In Shekhar Shah, Barry Bosworth and Arvind Panagariya, editors, India Policy Forum, volume 9.

Vargas, R.; Hill, M. Robles and Ceballos, F. (2016): "Demand for a Simple Weather Insurance Product in India: Theory and Evidence", *American Journal of Agricultural Economics*.

Articles from journals and working papers.

4.7.5   Economics of Health and Education: EC705

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours

- **Credits** : 5

- **Course Objectives**:

Education and health are two critical aspects of well-being. The objective of this course is to explore how these are determined and related to other features of a society. This involves thinking about the proper measurement of outcomes in these areas, modelling individual, community and government decisions and evaluating public policy programs.

- **Course Learning Outcomes:**

Students will learn to develop microeconomic models that relate family and neighborhood composition to health outcomes and schooling choices. They will also learn how to estimate treatment effects in order to evaluate public programs.

- **Content: Unit-wise**

  1. **Measurement and trends:** Correlation between alternative measures of well-being. The spread of education across the world. Budgetary allocations across space and time.
  2. **Institutional design** Alternative systems for service delivery. The role of imperfect information, incentives and contracts.
  3. **Discrimination and inequality:** Models of preference-based and statistical discrimination. Effective policies to address historical inequalities
  4. **Environmental health:** Estimating impact and designing appropriate regulation to regulate social damages through environmental externalities
  5. **The political economy of public policy:** The role of community structure in determining the distribution of public goods. Models of voting and collective action.
  6. **Evaluating policy impact:** The estimation of treatment effects in randomized experiments and in observational data.

- **Selected Readings**

Banerjee, A. and Somanathan, R. (2007): "The Political Economy of Public Goods: Some Evidence from India." *Journal of Development Economics*, 82(2), 542-559.

Becker, G. (1962): "Investment in Human Capital: a Theoretical Analysis." *The Journal of Political Economy*, 70(5), 9-49.

Benabou, R. (1993): "Workings of a City." *Quarterly Journal of Economics*, 108(3), 619-652.

David Cutler and Grant Miller (2005): "The Role of Public Health Improvements in Health Advances: The Twentieth-Century United States." *Demography* 42(1), 1-22.

Angus Deaton (2013): *The Great Escape: Health, Wealth and the Origins of Inequality*, Princeton University Press.

Robert Fogel (2004): "Health, nutrition and economic growth." *Economic Development and Cultural Change*, 52(3), 643-658

Galanter, M. (1984): "Competing Equalities: Law and the Backward Classes in India," University of California Press.

Loury, G. (2002): *The Anatomy of Racial Inequality.* Harvard University Press.

Preston, S. (1996): "American Longevity: Past, Present and Future." Distinguished Lecture in Aging, Syracuse University.

Sethi, R. and Somanathan, R. (2004): "Inequality and Segregation", *Journal of Political Economy*, 112(6), 1296-1321.

Spence, M. (1973): "Job Market Signaling." *Quarterly Journal of Economics*, 87(3), 355-374.

Tiebout, C. (1956): "A pure theory of local expenditures.?" *Journal of Political Economy* 64(5), 416-424

Wooldridge, J.: *Econometric analysis of cross section and panel data.* MIT press (2010).

4.8 Industrial Economics

4.8.1 Industrial Organisation: EC801

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours.

- **Credits** : 5.

- **Course Objectives**

  This course provides a foundation for the study of theoretical models of industrial organisation. This field of study is mainly concerned with different strategic motives and interactions in oligopolistic markets, employing the techniques taught in the compulsory course on Game Theory. It also provides a theoretical framework for analysis of antitrust/competition policy, as well as other policies relating to regulation, innovation, intellectual property rights, and strategic trade policy, which are covered in other courses.

- **Course Learning Outcomes** Upon completing this course, the student would have learned to think analytically, using game theoretic tools, about the principal issues concerning oligopolistic markets, competition, and apply them to the real world of industry. They would also be prepared to understand competition policy more naturally and foundationally.

- **Content : Unit-wise**

  1. Static oligopoly models with homogenous and differentiated products. Strategic substitutes and strategic complements. Dynamic models: Stackelberg and free entry.

2. Spatial models of horizontal and vertical product differentiation.

3. Repeated game oligopoly: Stability and sustainability of cartels.

4. Entry and entry deterrence strategies.

5. Vertically related markets and vertical contracts between firms.

- **Suggested Readings** M. Armstrong, R. Porter: *Handbook of Industrial Organization, Vol. III*, North-Holland (2007)

  P. Belleflamme, M. Peitz: *Industrial Organisation: Markets and Strategies*, Cambridge University Press (2015)

  L. Cabral: *Introduction to Industrial Organization*, MIT Press (2017)

  O. Shy: *Industrial Organization: Theory and Applications*, MIT Press (1996)

  J. Tirole: *The Theory of Industrial Organization*, MIT Press (1988)

4.8.2 Economic Theory of the Firm: EC802

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours.

- **Credits** : 5.

- **Course Objectives**

  The firm is the foundation for all production activity. The course analyses the factors determining the boundaries of firms with special focus on vertical integration and horizontal expansions. The design of internal organisation and managerial roles are studied.

- **Course Learning Outcomes**

  The student will understand the nature of the firm and its governance structure and also the different strategic aspects of firms' decision making.

- **Content: Unit-wise**

  1. Boundaries and nature of the firm

  2. Vertical and horizontal integration

  3. Make or buy decisions and outsourcing of inputs

  4. Managerial behaviour and incentives

  5. Technology innovation and efficiency

- **Suggested Readings**

  Tirole, J.: *The Theory of Industrial Organization*, MIT Press (1988).

  Shy, O.: *Industrial Organization: Theory and Applications*, MIT Press (1995).

The course is based on many journal articles and some of them are listed below:

Holmstrúm, B. and Tirole, J. (1987): "The Theory of the Firm" in *Handbook of Industrial Organization*, ed. By Schmalensee, R. and Willig, R. Amsterdam, North-Holland

Williamson, O. (1981): "The modern corporation: origins, evolution, attributes", *Journal of Economic Literature*, December, 1537-1568.

Hart, O., (1995): "Corporate Governance : some theory and implications", *Economic Journal*, 678-689.

Gibbons, R, (2005): "Four formal(izable) theories of the firm", *Journal of Economic Behavior and Organization* Vol. 58.

Grossman, S. and Hart, O. (1986): "The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration", *Journal of Political Economy*, 94(August): 691-719.

Shy, O. and Stenbacka, R. (2003): "Strategic Outsourcing", *Journal of Economic Behavior and Organization*, 50: 203-224.

Buehler, S. and Haucap, J. (2006): "Strategic Outsourcing Revisited", *Journal of Economic Behavior and Organization*, 61: 325-338.

Arya, A., Mittendorf, B., Sappington, D., (2008): "The make-or-buy decision in the presence of a rival: strategic outsourcing to a common supplier", *Management Science*, 54, 1747?1758.

Grossman, S. and Hart, O. (1980): "Takeover bids, the free-rider Problem, and the theory of the corporation", *Bell Journal of Economics*, 11 42-64.

Shleifer, A. and Vishny, R. (1986): "Large shareholders and corporate control", *Journal of Political Economy*, 94(3), 461-489.

4.8.3 Topics in Industrial Organisation: EC803

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours

- **Credits** : 5

- **Course Objectives**

  This course will deal with some recent developments in the field of Industrial Organisation theory. Keeping in view how the different market imperfections are created and perpetuated by firms in a modern economy, the course will study the following topics in particular, along with other recent developments.

- **Course Learning Outcomes** By the end of the course, the student will acquire a theoretical understanding of a variety of phenomena in industrial organisation and be prepared for research in this field.

- **Content : Unit-wise**

    1. Innovation and intellectual property rights:

       R&D race and innovation incentive, organisation of R&D, patent vs. trade secrecy, licensing and joint ventures.

    2. Bundling and tying:

       Economics of bundling and tying, strategic reasons and efficiencies, market structures and outcomes

    3. Competition with switching Costs, network effects and network standards:

       Consumer search, consumer inertia, competitive effects of switching cost, market with network goods, network effect, network effects and switching costs, markets for several network goods, oligopoly pricing and standardisation, strategies in standards wars.

    4. Product quality, reputation and advertising:

       Vertical product differentiation, quality choice, demand effect, advertising and competition, advertising and price signals, advertising and quality, informative and persuasive advertising.

    5. Markets with intermediated goods:

       Intermediaries as dealers, intermediaries as match-makers, intermediaries as two-sided platforms, intermediation and information, information overload, intermediation and reputation

    6. Public policies in network goods:

       Regulation, auction and auction markets.

- **Suggested Readings**

  Belleflamme, P. and Peitz, M.: *Industrial Organization: Markets and Strategies*, Cambridge University Press (2015)

  Tirole, J.: *The Theory of Industrial Organization*, MIT Press (1988)

  Shy, O.: *Industrial Organization: Theory and Applications*, MIT Press (1996)

  Armstrong, M. and Porter, R.: *Handbook of Industrial Organization, Vol. III*, North-Holland (2007)

4.8.4   Economics of Innovation: EC804

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours

- **Credits** : 5

- **Course Objectives**

  During last 40 years or so the Economics of Innovation has become an independent field of enquiry for the growth and development of society. The process of innovation is a

very complex phenomenon and thus, on the one hand, it requires proper organisational design to encourage and incentivise and on the other it requires awarding appropriate property rights for management and transfer of the innovation towards the greater social good. Technological progress is an endogenous process and largely determined by the interplay of different organisational and legal structures of an economy. The course will focus on various static and dynamic aspects of technology creation and technology transfer both from the theoretical and empirical perspective.

- **Course Learning Outcomes**

  The student will learn to think about technology and technological progress using the tools of economics. They will develop an understanding of what goes into the making of technological advancement and success for an economy.

- **Content : Unit-wise**

  1. Incentives and management of innovation
     - Intellectual property rights
     - Sequential and complementary innovation
     - Network effect and standards
  2. Patents and R&D:
     - Patents and litigation
     - Patent pool
     - R&D tournaments, race and R&D organisation
  3. Diffusion of Innovation
  4. Technology transfer and licensing
  5. Innovation and public policy.

- **Suggested Readings** Scotchmer, S.: *Innovation and Incentives*, MIT Press (2004)

  Swann, G.: *The Economics of Innovation: An Introduction*, Edward Elgar (2014)

  Hall, B. and Rosenberg, N.: *Handbook of the Economics of Innovation, Vols 1 & 2*, Elsevier (2010)

4.9 General

4.9.1 Ethics and Economics: EC901

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours

- **Credits** : 5

- **Course Objectives**

  This course is designed to highlight the relevance of moral concerns to the practice of both positive and normative economics. It will also sensitize students to the influence of economic theory and its tools on moral philosophy.

- **Course Learning Outcomes**

  Students will take away an understanding of, and ability to think about, fundamental categories such as rights, justice, equality, and their relationship to economics.

- **Content: Unit-wise**

  1. Introduction: The economic importance of morality; morality and economic outcomes; ethics and the market; economists and morality- an overview.
  2. Morality and economic rationality:
     Preferences vs. rights; preferences vs. rights vs. needs; norms and economic behavior; adaptive preferences.
  3. Morality and Welfare:
     The Pareto principle and its critics; outcomes vs. procedures. Liberty and rights.
  4. The doctrine of equality: types of equality; critics of equality.
  5. Theory of Justice.

- **Suggested Readings**

  Berlin, I.: *Four Essays on Liberty*, Oxford University Press (1969).

  Dworkin, R.: *Taking rights seriously*, Harvard University Press (1977).

  Elster, J.: *Sour Grapes: Studies in the Subversion of Rationality*, Cambridge University Press (1983).

  Nozick, R.: *Anarchy, State, and Utopia*, Basic Books (1974).

  Rawls, J.: *A Theory of Justice*, Harvard University Press (1982).

  Roemer, J.: *Free to Lose*, Harvard University Press (1972).

  Sen, A.: *On Ethics and Economics*, Blackwell (1987).

  Sen, A.: *Inequality Reexamined*, Harvard University Press (1992).

  Sen, A., and Williams, B. (eds.): *Utilitarianism and Beyond*, Cambridge University Press (1982).

4.9.2   Issues in Economic Systems and Institutions: EC902

- **Marks**: Assignments - 30, Exam - 70
- **Duration (per week)**: 5 hours.
- **Credits** : 5.

- **Course Objectives**

  Even relatively unregulated market economies do not operate in a vacuum. Transactions and contracts arise in a specific institutional setting, encompassing the legal and political system, corporate and social structure as well as cultural norms. Many relevant decisions are not mediated through a price system, e.g. allocations within a fi

  rm, verdicts delivered by a jury, job references provided by professors, etc. The way these systems and institutions are designed may affect resource allocation and outcomes significantly. The purpose of this course is to examine the linkage between institutions and economic performance.

- **Course Learning Outcomes**

  The student will learn to analyze seemingly somewhat disparate issues using a theoretical framework to study them. The main tool they will gain facility in, in doing so, is game theory, especially games of incomplete information.

- **Content: Unit-wise**

  1. Incentives and Motivation
  2. Communication
  3. Norms, Expectations and Coordination
  4. Information Aggregation
  5. Reputation
  6. History

- **Suggested Readings**

  The course is based on papers drawn from a variety of economic contexts. A sample follows.

  Holmstrom, B.: "Moral Hazard in Teams," *Bell Journal of Economics*, 1982. Vol 13(2), 324-40.

  Hermalin, B.: "Toward an Economic Theory of Leadership: Leading By Example," *American Economic Review*, 1998. Vol 88(5), 1188-1206.

  Benabou, R. and Tirole, J.: " Intrinsic and Extrinsic Motivation," *Review of Economic Studies*, 2003. Vol 70(3), 489-520.

  Crawford, V. and Sobel, J.: "Strategic Information Transmission," *Econometrica*, 1982. Vol 50(6), 1431-51.

  Greif, A.: "Contract Enforcability and Economic Institutions in Early Trade: The Maghribi Traders' Coalition," *American Economic Review*, 1993. Vol 83(3), 525-48.

  Ghosh, P. and Ray, D.: "Cooperation in Community Interaction without Information Flows," *Review of Economic Studies*, 1996. Vol 63(3), 491-519.

  Morris, S. and Shin, H.: "Unique Equilibrium in a Model of Self-ful

filling Currency Attacks," *American Economic Review*, 1998. Vol 88(3), 587-97.

Morris, S.: "Political Correctness," *Journal of Political Economy*, 2001. Vol 109(2), 231 - 65.

Acemoglu, D., Johnson, S., Robinson, J.: "The Colonial Origins of Comparative Development: An Empirical Investigation." *American Economic Review*, 2001. Vol 91(5), 1369-1401.

Banerjee, A. and Iyer, L.: "History, Institutions and Economic Performance: the Legacy of Colonial Land Tenure Systems in India," *American Economic Review*, 2005. Vol 95(4), 1190-1213.

4.9.3 Economics of Discrimination: EC903

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours

- **Credits** : 5

- **Course Objectives**

  This course familiarises students with theories and empirical tools to understand and measure economic discrimination based on social group identities, such as caste, race, gender, tribal status, ethnicity and so on. The course will also deal with policy options targeting group-based disparities and discrimination, with a focus on affirmative action policies. This component will outline the various types of affirmative action, including quotas or reservation, and discuss debates around affirmative action, focusing on evidence-based research gauging its impact.

- **Course Learning Outcomes**

  Students will develop an understanding of discrimination from economic and other perspectives, get a good handle on theoretical and empirical tools to study related research questions, and an appreciation of economic policy alternatives.

- **Content : Unit-wise**

  1. Theories:
     Statistical discrimination, taste for discrimination, signalling models.
  2. Overlap between economics of discrimination and related sub-disciplines:
     "Identity Economics", pioneered by George Akerlof and Rachel Kranton, "Feminist Economics" and "Stratification Economics".
  3. Empirical methods of estimating discrimination in market settings: decomposition techniques
  4. Experimental methods: both field-based as well as lab-based experiments to gauge discrimination outside the labour market.
  5. Affirmative action

- **Suggested Readings** Becker, G.: *Economics of Discrimination*, University of Chicago Press (1957)

  Loury, G.: *Anatomy of Racial Inequality*, Harvard University Press (2002)

  Thorat, S., and Newman, K.: *Blocked by Caste*, Oxford University Press (2010)

  Deshpande, A.: *Affirmative Action in India*, Oxford University Press (2013)

4.9.4 Political Economics: EC904

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours

- **Credits** : 5

- **Course Objectives**

  This course introduces students to the political economy of institutions and development. We explore the interrelation and interaction between state, power and economic outcomes. Lectures will mainly focus on theoretical framework. Empirical papers will be covered through class discussions and student presentations. As a supplement we may also read original texts on Liberalism and Marxism.

- **Course Leaning Outcomes** Students will develop an understanding of the interrelationships between institutions and development.

- **Content: Unit-wise**

  1. Democracy or dictatorship
  2. Political rent, corruption, cronyism
  3. Power of propertied classes in democracy
  4. Divide and rule
  5. Imperialism and colonialism
  6. Role of media and experts
  7. Collective action

- **Suggested Readings**

  Acemoglu, D.: Lecture Notes.
  http://economics.mit.edu/files/8753

  Persson, T. and Tabellini, G.: *Political Economics*, MIT Press (2000)

4.9.5   Behavioural Economics: EC905

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours

- **Credits** : 5

- **Course Objectives**

  This course will introduce the fast-evolving field of behavioural economics. This area has evolved through an interaction between experimental results (mostly from lab experiments, but also from field experiments) and the development of theory. While the evidence rejects some predictions of classical decision theory, it is yet to settle down on a firm alternative interpretation. Similarly, at present, there is often a multiplicity of theories to explain the evidence from behavioural experiments. Thus there is a good deal of leeway in the selection of material. The topics listed below are indicative and not meant to be comprehensive.

- **Course Learning Outcomes**

  Students would have learned the leading examples of departures in behaviour from that predicted by earlier economic theory, as well as the main models formulated to explain these departures.

- **Content : Unit-wise**

  1. Decision-making under risk and uncertainty.
  2. Reference dependence and loss aversion.
  3. Intertemporal decision-making.
  4. Social preferences.
  5. Behavioural game theory.
  6. Behavioural welfare economics.

- **Suggested Readings**

  Bernheim, B.D., DellaVigna, S., Laibson, D.: *Handbook of Behavioral Economics, Vol. 1*, North-Holland (2018)

  Bernheim, B.D., DellaVigna, S., Laibson, D.: *Handbook of Behavioral Economics, Vol. 2*, North-Holland (2019)

  Camerer, C.: *Behavioral Game Theory: Experiments in Strategic Interaction*, Princeton University Press (2003)

  Camerer, C., Loewenstein, G., Rabin, M.: *Advances in Behavioral Economics*, Princeton University Press (2004)

  Dhami, S.: *The Foundations of Behavioural Economic Analysis*, Oxford University Press (2016)

  Friedman, D., and Sunder, S.: *Experimental Methods: A Primer for Economists*, Cambridge University Press (1994)

4.9.6 Economics of Organisations: EC906

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours

- **Credits** : 5

- **Course Objectives**

  This course concerns the existence, nature, design and performance of organisations. It deals with co-ordination and interactions both within and across firms. In particular it will focus on decision-making in organisations, agency problems, social relations and contracts. The course would study in oligopolistic market environment the relevant issues from the perspective of internal organisation and interactions between firms. The foundation of the theory is based on empirical observations in different market contexts. Finally, the interplay of policy, institutions and organisations will be studied. This is an upcoming field and therefore the readings will be mostly from journal articles and the Handbook.

- **Course Learning Outcomes**

  By doing this course, students will extend their understanding of economics to how it impacts behaviour and outcomes within organisations.

- **Content : Unit-wise**

  1. Boundaries of firms: transaction cost economies, property rights and incentives

  2. Hierarchy, authority, leadership and efficiency

  3. Agency and incentive problems in organisational design

  4. Vertical and horizontal relations between firms

  5. Outsourcing and in-house productions

  6. Labour union and oligopolistic competition

  7. Delegation and incentives

  8. Formal and relational contracts between firms

  9. Research and development and technology transfer

  10. Corporate social responsibility

  11. Economics of non- profit organisations

  12. Lobbying and corruption

  13. Regulation and public policy.

- **Suggested Readings** Roberts, J, and Gibbons, R.: *The Handbook of Organizational Economics*, Princeton University Press (2012)

4.9.7   Health Economics: EC907

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours

- **Credits** : 5

- **Course Outline**

  This course analyses theoretical and empirical issues in health using economics tools, namely, microeconomics, game theory, behavioural economics and econometrics.

- **Course Learning Outcomes**

  1. A better understanding the economic theory of health and healthcare through a study of economic models of health, addiction, demand for healthcare and demand for insurance.
  2. Learn to evaluate and interpret empirical findings in health economics.

- **Content : Unit-wise**

  1. Introduction to health economics: the economic way of thinking about health; health measurement, determinants and long run trends; health and socioeconomic status.
  2. Economic models of health
  3. Health Insurance: introduction and moral hazard; adverse selection in health insurance; social insurance in India and global examples.
  4. The behavioural economics of health; unhealthy behaviour-evidence and policy issues.
  5. Health and economic development
  6. Health valuation: mortality risk valuation?static model, life cycle model, empirical models (hedonic wages, stated preference); valuing changes in morbidity-model of health production, revealed preference and stated preference approaches, quality adjusted life years.
  7. Externalities and public health: air pollution, pandemics.

- **Suggested Readings**

  Bhattacharya, J., Hyde, T. and Tu, P.: *Health Economics*, Palgrave (2013).

  Grossman, Michael (1972): "On the Concept of Health Capital and the Demand for Health", *Journal of Political Economy* 80(2).

  Case, A., Lubotsky, D., and Paxson, C. (2002): "Economic Status and Health in Childhood: The Origins of the Gradient", *American Economic Review*. 92(5): 1308-34.

  Becker, G., and Murphy, K. (1988): "A Theory of Rational Addiction", *Journal of Political Economy* 96(4):675-700.

Bhattacharya, J.; Goldman, D. and Sood, N. (2009): "Market Evidence of Misperceived Prices and Mistaken Mortality Risks", *Journal of Economic Behavior and Organization* 72(1):451-62.

Acemoglu, D. and Johnson, S. (2007: "Disease and Development: The Effect of Life Expectancy on Economic Growth", *Journal of Political Economy*, 115(6): 925-85.

Miguel, E., and Kremer, M. (2004): "Worms: Identifying Impacts on Education and Health in the Presence of Treatment Externalities", *Econometrica*, 72(1): 159-217.

Articles from journals and working papers.

4.9.8 Labour Economics: EC908

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 5 hours

- **Credits** : 5

- **Course Objectives**

  The objective of this course is to introduce the student to labour economics with an emphasis on microeconomic theory and empirics. The material covered would help the student to understand real world issues pertaining to labour markets and also to assess related public policy measures.

- **Course Learning Outcomes** The student will learn basic economic forces behind employment and wages, sources of labour market imperfections, driving forces for education and skill upgradation, discrimination among the workers and public polices for labour welfare.

- **Content : Unit-wise**

  1. Labour Supply:

     Choice between Consumption and Leisure; Incorporating Household Production and Decisions.

  2. Labour Demand and Equilibrium:

     Labour Demand Function, Competitive Equilibrium, Compensating Wage Differentials and Hedonic Theory of Wages

  3. Investment in Education:

     Theory of Human Capital, Education as a Signalling Device, Returns to Education

  4. Job Search

  5. Discrimination

     Theories of Discrimination, Measuring Discrimination, Affirmative Action

  6. Labour Market Institutions and Policies

     Collective Bargaining and Labour Unions, Minimum Wage and Employment, Unemployment Insurance, Job security regulations

    7. Incentives, Agency and Efficiency Wages

    8. Migration

- **Suggested Readings**

  Cahuc, P.; Carcillo, S. and Zylberberg, A. (2014): *Labor Economics*, MIT Press

  Ehrenberg, R. G. and Smith, R. S.(2018): *Modern Labor Economics: Theory and Public Policy*, Routledge

  Borjas, G. J. (2010): *Labor Economics*, McGraw-Hill/Irwin, Boston MA (5th edition).

  Card, D., and Ashebfelrer, O. (2011): Handbook of Labor Economics, Vol 4A & B, Elsevier

  Articles from journals and working papers.

4.10 Open Electives

The department will offer one of following courses in each semester as an open elective course.

4.10.1 Mathematical Economics: EC1001

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 4 hours.

- **Credits** : 4.

- **Course Objectives**

  This course is designed for students who plan to do further graduate level work in economic theory, especially those with a keen interest in creating, as opposed to consuming, pure theory.

- **Course Learning Outcomes** The course aims for students to learn the following: (1) a rigorous exposure to a selection of basic mathematical tools that are used by economic theorists, and (2) applications of these methods to some areas of economic theory including duality theory, game theory, the Arrow-Debreu model and comparative statics.

- **Content: Unit-wise**

  1. Set theory and preliminaries
  2. Topological Spaces:
     Metric spaces, topological spaces and continuous functions; various useful constructions, e.g., projective and inductive topologies
     Countability and separability properties
     Compactness, completeness, connectedness, etc.

Topologies on function spaces; linear spaces, weak topologies; topologies on space of probability measures

Convex analysis; separation theorems

Set-valued mappings, fixed point theorems

3. Arrow-Debreu model: existence and optimality

4. Debreu-Scarf theorem

5. Duality theory

6. Nash's existence theorem

- **Suggested Readings**

  Aliprantis, C., Brown, D. and Burkinshaw, O. (1990): *Existence and Optimality of Competitive Equilibria*, Springer-Verlag.

  Berge, C. (1963): *Topological Spaces*, Macmillan.

  Debreu, G. (1959): *Theory of Value*, Yale University Press.

  Hildenbrand, W. and Kirman, A. (1988): *Equilibrium Analysis*, North-Holland (1988).

  Munkres, J. (1975): *Topology: A First Course*, Prentice-Hall.

4.10.2 Macroeconomics of Development: EC1002

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 4 hours.

- **Credits** : 4.

- **Course Objectives**

  The course is motivated by two fundamental queries: (i) What explains the vast divergence in growth patterns across the world? (ii) What is an appropriate government policy (if any) in a low income-low growth country which can usher in a "high growth" regime? Modern growth theory has moved beyond the neoclassical framework to provide answers to these set of questions. This course takes a closer look at these alternative theories.

- **Course Learning Outcomes**

  This course will enable students to understand, evaluate and compare various policies that promote growth. It will also help them understand the deeper institutional and cultural characteristics that might be the root cause of underdevelopment in many poor countries.

- **Content: Unit-wise**

1. Proximate Causes of Growth:

   (a) Human Capital: The Ben Porath model of human capital accumulation; The Nelson-Phelps model of skill-technology complementarity.

   (b) Technology: Distance to the frontier and technology diffusion; Directed technological change; Appropriate versus inappropriate technologies.

2. Deeper Causes of Growth:

   (a) Imperfect Markets: Credit Market Imperfection and Indivisibility of investment; Risk, diversification and financial institutions.

   (b) Political Economy: Inequality, Taxation and Growth; Democracy versus Oligarchy.

   (c) History versus Expectations: Underdevelopment as coordination failure; Multiple equilibria in technology adoption.

- **Suggested Readings**

This course is primarily based on journal articles too numerous to list here. A broad overview of the topics can be found in the following text books:

Acemoglu, D. (2009): *Introduction to Modern Economic Growth*, Princeton University Press

Aghion, P. and Howitt, P. (2009): *The Economics of Growth*, MIT Press

A few representative articles are listed:

Acemoglu, Daron (2002): "Directed Technical Change." Review of Economic Studies 69: 781–809.

Acemoglu, Daron, and Zilibotti, Fabrizio (1997) "Was Prometheus Unbound by Chance? Risk, Diversification and Growth." Journal of Political Economy 105: 709–751.

Adsera, Alicia and Ray, Debraj (1998) "History and Coordination Failure", Journal of Economic Growth 3(3) 267–276.

Alesina, Alberto, and Rodrik, Dani (1994) "Distributive Politics and Economic Growth." Quarterly Journal of Economics 109: 465–490.

Ben-Porath, Yoram (1967) "The Production of Human Capital and the Life Cycle of Earnings." Journal of Political Economy 75: 352–365.

Doepke, Matthias and Zilibotti, Fabrizio (2008), "Occupational Choice and the Spirit of Capitalism", The Quarterly Journal of Economics, 123 (2), 747–793.

Galor, Oded and Zeira, Joseph (1993), "Income Distribution and Macroeconomics." Review of Economic Studies 60: 35–52.

Greenwood, Jeremy and Smith, Bruce (1997), "Financial markets in development, and the development of financial markets", *Journal of Economic Dynamics and Control*, 1997, 21(1), 145-181

Nelson, Richard R.,and Edmund S. Phelps (1966): "Investment in Humans, Technological Diffusion,and Economic Growth." American Economic Review 56: 69–75.

4.10.3   Public Economics: EC1003

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 4 hours.

- **Credits** : 4.

- **Course Objectives**

  Public Economics is a large and rapidly expanding field of research. It is concerned with normative and positive aspects of a government's activities in an economy. Normative analysis is concerned with how a government should behave to improve social welfare and positive analysis studies the implications of government activities on the behavior of individuals and communities. Governments intervene through regulation, taxation, redistributive transfers, and the provision and production of private and public goods. This course will focus on public spending on public goods, regulation in the presence of externalities and redistributive policy. It will cover important theoretical results in the field and a number of case studies from across the world.

- **Course Learning Outcomes**

  By the end of the course, students will be familiar with important theoretical results in this area and with empirical trends in public spending across the world. They will also be guided in developing their writing skills to express ideas within this field to popular readers.

- **Content: Unit-wise**

  1. The emergence of a social state:
     The evolution of social spending across the world since the early twentieth century.
  2. Efficiency in the provision of public goods:
     The types and quantities of public goods that should be provided.
  3. Externalities and their regulation:
     Sources of externalities, their relationship to contracts and markets and their regulation.
  4. Preference Aggregation and Public debate:
     How do we determine provision when we do not know preferences? Voting and other forms of information aggregate in democracies.

- **Suggested Readings**

  Anthony Atkinson and Joseph E Stiglitz: *Lectures on public economics*, Princeton University Press (2015)

  Peter Lindert: *Growing public: Volume 1, the story: Social spending and economic growth since the eighteenth century*, Cambridge University Press (2006)

  Glenn Loury (1994): Self-censorship in public discourse: a theory of political correctness and related phenomena. *Rationality and Society* 6(4), 428 – 461

Robert Nozick: *Anarchy, state, and utopia*, Basic books (2013)

Thomas Piketty: *Capital in the 21st century*, Cambridge: Harvard University Press (2014)

J. Rawls: *Justice as fairness: A restatement*, Harvard University Press (2001)

J. Roemer: *Equality of opportunity*, Harvard University Press (2009)

4.10.4   Environmental Economics: EC1004

- **Marks**: Assignments - 30, Exam - 70

- **Duration (per week)**: 4 hours.

- **Credits** : 4.

- **Course Objectives**

  The objective of this course is to present an economic approach to environmental problems such as air and water pollution. Alternative methods of addressing pollution, namely, direct regulation and market based instruments (taxes and tradable permits) are compared and contrasted, especially in the presence of asymmetric information. This is followed by techniques for measuring the benefits of environmental improvements and their applications.

- **Course Learning Outcomes**

  A logical, coherent and sensible understanding of the reasons for (and solutions to) environmental problems. In particular, an ability to apply economic theory to environmental issues with a view to developing effective and rational environmental policies.

- **Course Content: Unit-wise**

  1. Externalities and public goods
  2. Corrective mechanisms (taxes, subsidies, permits)
  3. Regulation with moral hazard and adverse selection
  4. Valuation of non-market goods and amenities: overview and basic theory.
  5. Revealed preference (indirect market methods); health valuation; constructed markets (direct market methods).

- **Suggested Readings**

  Phaneuf and Requate: *A Course in Environmental Economics: Theory, Policy and Practice*, Cambridge University Press (2017)

  Freeman, Herriges and Kling: *The Measurement of Environmental and Resource Values: Theory and Methods*, 3rd ed. RFF Press/Routledge (2014)

  W. Baumol, W. Oates: The Theory of Environmental Policy. Cambridge University Press (1988)

Champ, Boyle and Brown: *A Primer on Nonmarket Valuation.* Springer (2003)

Articles from journals and working papers.