



**MADRAS SCHOOL OF ECONOMICS
INSTITUTE OF SPECIAL IMPORTANCE**

**ORDINANCE OF THE UNDERGRADUATE PROGRAMME OF
ECONOMICS**

February 2022

ORDINANCE No. 4

Award of Degree of Bachelor of Arts (Honours) in Economics

(Effective from the Academic Session 2022-23)

I. ELIGIBILITY AND ADMISSION FOR B.A. (HONOURS) PROGRAM

Eligibility Criteria

- a) The following students are eligible to apply for the B.A. (Honours) Economics Program: (i) Students who have completed their plus-two (in any subject combination) in their first attempt; (ii) Students who are appearing for their plus-two exams in May 2022.
- b) The eligible candidates must secure at plus-two: 65% for General category; 60% for OBC – Non Creamy Layer; 50% for SC/ST/PWD candidates (OR respective equivalent grades or credits).
- c) The candidates should not have completed 22 years of age as on 01.07.2022.
- d) Students with mathematical interest are encouraged to apply

Application Process

- Candidates can fill the application form online at www.mse.ac.in.
- Application fee: Rs. 1000/- only (General category); Rs. 800/- only (SC/ST category)

Selection Process

- Admission will be based on entrance test at designated centres in India, subject to fulfilment of eligibility criteria. In case of tie in entrance test marks, merit ranking will be based on percentage of marks obtained in the qualifying examination, and age.

Fee Structure

- The B.A.(Honours) Program is a three-year full-time program comprising of six semesters. The total fees per semester constitute Rs. 50,000 as semester fee, and Rs. 25,000 towards infrastructure development. The semester fee includes all fees including tuition fees, exam fees etc.
- In addition, the students must pay one-time non-refundable admission fee of Rs. 5000.
- Students belonging to the SC and ST social groups can avail 20% concession in the semester fees.

Fee Refund Policy

- For students withdrawing from the Program before the commencement of 1st semester classes
 - Deduct admission fee (Rs. 5000), processing fee (Rs. 5000) and refund the rest.
- For students withdrawing from the Program after the commencement of 1st semester classes, but before the closure of the Admission Process
 - Deduct admission fee (Rs. 5000), processing fee (Rs. 5000), 25% of semester fee and refund the rest.
- For students withdrawing from the Program after the closure of the Admission Process
 - Deduct admission fee (Rs. 5000), processing fee (Rs. 5000), 100% of semester fee and refund the rest.

Intake

- The annual intake for the B.A. (Honours) Economics Program will be 80, including 35% quota for the resident students of Tamil Nadu.

II. ACADEMIC GOVERNANCE STRUCTURE

- The Academic Activities of the Institute are governed by the Academic Council. The Academic Council meets periodically to revise the syllabus and provide directions for the conduct of the Programs.
- The Chair Person (UG) will work with the Dean (UG) and the students' office (UG) to ensure smooth conduct of the three-year B.A. (Honours) Programme. The Chair Person will report to the Dean (UG). The Dean (UG) provides advice to the students during the course of their stay at MSE.
- The Controller of Examinations, with the help of the Dean (UG)/Chair Person (UG), governs all the examination processes of the B.A. (Honours) Programme and works with the Dean (Academic) for smooth conduct of the three-year B.A. (Honours) Programme.
- The student related administrative matters are coordinated by the Student's Office with the help of the Administrative Officer, under the guidance of the Dean (Academic), Dean (UG), the Chair Person (UG), and the Controller of Examinations.
- Two students (preferably one male and one female) will be elected as class representatives. The class representatives may change over the course of three years. The class representatives participate in the Class Committee Meetings (CCMs), which will be held twice during each semester. There will be third meeting without student representatives to finalize result. The CCMs constitutes representation from the faculty as well as the student community and provides scope for the student representatives to give feedback on the academic and other issues. The class representatives act as the points of contact for faculty members and the Students' Office on various issues during the course of the programme.

III. TEACHING AND EVALUATION REGULATIONS

1. Attendance

- i) Students are required to attend at least 75% of the classes held in each course of study as may be prescribed and at least 60% in case of 'redo' course. Attendance shall not be mandatory for students repeating only the end semester examinations.
- ii) Students absenting from classes continuously for 10 days and more will be liable to have his/her name removed from the rolls of the Institute. Absence on medical reasons should be supported by a certificate which has to be submitted with 5 working days after recovery/re-joining after illness. All Medical certificates should be from registered medical practitioner or hospital medical officer. The medical certificate(s) submitted after 5 working dates from the date of recovery/re-joining shall not be considered.
- iii) No student who has less than 75% attendance in any course shall be permitted to attend the end-semester examination and he/she shall be given grade of FA-failure due to lack of attendance. In such cases, the student shall be asked to redo that course by enrolling for it the next time it is offered.
- iv) Condonation of shortage of attendance below 75% may be considered by the Director on valid reasons such as medical or personal calamities on case by case basis.
- v) MSE encourages students who are representing their district/city/state/nation in sports or other extracurricular activities to apply. Such students are required to meet 65% attendance requirement. Students participating in sports or other extracurricular activities may also be allowed to miss certain lectures provided they get prior written approval from the Director/Dean (UG). No student in this category who has less than 65% attendance in any course shall be permitted to attend the end-semester examination and he/she shall be given grade of FA-failure due to lack of attendance.

2. Assessment and Examination

The student's progress in class shall be evaluated continuously. The continuous evaluation of students includes one mid-term written internal examination, an additional internal examination (decided by the concerned faculty member offering the course and can take form of either a written examination, or an assignment, or a term-paper), and an end-semester final examination. The final result in each semester is calculated on the basis of this Continuous Internal Assessment (CIA) component of 40 marks plus the End Semester component of 60 marks.

The Continuous Internal Assessment (CIA) and End Semester Examination (ESE) will form the basis for Evaluating/grading the student performance in each paper/course.

- i) It is mandatory for all students to participate in all the Internal Assessment tests and in various course-work related activities for the award of the marks.
- ii) If a student remains absent or scores low or nil marks in CIA, he/she shall not be permitted to reappear for internal assessment after the semester is over.

3. Evaluation

- i) Evaluation of each student enrolled in all programmes will be done based on the Grading System.
- ii) The students must secure a minimum of 40 percent in the End Semester Examination marks and a minimum 40 percent in the overall (Internal Assessment + End Semester Examination) marks to successfully complete each course.
- iii) The students having exceptionally lower marks in the Internal Assessment will be advised to 'redo' the course when it is offered next time.
- iv) Students failing a course due their absence in the end Semester examination (AE), or not securing minimum required percentage (F), can reappear only for the end semester examination, when it is conducted. This would be termed as a "Repeat"
- v) In case of 'Repeat', the internal marks secured by the student shall remain valid till he/she clears the course. In case of 'Redo', the student has to forgo his/her internal marks in the course. Specifically, he/she has to write internal as well as end-semester examination while fulfilling the minimum attendance requirements as specified above.
- vi) Students will not be allowed to redo/repeat the course for improving their grades.
- vii) Students should submit separate application for every course to be reevaluated in the prescribed form along with the prescribed fee (Rs. 1000 per subject) to the Controller of Examinations. The maximum number of reevaluation requests per semester is one paper.
- viii) Re-evaluation of answer-scripts can be sought only with at least one affirmation by a teacher relevant to the subject as mentioned below and that any of the criteria below are satisfied: (a) Finds that any answer(s) to question(s) that has/have not been evaluated and (b) Finds that the answer-script valuation in full or part is not justified and there is reasonable ground for re-evaluation.
- ix) The application for reevaluation shall be submitted to the Controller of Examinations through the Faculty Coordinator (UG).

4. Examination Fees

- i) There will be no additional examination fees for regular end semester examinations during the course of three years.
- ii) For arrear examinations, the students should pay Rs. 2000 per subject towards the examination fee.
- iii) In case of repeat dissertation, the students should pay Rs. 4000 towards the dissertation evaluation.

5. Grading System

- i) Grade is an index of the performance of a student in a particular course. It is the transformation of scaled marks secured by a student in a course. Grade point is the weight allotted to each grade depending on the range of marks awarded in a course.
- ii) The results of successful candidates will be classified as indicated below on the basis of the Cumulative Grade Point Average (CGPA):

- a) CGPA of 8.0 and above and up to 10.0 I Division with Distinction
- b) CGPA of 6.5 and above and up to 7.9 I Division
- c) CGPA of 5.5 and above and up to 6.4 II Division
- d) CGPA of 5.0 and above and up to 5.4 III Division

iii) To satisfactorily complete the programme and qualify for the degree, a student must obtain a minimum CGPA of 5. No student with “F”/ “FA”/ “AE” grade(s) on record shall be eligible for award of the degree.

6. *Grades and Grade Points*

Absolute grading system is followed by MSE. Under this system, the marks are converted to letter grades based on pre-determined mark intervals. The marks in fractions shall be rounded off to the nearest integer. The performance of students in each course is expressed in terms of marks as well as in Letter Grades. The grades may be awarded as given in the following Table.

Table 1: Grades and Grade Points

Range in Marks (%)	Letter Grade	Grade Point	Description
90 to 100	O	10	Outstanding
80 to 89	A+	9	Excellent
70 to 79	A	8	Very Good
60 to 69	B+	7	Good
50 to 59	B	6	Average
40 to 50	P	5	Just Pass (or Fair)
Below 40	F	0	Fail
	FA	0	Failure due to lack of attendance
	AE	0	Absent in the end semester examination

For conversion of overall CGPA into percentage of marks, the CGPA is multiplied by 10.

7. *Grade Sheets and Provisional/Final Degree Certificate*

- i) At the end of each semester, students are given grade sheet that includes grade point average (GPA) secured by the student in the semester.
- ii) A consolidated grade sheet is given at the end of three-years that reports the course-wise grade, semester-wise GPA, and the cumulative GPA (CGPA) obtained by the student.
- iii) For the students who have passed in all the courses of the programme, **Provisional Certificate** will be given soon after the declaration of the results. The **Final Degree Certificate** will be given during the Annual Convocation held in the month of September after earning 142 credits.

8. *Maximum Duration*

The students are allowed to carry arrears in each semester, but must pass in all the prescribed subjects within a maximum duration of **6** years from the date of joining the programme.

9. Grievances in Examinations

- i) MSE will have a Grievance Committee consisting of 2 faculty members along with the Controller of Examinations to examine the complaints received from the students of the school regarding their assessment.
- ii) Such requests for review from the students concerned should reach the Controller of Examinations through the Students Office within 15 days of the announcement of the results.

10. Awards/prizes/Medals

A maximum of four scholarships **would be** provided to deserving students (on merit-cum-means basis). **At the completion of the program**, the top student from the **program** will be awarded a Gold medal; top 3 students will be given merit **certificates**.

IV. ADMISSION GUIDELINES FOR NRI/FOREIGN NATIONALS INTO B.A. (HONOURS) PROGRAMME

- Application of Foreign Nationals seeking direct admission through self-financing scheme shall be entertained for the B.A. (Honours) Programmes of MSE.
- The Foreign nationals need NOT appear in the entrance test for admission; however, they should have passed the equivalent Qualifying Examination from an Indian or Foreign University/Institution.
- Provision to the extent of 10% of the total seats in the Programme on supernumerary basis for Foreign Nationals is available.

(i) Admissions Procedure:

- The Foreign Student, who wish to join under Self-financing category are required to submit their application along with bio-data and academic qualification on the prescribed format to the Students Office of MSE (email: studentsoffice@mse.ac.in).

(ii) Eligibility Criteria:

- Minimum eligibility qualifications for international students will be the same as for Indian students for the B.A.(Hons.) Programme.
- The correspondence of the qualifying examinations of the applicant can be assessed from the list of the Association of Indian Universities (AIU), New Delhi- 110002 (<http://www.aiuweb.org>). In case the University/Board is not included in the said list, the candidate has to obtain and submit an Equivalence Certificate to this effect from the Association of Indian Universities.
- English translations of all transcripts, duly attested, are to be submitted
- Candidates applying from their own country should get their transcripts attested by the concerned accredited authorized government agency and also duly certified by the Indian Embassy or Consulate
- On being granted admission, all applicants should produce their Students Visa within one month of completion of admission formalities. In case of failure to obtain a visa within the stipulated period, the admission shall stand cancelled. A copy of this visa is to be submitted to the Administrative Officer, MSE.
- Upon arrival in India every foreign student must register with the Foreigners Regional Registration Officer (FRRO).

(iii) Documents to be Submitted at the Time of Application/Admission

- All the Foreign nationals should submit their application on prescribed format along with all relevant documents, which can be downloaded from the website, www.mse.ac.in.
- Copy of the grade transcripts with the explanation of the assigned grades including certificate of secondary school, Diplomas and Degrees of examination passed. Original Certificates should not be sent.
- Attested copies of the syllabi and curricula of the qualifying degree adopted in the Colleges/ Universities attended with full details
- Copy of the passport indicating nationality and personal details
- Financial undertaking either a letter of recommendation from the Govt. certifying that the fees will be paid by the Govt. or a copy of the student's bank statement showing a balance of US \$ 5000
- Proof that the applicant has adequate knowledge of English
- If English is not the first language or language of medium of instruction (during secondary & tertiary education), the candidates must obtain the score mentioned in either of the two tests listed below:
 - a. The test of English as a foreign language (TOEFL), administered by the Educational Testing Service in the US, in which scores of at least 580 overall and 4.0 in the test of written English are required. The computer based test requires scores of at least 240 overall and 4.0 in essay writing. The internet based test requires scores of at least 95 overall with a minimum score of 20 in writing.
 - b. The International English Language Testing Service (IELTS) test, administered by the British Council, in which scores of 6 in each section and an overall score of 6.5 are required
 - c. Test scores more than two years old will not be accepted for consideration

(iv) NRI - Fees

Fee Structure for NRI students for the academic year **2022-23** are allowed to be decided by the Dean Academics, Dean (UG), Dean Research, Dean Student Affairs, Controller of Examination and Director of MSE.

V. CURRICULUM OF B.A.(HONOURS) PROGRAMME

1. The under-graduate programme is designed to offer B.A. (Honours) degree in Economics. The Programme is organized on the semester pattern. The academic year consists of two semesters of about 16 weeks each. Each semester consists of 4-5 courses. The main features of the curriculum are as follows:
 - **Core Courses**, which are compulsory
 - **Ability Enhancement (AE) Courses** are also compulsory. The AE courses are of two types: Ability Enhancement Compulsory Courses (AECC) and Skill Enhancement Courses (SEC):
 - **AECC** include English (Communication) and Environmental Studies/Science; and second language (a pass course).
 - **SEC** include a pool of courses designed to provide skill-based knowledge.
 - **Elective Courses**: Students can choose a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline. Elective Courses are grouped as:
 - **Generic Electives (GE)**: Electives from unrelated or allied subjects
 - **Discipline Specific Electives (DE)**: Electives offered by the main discipline are DSEs (certain electives may be discipline related or interdisciplinary nature)
 - **Dissertation/Project**: This is optional. Helps acquire special/advanced knowledge in a particular field (substitute for one course under DE)
 - For successful completion of the Programme, the student must earn a total of 142 credits.

2. The distribution of credits across core and elective courses is shown in Table 2.

Table 2: Structure of B.A. (Honours) Programme

Course Type	Number of Courses	Number of Credits (Theory)	Number of Credits (Tutorials/Practical)	Total Credits
Core Course (CC)	14	5	1	84
Generic Elective (GE)	4	5	1	24
Discipline Specific Elective, including Discipline Related Elective (DE)	4	5	1	24
Ability Enhancement Courses (AE): (AECC+SEC)\$	4 (AECC-2 & SEC-2)	2*	0	10
Total	26	-	-	142

* AE-1 (English) course is given 4 credits

\$ AE-2 is the second language (pass) course, for the completed within first 4 semesters of the program

3. The distribution of various courses across different semesters is shown in Table 3 below. The elective courses are listed in Table 4.

Table 3: Course Structure Across Semesters \$

Year	Odd Semester	Even Semester
1 st Year	Principles of Microeconomics (CC1) Mathematical Methods for Economics I (CC2) Indian Economy (CC3) English (AE-1)	Principles of Macroeconomics (CC4) Mathematical Methods for Economics II (CC5) Money and Banking (CC6) Environmental Studies/Science (AE-2)
2 nd Year	Intermediate Microeconomics (CC7) Statistics for Economics (CC8) GE1 DE-1 Decision Support System (AE-3)	Intermediate Macroeconomics (CC9) Introductory Econometrics (CC10) GE-2 DE-2 Introduction to R, Matlab and Python (AE-4)
3 rd Year	Public Economics (CC11) Economic Growth and Development (CC12) GE-3 DE-3	International Trade (CC13) Applied Econometrics (CC14) GE-4 DE-4/Dissertation

\$ The Second language (Tamil/Hindi/French/ German etc.) is a pass course

Table 4: Elective Courses

Elective Type	Courses
Generic Elective (GE)	History of Western Philosophy Logic and Philosophical Inquiry Real Analysis Abstract Algebra Operations Research Differential Equations Stochastic Calculus Introduction to Business Analytics Introductions to Computer Programming Introduction to Machine Learning Introduction to Data Science
Ability Enhancement Compulsory Courses (AECC)	English (AE-1) Environmental Studies/Science (AE-2)
Skill Enhancement Courses (SEC)	Decision Support System (AE-3) Introduction to R, Matlab and Python (AE-4)
Discipline Specific Electives (DE)	Special Topics in Macroeconomics Introduction to Game Theory Issues in Development Economics Risk Management Energy Economics Financial Economics International Finance Environmental Economics Introduction to Time Series Analysis History of Economic Thought Project/Dissertation

Note: Not all elective courses would be offered during a given semester. Courses offered would depend on faculty availability and commitments.

Detailed Syllabus of the Core and Elective Courses

Economic Discipline

Traditionally, economics has focused on understanding prices, competitive markets, and the interactions between markets. Today it is a scientific discipline. Economists today address a remarkable variety of social science questions. They formulate theories and collect data to test these theories against alternative hypothesis. Doing economic research involves asking questions about the social world and addressing those questions with data and clear-headed logic; employing mathematical, statistical, and econometric tools whenever appropriate to aid the analysis.

An undergraduate education in economics focuses on learning to analyse the world in terms of trade-offs and incentives- that is, to think like an economist. Our Economics course is designed for students who intend to pursue a career in industry, public policy and academia as they are trained to perform such tasks as gathering and analyzing economic/financial data, writing computer programs, solving mathematical problems, forecasting, etc. To achieve these objectives, we will acquaint ourselves with the set of tools – terminology, methodology, and the way of thinking– of an economist and practice using these.

Reasons to Study Economics

There are many reasons to study economics.

- For students interested in international trade, business cycles, or the stock market, economics is the natural choice.
- Many students choose economics because it provides an excellent background for business, banking, law, and even medicine. But more broadly, anyone seeking a quantitative, rigorous approach to any social science question will find economics exciting and relevant.

Undergraduate Economics Program at MSE

Madras School of Economics (MSE) is recognized as an Institute of Special Importance” by the Government of Tamil Nadu through MSE act 2020. MSE is now empowered to award its own degrees as specified under Section 22 of the UGC Act. It is one of the top ranked economics institutions in the country, headed by Dr. C. Rangarajan (former Chairman of Economic Advisory Council to Prime Minister of India and former Governor of RBI).

This course is unique as it adopts a quantitative, rigorous, data-driven analytic approach to the field. Students who complete this course have a fair chance to get admission into MA/MSc/PhD Program offered in reputed institutions both in India and abroad.

Employment Opportunities

- An undergraduate (honours) program in economics opens up many possibilities for employment.
- Many firms, including commercial banks, investment banks, hedge funds and other financial institutions, and large manufacturing companies, seek out economists in substantial number.
- There are also many opportunities for employment in government at the state, federal and international level.
- In addition, a growing number of research and consulting firms employ large number of economists in areas like forecasting, industry and financial analysis, consulting, strategy, etc.
- MSE in fact has a very good track record of placing its MA Students (almost 100%).

COURSE DESCRIPTION

CORE COURSES

SEMESTER I

CC:01 PRINCIPLES OF MICROECONOMICS

1: Consumer Theory

- Preference; utility; budget constraint; choice: utility maximization; demand; elasticity: price, income, cross price elasticity; indirect utility function; Slutsky equation; inferior, normal and Giffen goods; Roy's identity, revealed preference: weak axiom, compensated law of demand; consumer surplus, equivalent variation and compensating variation

2: Choice under Uncertainty and Intertemporal Choice

- Choice under uncertainty – utility function and expected utility, risk aversion and risk preference; intertemporal choice: savings and borrowing

3: Production and Costs

- Technology; isoquants; production with one and more variable inputs; returns to scale; Law of variable proportion, total, average and marginal product, marginal rate of technical substitution, iso-cost line and firm's equilibrium, elasticity of substitution; cost minimization; expansion path, short run and long run costs; various cost curves in the short run and long run and its relation; economies of scale; Shepard's lemma, Hotelling's lemma

4: Perfect Competition

- Review of perfect competition-firm and industry equilibrium, Marginal Revenue, Marginal Cost and Profit Maximization; uniqueness and stability of equilibrium, efficiency and welfare, tax incidence analysis, price-controls and shortages.

5: Input Market in a Competitive Setup

- Input demand for a competitive firm and competitive industry, Marginal productivity theory of distribution; Labour market-supply of labour, competitive labour markets, equilibrium, returns to scale and product exhaustion, Land markets and rent

Textbooks

- Varian, H. (2010). Intermediate microeconomics: A modern approach, 8th ed. W. W. Norton.
- Bernheim, B., Whinston, M. (2009). Microeconomics. Tata McGraw- Hill.
- Snyder, C., Nicholson, W. (2010). Fundamentals of Microeconomics. Cengage Learning.
- Robert Pindyck, Daniel Rubinfeld (2017): Microeconomics Eighth Edition, Pearson
- Bergstrom, T., Varian, H. (2014). Workouts in Intermediate Microeconomics. W. W. Norton.

CC:02 MATHEMATICAL METHODS FOR ECONOMICS I

1. Polynomial and rational functions. Quadratic equations, exponential and logarithmic functions, trigonometry and trigonometric functions. Coordinate geometry, circle, ellipse, hyperbola.
2. Complex numbers, fundamental theorem of algebra, mathematical induction, binomial theorem, series, and sequences, convergence.
3. Calculus of one variable; Limits, derivatives, chain rule, Taylor's series, maxima minima, integral calculus
4. Parametric equations and polar coordinates, Vectors, Matrices and Determinants.
5. Constrained and Unconstrained optimization, Lagrange Multiplier, Kuhn-Tucker condition, Envelope Theorem and Linear Programming.

Textbooks

- Rosen, Kenneth H. Discrete mathematics and its applications. 7th Ed. New York: McGraw-Hill, 2012.
- Simon, Carl P. and Blume L., Mathematics for Economists, Viva-Norton Student Edition, 2010.
- Stewart, James, Calculus Early Transcendentals, 6th Ed. Thomson Brooks/Cole, 2008.

CC: 03 INDIAN ECONOMY

1. Pros and cons of colonial rule and the status of Indian economy on the eve of Independence. The Soviet model of planning in India- Historical roots, evolution of plan models, limitation and lessons- Dominance of Public Sector and License Raj. Industrial Stagnation. Indian Economy in the 1980s-Nationalization of Banks- Industrial revival in the 1980s- Initial round of reforms in the 1980s- Growth revival in the late 1980s.
2. Importance of agriculture in national economy; Productivity in agriculture; Land reforms; New technology in Indian agriculture- Green Revolution- Need for second Green Revolution; Modern farm inputs and marketing- price policy and subsidies; Commercialisation and diversification
3. Poverty in India- Magnitude and determinants; Concepts of Poverty and Poverty Line- Trends and Pattern of Urban and Rural Poverty- Committees on poverty estimation; Poverty eradication programmes. Pattern of income distribution and the question of inequality in India.
4. Economic Crisis of early 1990s-Macro Economic Reforms since 1991-Structural Adjustment Programmes- Globalisation, Liberalisation and Privatisation- impact of 25 years of reforms on various sectors of the economy- Planning to markets - NITI Aayog and discontinuation of Central Planning- Demonetisation and its macro-economic impact - growth and inequality from regional perspective in Poverty in India.
5. Service sector as the engine of growth in India- Trade in services- Global technological change and Indian IT boom. Challenges of India's Service sector -External Sector- Foreign Trade- Salient features, composition and direction; Trade reforms- Balance of Payment; Exchange rate- India and WTO- Money and Banking- Organisation of India's money market and capital market- Changing role of Reserve Bank of India, Commercial banks, Development finance institutions, foreign banks and Non-banking financial institutions

Textbooks

- 1 Ahluwalia Isha Judge (1985): 'Industrial Growth in India: Stagnation Since the Mid-Sixties'. Oxford University Press, New Delhi.
- 2 Balakrishnan, P. (2010): 'Economic Growth in India: History and Prospect'. Oxford University Press, New Delhi.
- 3 Balakrishnan, P. (ed) (2011): 'Economic Reforms and Growth in India'. Orient Black Swan, Hyderabad.
- 4 Bhagwati Jagdish and Arvind Panagariya (2012): 'India's Tryst with Destiny'. Collins Business, Noida, India.

- 5 Deaton, A. and V. Kozel (ed) (2005): 'The Great Indian Poverty Debate'. New Delhi: Macmillan.
- 6 Nayyar Deepak (1994): 'Industrial Growth and Stagnation: The Debate in India', Oxford University Press, New Delhi.
- 7 Kapila, Uma (2016): 'Indian Economy since Independence: A Comprehensive and Critical Analysis of India's Economy 1947-2016', Academic Foundation, New Delhi.
- 8 Eswaran Mukesh and Ahosk Kotwal (1994): 'Why Poverty Persists in India'. Oxford University Press, New Delhi.
- 9 Jalan B (2017): 'India: Priorities for the Future'. Penguin Random House, New Delhi.
- 10 Jean Dereze and Amartya Sen (1996): 'An Uncertain Glory: India and its Contradictions'. Penguin Books Ltd. London.
- 11 Jeffrey Sachs, Ashutosh Varshney and Nirupam Bajpai (eds).(1999): India in the Era of Economic Reforms, Oxford University Press, New Delhi.
- 12 Rakesh Mohan (ed) (2017): ' India Transformed- 25 years of Economic Reforms'. Penguin Random House, New Delhi.
- 13 Vijay Joshi (2016): 'India's Long Road: The Search for Prosperity'. Penguin Random House, New Delhi. Publishers, New Delhi.

SEMESTER II

CC:04 PRINCIPLES OF MACROECONOMICS

1: The Science of Macroeconomics and the Data of Macroeconomics

- Time Series Decomposition
- Schools of Economic Thought
- National Income Accounts and Distribution of Income/GDP

2: The Classical Model and Economic Growth

- Long run aggregate supply in the classical model
- Determinants of Money Supply and the QTM
- Neoclassical model of Economic Growth
- Introduction to Endogenous Growth models

3: The Great Depression and the Keynesian Revolution

- Irving Fisher's Debt Deflation Hypothesis
- The IS-LM model of Aggregate Demand
- Theories of Consumption and Investment
- The IS-LM-BP model of the Open Economy or the Mundell-Fleming model
- The Gold Standard and international transmission of shocks

4: Inflation, Unemployment, and the Phillips Curve

- A. W Phillips (1958) and Samuelson and Solow (1960)
- The Natural Rate Hypothesis of Friedman and Phelps (1968)
- Determinants of the natural rate of unemployment

5: The Neoclassical-Keynesian Synthesis

- Solving the model with difference equations
- Understanding its properties (short-run dynamics and long-run behaviour) and policy implications
- Stagflation of the 1970s and the breakdown of the Phillips curve

Textbooks

- Mankiw, Gregory. N (2002), Macroeconomics, Worth Publishers; 5th edition.
- Blanchard, Olivier (2003), Macroeconomics, Prentice Hall, Third Edition
- Parkin, M., and Bade, R. (1988), Modern Macroeconomics 2nd. Edition, Philip Allan Publishers Limited.
- Snowdon, B., Vane, H. and Wynarczyk, P. (1994), A Modern Guide to Macroeconomics: An Introduction to Competing Schools of Thought. Northampton MA: Edward Elgar Publishing.

CC: 05 MATHEMATICAL METHODS FOR ECONOMICS II

1. Vectors in 2- and 3-dimensional Euclidean spaces.
2. Partial derivatives, Taylor's Series, maxima minima in several variables, Multiple integrals.
3. Vector calculus. Theorems of Green, Gauss, and Stokes.
4. Linear Algebra, Matrix Factorization, Echelon Form, Row, Column and Null Spaces, Orthogonal Matrices.
5. Least Squares, SVD, Gradient, Hessian and Jacobian. Change of Basis, Eigen values and Eigenvectors.

Textbooks

- Lay, David C, McDonald, Judi J and Lay, Steven R. Linear Algebra and Its Applications, 5th Ed, Pearson, 2015.
- Simon, Carl P. and Blume L., Mathematics for Economists, Viva-Norton Student Edition, 2010
- Stewart, James, Calculus Early Transcendentals, 6th Ed. Thomson Brools/Cole, 2008.

CC:06 MONEY AND BANKING

1: Financial System and Money: Overview of Financial system and introduction to money, role of money in the payment system, financial instruments and financial markets.

2: Interest Rates: Meaning of interest rates, types of interest rates, interest rates and asset values, present value, future value, risk and term structure of interest rates

3: Banks and NBFCs: Banking regulation act 1949 and revision/re-regulation, nationalized and private banks, non-banking financial intermediaries

4: Central Bank: Role of central banks, central bank balance sheet and money supply process, conduct of monetary policy, central bank and foreign exchange, Basel norms

5: Financial Market: Capital markets- primary and secondary, Introduction to the stock market, rational expectations, efficient market hypothesis

Textbooks

- Money, Banking, and Financial Markets, Fourth Edition, Stephen G. Cecchetti, Kermit L. Schoenholtz
- Money and Banking, Robert E. Wright, Vincenzo Quadrini

SEMESTER III

CC:07 INTERMEDIATE MICROECONOMICS

1: General Equilibrium, Efficiency and Welfare

- Equilibrium and efficiency under pure exchange and production; Walras law; Pareto Optimality, Edgeworth box and contract curve; efficiency and welfare economics: fundamental theorems of welfare economics.

2: Monopoly

- Monopoly and barriers to entry; pricing with market power; mark-up, Lerner's index; price discrimination: 1st degree, 2nd degree, 3rd degree; dead-weight loss; impact of tax

3: Monopolistic Competition

- Product differentiation, love for variety, Perceived and proportionate demand, short run and long run equilibrium, excess capacity, ideal output

4: Game theory and Oligopoly

- Normal and extensive form of games under complete information, Sequential and simultaneous games, dominant strategies and elimination of dominated strategies, Nash equilibrium, Dynamic games, backward induction, subgame perfect equilibrium, applications: Cournot model, Bertrand Model, Quantity and Price leadership

5: Market Failure

- Types of public goods, theory of public goods – provision and pricing, government intervention, second-best solution, free riding; types of externalities – production and consumption externalities, Pigovian and Coasian solutions; asymmetric information and moral hazard: principal agent problem, theory of lemon, credit market, implications of asymmetric information, market signalling, hidden information modelling

Textbooks

- Varian, H. (2010). Intermediate Microeconomics: A modern approach, 8th ed. W. W. Norton.
- Bernheim, B., Whinston, M. (2009). Microeconomics. Tata McGraw- Hill.
- Snyder, C., Nicholson, W. (2010). Fundamentals of Microeconomics. Cengage Learning.
- Robert Pindyck (Author), Daniel Rubinfeld (2017): Microeconomics Eighth Edition, Pearson
- Bergstrom, T., Varian, H. (2014). Workouts in Intermediate Microeconomics. W. W. Norton.
- Osborne, M. (2004). An introduction to game theory. Oxford University Press.

CC:08 STATISTICS FOR ECONOMICS

1: Probability Theory

- Sets, Sample spaces and events;
- probability axioms and properties; counting techniques;
- conditional probability and Bayes' rule; independence

2: Random Variables and Probability Distributions

- Defining random variables; discrete and continuous random variables, probability distributions – pdf and cdf; uniform, binomial, exponential, Poisson, hypergeometric and Normal random variables

3: Expectation

- Order Statistics and expected values and functions of random variables;
- Median, quantiles, variance,
- Covariance and conditional expectations

4: Random Sampling, Law of Large Numbers and Central Limit Theorem

- Sample and population, simple random sampling, estimators,
- Law of large numbers,
- Central Limit Theorem

5: Estimation Methods and Properties; Confidence Intervals and Hypothesis Testing

- Estimation of population parameters using methods of moments and maximum likelihood procedures; properties of estimators; bias, efficiency and consistency
- confidence intervals for population parameters, Defining statistical hypotheses; distributions of test statistics; testing hypotheses related to population parameters; Type I and Type II errors; power of a test; tests for comparing parameters from two samples

Textbooks

- Larsen, R., and M. Marx. Introduction to Mathematical Statistics and Its Applications. 4th ed. Upper Saddle River, NJ: Pearson Prentice Hall, 2005. ISBN: 9780131867932.
- Gupta S C and Kapoor V K - Fundamentals of Mathematical Statistics, Sultan Chand and Sons (2017).

SEMESTER IV

CC:09 INTERMEDIATE MACROECONOMICS

1: Rational Expectations Hypothesis

- Properties of the conditional expectations operator
- Comparison of REH with AEH when there is a policy regime change

2: Solving Linear RE Model

- Basic method to solve linear RE
- Muth method of undetermined coefficients
- MSV solution technique

3: Policy Implication of Rational Expectations Hypothesis

- Sargent-Wallace (1975) policy invariance result
- Cost of disinflation under AE and RE
- Rules versus Discretion debate

4: Role for Keynesian Stabilization under REH

- Asymmetric Information
- Fischer's overlapping wage contracts model
- Wage indexation

5: Optimal Policy and Time Inconsistency

- Lucas (1976) critique of Econometric Policy Evaluation
- Case for stabilization under REH
- Problem of time inconsistency (Kydland and Prescott, 1977) and inflation bias that results under discretion (Barro and Gordon, 1983)

Textbooks

- Mankiw, Gregory. N (2002), *Macroeconomics*, Worth Publishers; 5th edition
- Attfield, C., D. Demery and N. Duck (1992) *Rational Expectations in Macroeconomics* 2nd Edition, New York: Basil-Blackwell.
- Chiang, A. (1984) *Fundamental Methods of Mathematical Economics*, 3rd. Edition, New York: MacGraw-Hill. (chapters 16 & 17 a must for learning difference equations)
- Minford, P., and Peel, D. (2002) *Advanced Macroeconomics: A Primer*, Northampton, MA: Edward Elgar.
- Lucas, R.E. and T.J. Sargent (1981), *Rational Expectations and Econometric Practice*, Allen & Unwin, London. (Volume 1)

CC:10 INTRODUCTORY ECONOMETRICS

1: Nature and Scope of Econometrics

Distinction between Economic Model and Econometric model; Concept of stochastic relation, Role of random disturbance in econometric model; Types of data; Application of Econometrics in different branches of social science

2: Two-variable Linear Regression Model and Introduction to Multiple Regression Model

The classical assumptions; Concepts of population regression function and sample regression function; Estimation of model by method of ordinary least squares, Limitations of SLRM, Economic interpretations of the estimated model; Multiple Linear Regression Model: Estimation of parameters; partial regression coefficients; Simple correlation, partial correlation and multiple correlation

3: Classical Linear Regression Model (Simple and Multiple Linear Regression)

Properties of the Least Squares Estimators (BLUE) in SLRM- Gauss-Markov theorem; Qualitative (dummy) independent variables – intercept dummy and slope dummy (only interpretation of the model); Specification Analysis: Omission of a relevant variable: Inclusion of irrelevant variables, Tests of specification errors; Forecasting - Ex-post forecast and Ex-ante forecast, forecast error (only for two variable model)

4: Statistical Inference in Linear Regression Model

Use of standard normal, chi², t, and F statistics in linear regression model; Testing hypothesis: Single test (t test and chi² test) Joint test (F test); Goodness of fit (in terms of R², adjusted R² and F statistic), Analysis of Variance (ANOVA); Statistical significance and economic importance

5: Violations of Classical Assumptions

Multicollinearity - Consequences, Detection (Variance Inflationary Factor (VIF)) and Remedies; Heteroscedasticity - Consequences, Detection (Lagrange Multiplier test) and Remedies; Autocorrelation - Consequences, Detection (Durbin-Watson test) and Remedies

Textbooks

- G.S..Maddala, Introduction to Econometrics, 3rd edition, John Wiley & Sons Ltd (2005).
- Wooldridge, Jeffrey M. (2013), Introductory Econometrics – A Modern Approach, CENGAGE learning
- J. Johnston, Econometric Methods, 3rd Edition, McGraw-Hill/Irwin; 4th edition (1996)
- Jan Kmenta, Elements of Econometrics, Macmillan Publishing company (1991)
- D. Gujarati, Basic Econometrics, McGrawhill Higher Education (2003)
- Greene W.H.: Econometric Analysis, 4th edition, Pearson Education (2000)
- Christopher Dougherty, Introduction to Econometrics, Oxford University Press, 3rd edition, Indian edition, 2007.

SEMESTER V

CC:11 PUBLIC ECONOMICS

1: Normative Approach to Public Finance

Welfare Economics-Pure Exchange Economy and Economy with Production- The Fundamental Theorem of Welfare Economics; Choosing among Pareto Efficient Points

2: Market Failure and Public Goods

Types of market failure- Public goods-Samuelson's theory-Lindahl Model of Pareto Optimality-Free rider problem- Efficient provision of public goods-Externalities-Introduction to Public Choice

3: Principles of Taxation and Grant Theory

Benefit approach, Ability to Pay Principle-Progressive Taxation-Excess Burden-Direct vs. Indirect Taxes-Theory of Tax Incidence-Theory of Grant

4: Deficit Financing and Public Debt

Deficit financing-measures of deficit and their relation with public debt-causes and sources of public debt-consequences of high level debt-debt sustainability-solvency conditions-debt dynamics-relation between debt and growth-Ricardian view, Keynesian view and neo-classical view.

5: Indian Fiscal System

Constitutional Assignment of Tax powers and Expenditure Responsibilities to Union and States-Transfers mechanism-Trends in Central and States Receipts and Expenditures-Tax Reforms-Deficit and Public Debt- FRBM rules; Finance Commission- local body governments-public sector undertakings.

Textbooks

- Govinda Rao, M: Studies in Indian Public Finance, Oxford University Press (forthcoming)
- Harvey S. Rosen: Public Finance, Richard Irwin Inc., (1992).
- Hillman A.L.: Public Finance and Public Policy, Cambridge University Press (2003)
- Jha, R: Modern Theory of Public Finance, Wiley Eastern Ltd., (1987)
- Musgrave, R.A, and P.B.Musgrave: Public Finance in Theory and Practice, McGraw-Hill, New York, (1976)
- Srivastava, D.K : Issues in Indian Public Finance, New Century Publications (2005)

Web Resources

<https://prezi.com/nqadt5-xobnq/m2-analyse-the-effects-of-fiscal-and-monetary-policies-for-a/>
<https://economics.stanford.edu/courses/public-finance-and-taxation-ii>
http://www.andrew.cmu.edu/user/rs9f/pf04_9_12_04_vol_1.pdf
<http://ocw.mit.edu/courses/economics/14-471-public-economics-i-fall-2012/lecture-notes/>
http://obs.rc.fas.harvard.edu/chetty/public_economics_lectures.pdf

CC:12 ECONOMIC GROWTH AND DEVELOPMENT

1: Conceptions of Development

- Income Approach and Capability Approach
- Construction and interpretation of HDI; international variations in development measures; comparing development trajectories across nations and within them.
- Dependency school of development.

2: Growth Models and Empirics

- The Harrod-Domar model
- Solow model and its variants, endogenous growth models and evidence on the determinants of growth.
- Balanced vs. Unbalanced Growth Theories
- Choice of Techniques

3: Dual Economy Models

- The concept of surplus labour and disguised unemployment
- Peasants and Dualism with and without surplus labour
- Interdependence of agriculture and Industry (Lewis model, Ranis-Fei model)
- Rural-Urban Migration (Harris- Todaro model)

4: Poverty and Inequality

- Definitions, Measures and Mechanisms Inequality axioms;
- comparison of commonly used inequality measures; connections between inequality and development;
- poverty measurement; characteristics of the poor; mechanisms that generate poverty traps and path dependence of growth processes.

5: Political Institutions and the Functioning of the State

- Definition of institutions, Evolution of Political and Economic Institutions.
- The determinants of democracy;
- Alternative institutional trajectories and their relationship with economic performance;

- Within-country differences in the functioning of state institutions; state ownership and regulation; government failures and corruption.

Textbooks

- Debraj Ray, *Development Economics*, Oxford University Press, 2009.
- Partha Dasgupta, *Economics, A Very Short Introduction*, Oxford University Press, 2007.
- Abhijit Banerjee, Roland Benabou and Dilip Mookerjee, *Understanding Poverty*, Oxford University Press, 2006.
- Kaushik Basu, *The Oxford Companion to Economics in India*, OUP, 2007.
- Amartya Sen, *Development as Freedom*, OUP, 2000.
- Daron Acemoglu and James Robinson, *Economic Origins of Dictatorship and Democracy*, Cambridge University Press, 2006.
- Robert Putnam, *Making Democracy Work: Civic Traditions in Modern Italy*, Princeton University Press, 1994.
- Kaushik Basu, *Analytical Development Economics*, OUP.
- Meier & Rauch (ed), *Leading Issues in Development Economics*, OUP.
- Todaro & Smith, *Economic Development*, Pearson Education, 2009.
- Bardhan, P. (2010). *Awakening giants, feet of clay: Assessing the economic rise of China and India*. Oxford University Press.

SEMESTER VI
CC:13 INTERNATIONAL TRADE

1. Mercantilist doctrine of balance of trade - Adam Smith and absolute advantage theory of trade- Ricardo and comparative advantage, its limitations- production possibility curve – Community indifference curve- Gain from trade- Offer curve- Determination of international equilibrium price.
2. Different concepts of terms of trade- Factors affecting terms of trade. Heckscher Ohlin Model- Stolper-Samuelson Theorem- Rybczynski Theorem.
3. Definitions of factor abundance- relationship between factor prices and commodity prices- Factor price equalisation theorem- Factor intensity reversal- the Leontief Paradox.
4. Other alternative explanations of the basis of trade in terms of technological lead, domestic market size and product cycle approach– Linder’s hypothesis– Intra-industry trade.
5. The rationale of tariffs, quotas and subsidies– infant industry argument– tariffs and factor income distribution– tariffs, terms of trade and domestic prices– the optimum tariff rate – tariffs, subsidies and distortions in commodity and factor markets – effective rate of protection. Welfare implications of tariff.

Textbooks

- Feenstra. R., and Taylor, A. (2014). International Economics, 3rd ed. Worth Publishers.
- Bhagwati, J., A. Panagariya, and T. Srinivasan. Lectures on International Trade (2nd edition), MIT Press, 1998.
- Van Marrewijk, C., International Economics, Oxford University Press, 2007.
- Krugman, P., Obstfeld, M., Melitz, M. (2018). International Economics Theory and Policy, 11th ed. Pearson Education.
- Pugel, T. (2015). International Economics, 16th ed. McGraw-Hill.

CC:14 APPLIED ECONOMETRICS

1: The Linear Regression Model

- Estimation, specification, inference and diagnostic testing: estimation, Mis-specification, functional forms, model selection

2: Advanced Topics in Regression Analysis

- Non-linear regression models, measurement errors, Using IV to solve omitted-variables problems

3: Panel Data Models and Estimation Techniques

- Types of panel data, Panel data models and estimation techniques: pooled regression, fixed and random effects models

4: Limited Dependent Variables Models

- Logit and Probit models for binary responses, Tobit models for truncated data.

5: Time Series Regression

- Basic concepts of time series, seasonality, time trend, autoregressive models, distributed lag models

Textbooks

- Stock JH and Watson MW (2019) Introduction to Econometrics, 4th edition, Pearson.
- Wooldridge, Jeffrey M. Introductory Econometrics: A Modern Approach. 3rd ed. Mason, OH: Thomson/South-Western, 2006. ISBN: 9780324289787.
- Christopher F. Baum, (2006), An Introduction to Modern Econometrics Using Stata, Stata Press
- Maddala, G. S. (2002), Introduction to Econometrics, Macmillan Publishing Company

GENERIC ELECTIVE (GE) COURSES

GE:01 HISTORY OF WESTERN PHILOSOPHY

- 1.Plato: Ideal State Justice Education Plato's Communism
- 2.Aristotle: Origin of the State End of the State –Law and Justice – Aristotle on Revolution
- 3.Rousseau: Social Contract General Will Sovereignty
- 4.Hobbes: Social Contract Sovereignty Liberty – Rights
5. Karl Marx: Materialism Class war Socialist Revolution Final Goal of Communism

Textbooks

- Collinson, Diane: Fifty Major Philosophers, London: Croom Helm, 1987.
- Lechte, John: Fifty Key Contemporary Philosophers, London: Routledge, 1994.
- Price, Joan A: Philosophy through the Ages, Australia: Wadsworth 2000.
- Scruton, Roger: A Short History of Modern Philosophy, London: Routledge, 1995.
- Catlin, The Story, of the Political Philosophers, London. Whittlesey House, 1939
- Cocker Francis W., Recent Political Thought. London, D. Appleton Century Company, 1934.
- Cocker Francis W., Reading in Political' Philosophy, New York, Macmillan. 1938.
- Doyle, Phyllis, A History of Political Thought, London, Jonathan Cape, 1961.

GE:02 LOGIC AND PHILOSOPHICAL INQUIRY

1: Introduction to Philosophy

- The definition, meaning, scope and subject matter of philosophy- the main branches of philosophy- Philosophical attitudes, motives for doing philosophy- characteristics of philosophy- schools of philosophy.

2: Formal Logic

- Definition, meaning- units of arguments- terms, definition, proposition, inference—mediate and immediate inference. Dilemma and fallacies.

3: Symbolic Logic

- The transition to modern logic; constants and variables; truth tables, propositional and predicate logic.

4: Indian Systems of Logic

- Hindu, Buddhist, etc

5: Research Methodology

- General directions on writing the dissertation, thesis and steps in writing; research design, language and style; sectional arrangement, regulations on quotations, documenting sources, preparing bibliography.

Textbooks

- Copi, Irving and Cohen, Carl: Introduction to Logic, 13th edition, Pearson Education India, 2008.
- Bergmann, Merrie: The Logic Book, 3rd ed., New York: Mcgraw - Hill 1998.
- Davis, Thomas D., Philosophy: An Introduction, New York: Mcgraw - Hill, 1993.
- Gangopadhyay, Mrinal: Indian Logic in its sources, New Delhi: Munshiram Manoharlal Publishers, 1984.
- Hurley, Patrick: A Concise Introduction to Logic, Melbourne: Wadsworth, 2000.

GE:03 REAL ANALYSIS

1. Review of Set Theory, Basics of Logic, Proof Techniques, Induction, Proof by Contradiction, Constructive proofs, Contrapositive, Relations, Functions, Different types of Mappings, Cardinality of Sets, Rational and Irrational Numbers
2. Real Number System, Sequences and Series of Real Numbers, Increasing, Decreasing and Monotonic Sequences, Sub-sequences, Types of Convergence, Sup, Inf, Completeness, Cauchy Sequences, Limsup, Liminf
3. Open and Closed Sets, Balls, Limit Points, Different Types of Norms, Metric Spaces, Compact and Connected Sets, Heine Borel Theorem, Bolzano Weierstrass Theorem, Applications to Economics
4. Limits and Continuity of Functions, Epsilon Delta definition, Types of Discontinuity, Intermediate Value Theorem, Uniform Continuity, Differentiability, Integrable Functions, Interchange of Integration and Differentiation.
5. Sequences and Series of Functions, Uniform Convergence, Power Series

Textbooks

- Walter Rudin, Principles of Mathematical Analysis, International Series in Pure and Applied Mathematics, 3rd Edition, McGraw-Hill, 1976.
- Robert G. Bartle and Donald R. Sherbert, Introduction to Real Analysis, Wiley, 2011.

GE:04 ABSTRACT ALGEBRA

1. Review of Set Theory, Basics of Logic, Proof Techniques, Induction, Proof by Contradiction, Constructive proofs, Contrapositive, Relations, Functions, Different types of Mappings, Combinatorics, Number Theory
2. Groups, Subgroups, Isomorphic Binary Structures, Cyclic Groups, Groups of Permutations, Orbits, Cycles, Cosets, Homomorphisms
3. Cauchy's Theorem, Finite Abelian Groups, Sylow's Theorem, Symmetric Group, Factor Groups, Polya's Enumeration Theorem
4. Rings, Ideals, Homomorphisms, Quotient Rings, Rings of Polynomials, Ideals, Integral Domain, Field of Quotients, Fermat's and Euler Theorem's, Polynomials over the Rationals
5. Fields, Field Extensions, Roots of Polynomials, Finite Fields, Factorization of Polynomials over a Field, Finite Fields, Automorphisms of Fields, Splitting Fields, Galois Theory and applications

Textbooks

- John B. Fraleigh and Neal Brand, A first course in Abstract Algebra, 8th Edition, Pearson, 2020.
- P.M. Cohn, Basic Algebra, Groups, Rings and Fields, Springer, 2005.
 - Charles C. Pinter, A Book of Abstract Algebra, 2nd Edition, Dover, 2010.

GE:05 OPERATIONS RESEARCH

1. Operations Research Models, Solving the OR Model, Queuing and Simulation Models, Art of Modeling, More than Just Mathematics, Phases of an OR Study Modeling with Linear Programming- Introduction, Two-Variable LP Model, Graphical LP Solution, Computer Solution with Solver and AMPL, Linear Programming Applications. The Simplex Method and Sensitivity Analysis - LP model in Equation Form, Transition from Graphical to Algebraic Solution, The Simplex Method, Artificial Starting Solution, Special Cases in the Simplex Method, Sensitivity Analysis
2. Duality and Post-Optimal Analysis- Definition of the Dual Problem, Primal–Dual Relationships, Economic Interpretation of Duality, Additional Simplex Algorithms, Dual Simplex Algorithm, Post-Optimal Analysis Bounded-Variables Algorithm, Duality, Unboundedness and infeasibility, Parametric Linear Programming Transportation Model and Its Variants Definition of the Transportation Model, Nontraditional Transportation Models, The Transportation Algorithm - Determination of the Starting Solution, Northwest-corner method, Least-cost method, Vogel approximation method (VAM), Iterative Computations of the Transportation Algorithm, etc
3. Classical Optimization Theory Unconstrained Problems, Constrained Problems Constrained derivatives (Jacobian) method. Sensitivity analysis in the Jacobian method, Lagrangean method- Inequality Constraints—Karush–Kuhn–Tucker (KKT) Conditions, Sufficiency of the KKT conditions. Nonlinear Programming Algorithms Unconstrained Algorithms, Constrained Algorithms.
4. Markov Chains: Definition of a Markov Chain, Absolute and n-Step Transition Probabilities, Classification of the States in a Markov Chain, Steady-State Probabilities and Mean Return Times of Ergodic Chains, First Passage Time, Analysis of Absorbing States.
5. Simulation Modeling Monte Carlo Simulation, Types of Simulation.

Textbooks

- G.B. Dantzig, Linear Programming and Extensions, Princeton Landmarks in Mathematics, Princeton University Press, 1963.
- D. Bertsekas and J. Tsitsiklis Introduction to Linear Optimization, Athena Scientific, 1997.
- D. Bertsekas, Nonlinear Programming, Athena Scientific, 2nd Edition, 1999.
- R. Bellman, Dynamic Programming, Dover, 2003.
- F. Hillier and G. Lieberman, Introduction to Operations Research, McGraw Hill, 11th Edition, 2021.

GE:06 DIFFERENTIAL EQUATIONS

1. Ordinary differential equations, first-order systems with constant coefficients.
2. Fourier series, Linear second-order ordinary differential equations, Laplace and Fourier Transforms.
3. Special functions, series solutions of ordinary differential equations, partial differential equations.
4. Existence and uniqueness of solutions, autonomous systems, Sturm-Liouville Theory, Elliptic.
5. Parabolic and Hyperbolic partial differential equations, Green's function.

Textbooks

- George F. Simmons, Differential Equations with Applications and Historical Notes, 3rd Edition, Chapman and Hall, CRC Press, 2016.
- Morris W. Hirsch, Stephen Smale and Robert L. Devaney, Differential Equations, Dynamical Systems, and an introduction to Chaos, Elsevier, 2004.
- Walter A. Strauss, Partial Differential Equations: An Introduction, 2nd Edition, Wiley, 2007.

GE:07 STOCHASTIC CALCULUS

1. Convergence of Random Variables, Limit Theorems, Introduction to Stochastic Process, Sample Paths, Discrete Time Markov Chains (DTMC), Transition Matrices, Equilibrium Distribution, Gambler's Ruin problem, Recurrent and Transient States, Continuous Time Markov Chain (CTMC), Forward and Backward Kolmogorov equations
2. Poisson Processes, Counting Process, Stationary and Independent Increments Property, Inter-arrival and Waiting Time Distributions, Nonhomogeneous and Compound Poisson Process
3. Conditional Expectation, Filtrations, Martingales, Martingale Representation and Convergence Theorem, Stopping Times, Super and Sub Martingales, Brownian Motion as a limit of a Random Walk
4. Brownian Motion, Stationary and Independent Increments Property, Reflection Principle, Hitting Times, Brownian motion with Drift, Geometric Brownian Motion, Quadratic Variation of Brownian Motion.
5. Ito Processes, Ito's Lemma, Ito Integrals, Ito Isometry, Stochastic Differential Equations, applications to Derivative Pricing

Textbooks

- Howard M Taylor and Samuel Karlin, An introduction to Stochastic Modeling, Academic Press, 3rd Edition, 1998.
- Sheldon M Ross, Introduction to Probability Models, Academic Press, 10th Edition, 2010.
- Martin Baxter and Andrew Rennie, Financial Calculus: An Introduction to Derivative Pricing, Cambridge University, Press, 1st Edition, 1996.

GE:08 INTRODUCTION TO BUSINESS ANALYTICS

1: Metrics

- Introduction to metrics and measurements. Management processes, data collection, databases to support organizational metrics

2: Management Reporting

- Understanding business objectives, problems to be solved, new initiatives. Examining the data and preparing management reports to address these. Interpreting and presenting management reports. Graphical and cross tabs.

3: Human Resources

- Work with Human Resources (HR) data, develop and understand HR metrics, prepare reports and develop recommendations for improvement in organizational HR performance – productivity, absenteeism, etc.

4: Marketing And Sales

- Work with Marketing and Sales data, develop and understand Marketing and Sales metrics, management reporting and present plans and recommendations supported by data for exercises such as rationalization of product lines, profitability etc.

5: Vertical Industries

- Understand business drivers in specific industries and relation to outcomes, profits, growth sustainability. Students will choose an industry, discover data, and use the concepts of metrics and reporting to understand the key determinants of success of the chosen industry. Examples: credit cards, electric utilities, government.

Textbooks

- Exit Voice And Loyalty Albert O. Hirschman – PDF available.
- An Introduction To Statistical Learning
- Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirami.

GE:09 INTRODUCTION TO COMPUTER PROGRAMMING

1. Basic model of computation, Data types, operators and variables. Operators and operands; statements; branching, conditionals, and iteration
2. Notion of Algorithms, Principle of Mathematical Induction. Basics of functional programming, notion of types
3. Iterative versus recursive style. Correctness and efficiency issues in programming, time and space measures.
4. Basics of imperative style programming. Assertions and loop invariants.
5. Top down design and examples of step-wise refinement. Programming using structures, introduction to encapsulation and object oriented programming.

Textbooks

- Subhashis Banerjee, S. Arun-Kumar, D. Dubhashi: Introduction to Computer Science. Manuscript.
- Structure and Interpretation of Computer Programs by Harold Abelson and Gerald Sussman with Julie Sussman, MIT Press, 1985.
- How to solve it by Computer by R. J. Dromey, Prentice-Hall India EEE Series
- Guttag, John. *Introduction to Computation and Programming Using Python: With Application to Understanding Data Second Edition*. MIT Press, 2016. ISBN: 9780262529624

Most of the topics are taken from the two courses in the links below. This will help in Econometric Data Science a lot. Especially if the tool used is Python.

<https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-0001-introduction-to-computer-science-and-programming-in-python-fall-2016/syllabus/>

https://nptel.ac.in/content/syllabus_pdf/106104074.pdf

GE:10 MACHINE LEARNING

- 1. Search Problems:** Review of Propositional and Predicate Logic, Constraint Satisfaction, Heuristic Search, Motion Planning, Action Planning, Knowledge Representation, Discrete mathematics and Algorithmic thinking
- 2. Supervised and Unsupervised Learning:** Basic framework and concept of training, test and validation data, building machine learning models, Review of basic probability and statistics, data cleaning
- 3. Linear Regression:** Motivation, Probabilistic Model, Matrix Calculus, Maximum likelihood approach, Weighted Least Squares, Gradient descent algorithm
- 4. Classification:** Formulation of the classification problem, Confusion Matrix, Precision and Recall, Binary and Multiclass Logistic Regression, Naïve Bayes algorithm, Applications to text analytics
- 5. Clustering and Dimension Reduction:** Introduction to K-means Clustering, Elbow Heuristic for choosing number of clusters, Hierarchical Clustering, Principal Component Analysis, connection to Optimization

Textbooks

- Mitchell T, *Machine Learning*, McGraw Hill 1997
- Russel S. and Norvig P. *Artificial Intelligence: A Modern Approach*, 3rd Ed., Prentice Hall, 2010
- Bishop C.M., *Pattern Recognition and Machine Learning*, Springer, 2006

GE:11 INTRODUCTION TO DATA SCIENCE

1: Data

- Constituent elements of data. Information theory. Data structures - representing data – Rows, Columns and Tables. Identifying problems in data

2: Data Descriptors

- Understanding data through summary statistics. Graphical exploration. Distributions. Sampling. Correlations and Inference

3: Big Data

- Descriptions of large data sets. Construction of large data and wide datasets. Tidy Data.

4: String Manipulation

- Dealing with textual data. Webscraping to harvest data. Cleaning, storing and organizing text data for analysis.

5: CRISP – DM

- Follow the cross industry standard process for data mining in a class project. Steps include: Business understanding, Data Understanding, Data Preparation, Modeling, Evaluation and Deployment.

Required Course Material

Python Programming Resources – setting up the environment

Tableau – install on desktops

Supplemental Course Material

<http://www.datasciencecentral.com/>

<http://datasciencemasters.org/> (Open Courseware and MOOCs)

https://en.wikibooks.org/wiki/Data_Science:_An_Introduction

<http://bhcc.onthehub.com/>

Blogs And Other Data Science Resources

<http://flowingdata.com>

<http://fivethirtyeight.com>

<http://www.kdnuggets.com>

<https://www.kaggle.com>

ABILITY ENHANCEMENT (AE) COURSES

AE:01 ENGLISH

1: POETRY

- John Milton On His Blindness
- William Wordsworth Daffodils
- Percy Bysshe Shelley Ozymandias
- Emily Dickinson Because I could not stop for Death
- Sarojini Naidu The Queen's Rival

2: PROSE

- Francis Bacon Of Love
- Charles Lamb A Dissertation upon Roast Pig
- Katherine Mansfield A Doll's House
- R. K Narayan An Astrologer's Day
- Abdul Kalam The Power of Prayer

3: DRAMA

- Oscar Wilde *Lady Windermere's Fan*

4: GRAMMAR

- Tenses
- Subject-Verb Agreement

5: COMPOSITION

- Essay Writing

Recommended Reading:

- Wisdom and Experience: An Anthology for Degree Classes. Board of Editors, Orient Longman Limited, 2007.
- Lalitha Natarajan and Sasikala Natesan: English for Excellence: Poetry Anuradha Publications
- Literary Pursuits: Board of Editors, Orient Longman Limited, 2015
- Literary Pinnacles: An Anthology of Prose and Poetry. Board of Editors, Orient Longman Limited, 2015.
- Brookside Musings: A Selection of Poems and Short Stories: Board of Editors, Orient Longman Limited, 2009.
- The Approach to Life: A Selection of English Prose: Orient Longman Limited, 2009.

E-Learning Resources:

John Milton: On His Blindness - <https://www.bartleby.com/4/313.html>

Sarojini Naidu: The Queen's Rival - <https://www.poemhunter.com/poem/the-queen-s-rival/>

Charles Lamb: A Dissertation upon a Roast Pig -<https://www.bartleby.com/380/prose/491.html>

Narayan: An Astrologer's Day -

[https://www.scribd.com/document/375116249/An-Astrologer-s Day pdf](https://www.scribd.com/document/375116249/An-Astrologer-s-Day-pdf)

Lady Windermere's Fan-

<https://www.gutenberg.org/files/790/790-h/790-h.htm>

AE:02 ENVIRONMENTAL STUDIES

1. Ecosystem: Ecosystem – Types and Functions; Linkage between Economy and Ecosystem; Degradation of Ecosystem; Need for Conservation of Ecosystems; Present state of Eco-systems with special reference to India.

2. Natural Resources: Resource Classification; Renewable and Non- Renewable Natural resources: Forest Resources, Water resources, Mineral resources, Land resources, Energy resources; Common Property resources (CPRs); Destruction of CPRs and its Impact on Human Welfare; Scarcity of Natural Resources; Concept and Management.

3. Environmental Pollution: Concept and Classification; Types of Environmental Pollution: Air Pollution, Water Pollution, Soil Pollution, Marine Pollution, Noise Pollution, Nuclear Pollution, Thermal Pollution; Causes of Pollution and Measures of Pollution Control.

4. Environmentalism: Introduction to Environmental thought; Environmentalism- Definition, Major Environmental Ideology; Evolution of Environmentalism; Current State of Environment: Biodiversity, Forest, Water, Air.

5. Environmental Regulations: Environmental Dimension of Sustainable Development Goals; Environmental Legislations and Policies in India; Environmental Justice and Ethics; Major International Environmental Negotiation/Agreement; Global/Regional Environmental Organization

Textbooks

1. J. E. De Steiquer, The origins of Modern Environmental thoughts. University of Arizona Press, 2006
2. Bhattacharya, K.S. and A. Sharma, Comprehensive Environmental Studies. Narosa Publishing House Private Ltd., New Delhi. 2015.
3. E. Bharucha, Textbook of Environmental Studies for Undergraduate Courses, UGC, New Delhi, 2004.
4. Hanley, N., Shorgren, J.F. and B. White, Introduction to Environmental Economics, Oxford University Press, 2019.

AE:03 DECISION SUPPORT SYSTEM (EXCEL SKILLS)

- 1.** Look up tables, Index and matching, retrieval of selective data from the data base
- 2.** Sensitivity, scenario and simulation analysis, Forecasting techniques - MAPE, Regression analysis
- 3.** Optimisation technique
- 4.** Graph
- 5.** Time value of Money

Textbook

- Management Information System by James O'Brien

AE:04 INTRODUCTION TO R, MATLAB AND PYTHON

1 : Basics and Flow Control

Computation Problem Solving-Limits of Computational Problem Solving - Computer Algorithm - Computer Hardware - Digital Computer - Operating System- Limits of IC technology - Computer Software - Syntax, semantics and program translation, Introduction to Python Programming Language, IDLE Python Development Environment, Output function - variables, types and id, input function , operators and expressions, Control structures.

2 : Collections & Basics of Functions

MATLAB windows, A first program, Expressions, Constants, Variables and assignment statement, Arrays, Lists, Tuples , Dictionaries, Sets, Strings and text file manipulation: reading and writing files. Functions : Definition, call.

3 : Functions and Graphical User Interface

Positional and keyword parameter, Default parameters, Variable number of arguments, Recursion, Callbacks, Closure, Decorators. Graphical User Interface with Tinkter package- Different geometric methods – Tk, mainloop, Creating simple GUI - buttons, canvas, check button, labels, entry fields, dialogs Widgets - sizes, fonts, colors layouts, nested frames.

4 : Functional Programming, Modules, Testing and Debugging

Map, filter, reduce, max, min. lambda function - list comprehension, Modules - import mechanisms, Testing - Pytest , Function testing with Doctest, pdb debugger commands.

5 : Object Oriented Programming

Classes and objects - inheritance , polymorphism. Error handling & Exceptions - try, except and raise , exception propagation.

Textbooks:

- “MATLAB: An Introduction with Applications” Amos Gilat, 2nd Edition, Wiley, 2004
- “Numerical Computing with MATLAB”, C.B. Moler, SIAM, 2004.
- “Introduction to Computer Science Using Python: A Computational Problem-Solving Focus” Charles Dierbach, Wiley India Edition, John Wiley, 2015.

Reference Books:

- “Learn python Programming”, Fabrizio Romano, 2nd Edition, Packt Publishing,2018.
- “Fundamentals of Python: First Programs”, Kenneth A. Lambert, Cengage,2019.
- “Introduction to Computation and Programming Using Python: With Application to Understanding Data”, John V. Guttag, MIT Press, MIT with Library of Congress Cataloging-in- Publication Data, 2016.

DISCIPLINE SPECIFIC ELECTIVE (DE) COURSES

DE:01 SPECIAL TOPICS IN MACROECONOMICS

1: The New Classical Phillips curve

- Lucas (1972, 1973) signal extraction model
- Predictions of the signal extraction Phillips curve

2: Rational Expectations with Future Variables (REFV)

- Bubbles, non-uniqueness problem and Transversality/Terminal condition
- Neutrality of Fiscal Feedback Rules
- Role for Automatic Stabilizers

3: New Keynesian Economics

- Small menu costs and large business cycles (Mankiw, 1985)
- The Calvo-Rotemberg or New Keynesian Phillips curve (NKPC)
- Predictions of the NKPC

4: Institutional Structures, Independence and Performance of Central Banks

- Inflation Bias problem and Rogoff (1985) weight-conservative central bank
- Alesina and Summers (1993) Free Lunch result
- Inflation Forecast Targeting (Svensson, 1997)
- Model stability and the Taylor Principle

5: Government Solvency and constraints on Fiscal Policy

- Seigniorage, hyperinflation, debt dynamics and unpleasant monetarist arithmetic
- Barro-Ricardo Equivalence result, credit market imperfections and distortionary taxation
- Wallace-Townsend OLG model and government debt in general equilibrium

Textbooks

- Minford, P., and Peel, D. (2002) *Advanced Macroeconomics: A Primer*, Northampton, MA: Edward Elgar.
- Bernanke, Ben, Thomas Laubach, Frederic Mishkin, and Adam Posen (1999), *Inflation Targeting: Lessons from the International Experience*. Princeton N.J.: Princeton University Press.
- Walsh, Carl E. (2003), *Monetary Theory and Policy*, 2nd ed, The MIT Press.

DE:02 INTRODUCTION TO GAME THEORY

1: Simultaneous Move Games with Complete Information

- The normal form; solution concept: Iterated deletion of strictly and weakly dominated strategies; Best Response Functions and Nash equilibrium, mixed and pure strategies; applications

2: Extensive Form Games with Perfect Information

- The game tree; strategies; subgame perfection; backward induction; commitment; bargaining; other applications

3: Simultaneous Move Games with Incomplete Information

- Strategies; Bayesian Nash equilibrium; applications

4: Extensive Form Games with Imperfect Information

- Strategies; beliefs and sequential equilibrium; applications

5: Introduction to Mechanism Design and Auction

- introduction to mechanism design; objective and examples; Definition and examples; various types of auctions;

Textbooks

- Osborne, M. (2004). An introduction to game theory. Oxford University Press.
- Gibbons, R., A Primer in Game Theory, Harvester-Wheatsheaf, 1992.
- Fudenberg, D and J. Tirole, Game Theory, MIT Press, 1991.
- Osborne, M. J. and A. Rubinstein, A Course in Game Theory, MIT Press, 1994.

DE:03 ISSUES IN DEVELOPMENT ECONOMICS

1: Demography and Development

- Demographic concepts; birth and death rates, age structure, fertility and mortality
- Demographic transitions during the process of development; gender bias in preferences and outcomes and evidence on unequal treatment within households
- Connections between income, mortality, fertility choices and human capital accumulation
- Migration

2: Land, Labor and Credit Markets

- The distribution of land ownership; land reform and its effects on productivity
- Contractual relationships between tenants and landlords
- Land acquisition; nutrition and labor productivity
- Informational problems and credit contracts
- Microfinance
- Inter- linkages between rural factor markets.

3: Individuals, Communities and Collective Outcomes

- Individual behaviour in social environments
- Multiple social equilibria
- Governance in organizations and in communities;
- Individual responses to organizational inefficiency.

4: Environment and Sustainable Development

- Defining sustainability for renewable resources
- A brief history of environmental change;
- Common-pool resources;
- Environmental externalities and state regulation of the environment;
- Market based instruments, economic activity and climate change.

5: Globalization

- Globalization in historical perspective
- Economics and politics of multilateral agreements;
- Trade, production patterns and world inequality
- Financial instability in a globalized world.

- India in the context of global economy

Textbooks

- Debraj Ray, Development Economics, Oxford University Press, 2009.
- Partha Dasgupta, Economics, a Very Short Introduction, Oxford University Press, 2007
- Abhijit Banerjee, Roland Benabou and Dilip Mookerjee, Understanding Poverty, Oxford University Press, 2006.
- Thomas Schelling, Micromotives and Macrobehavior, W. W. Norton, 1978.
- Albert O. Hirschman, Exit, Voice and Loyalty: Responses to Decline in Firms, Organizations and States, Harvard University Press, 1970.
- Raghuram Rajan, Fault Lines: How Hidden Fractures Still Threaten the World Economy, 2010.
- Elinor Ostrom, Governing the Commons: The Evolution of Institutions for Collective Action, Cambridge University Press, 1990.
- Dani Rodrik, The Globalization Paradox: Why Global Markets, States and Democracy Can't Coexist, Oxford University Press, 2011.
- Michael D. Bordo, Alan M. Taylor and Jeffrey G. Williamson (ed.), Globalization in Historical Perspective, University of Chicago Press, 2003
- Nordhaus, W. (2013). The Climate Casino. Yale University Press.

DE:04 RISK MANAGEMENT

1: Principles of Risk Management

- Risk Management Process: Identify sources, risk assessment
- Efficient risk bearing; Risk intermediation
- Risk management through hedging, insuring and diversifying

2: Risk Measurement

- Distributions, standard deviation, VaR, CVaR
- Techniques of measurement - simulation, stress testing

3: Risk Management in Financial Institutions

- Banking business lines and regulations - market, credit and operational risks
- Capital adequacy and the Basel accords
- Managing market risks: Hedging, Duration, Asset-Liability Management
- Managing credit risks: 5Cs of credit, credit scoring, ratings, credit default swaps, credit VaR, CVA / XVA
- Managing operational, legal and tax risks
- Managing strategic risks and uncertainties

4: Risk Based Capital Allocation

- Risk adjusted valuation and returns
- Capital allocation using RAROC

5: Systemic Risk Management

- Financial networks - Cascades, systemic risk and TBTF
- 2008 crisis, response and macro-prudential regulation

Textbooks

- Financial Economics 2/e, Bodie, Merton and Cleeton
- Introduction to Derivatives and Risk Management, 10/e, Chance and Brooks
- Risk Management in Banking (2/e), Bessis
- Jorion, P. Financial Risk Manager Handbook, Wiley, 2002.

Suggested Cases:

- Banc One Corp.: Asset and Liability Management - Tufano/Esty (HBSP)
- JPMorgan and the London Whale - Chen/Zeisberger (HBSP)
- Deutsche Bank and the Road to Basel III - Allayannis; Yemen; Wicks; Dougherty (HBSP).

DE:05 ENERGY ECONOMICS

1: Energy and Economy

- Energy as resource; Classification, measurement and accounting; understanding energy-economy linkages

2: Energy Demand

- Short Run and Long Run Price and Income Elasticities; Energy demand at aggregate and disaggregated levels; Demand Side Management, policies and behavioural issues

3: Energy Supply – Non-renewable & Renewable Sources

- Economics and policies of non-renewable energy supply; Economics of electricity supply; Renewable energy and related policies

4: Energy Security

- Energy poverty – conceptual and measurement issues; Geo-political issues concerning energy supply

5: Energy and Environment

- Energy-environment interactions; Energy and climate change; Taxes and cap-and-trade mechanisms for internalization of environmental externalities; energy efficiency policies

Textbooks

- Schwarz, P. (2018), Energy Economics, Routledge.
- Bhattacharyya, Subhes. C. (2011), Energy Economics: Concepts, Issues, Markets and Governance, Springer.

DE:06 FINANCIAL ECONOMICS

1: Finance and Accounting

- Understanding transactions, Cash flow Statement, Balance Sheet, Assets and Liabilities, Profit and Loss statements, Indian accounting standards, Financial Ratios

2: Valuation

- Present and Future Values, Annuity, Perpetuity, Net Present Value; Valuation of Fixed income securities - Valuing bonds, term structure of interest rates, yield curves, spot and forward rates; Valuation of Stocks- Dividend discount model; Free cash flow model; Capital Budgeting techniques - payback period, internal rate of return

3: Risk and Returns

- Introduction to uncertainty, Expected utility, Risk Preferences, Risk Aversion, Mean-variance theory, Portfolio return and risk, Diversification and Hedging, Measures of risk aversion - absolute and relative risk aversions, Arrow-Pratt measures, the Markowitz model of optimal portfolio

4: Market Efficiency

- Efficient Market Hypothesis; Weak form, Semi-strong and Strong Form; Empirical evidence and Implications

5: Asset Pricing

- Systematic and specific risk, Capital market line, Capital asset pricing model (CAPM), Beta of an asset and portfolio, Security market line; Arbitrage Pricing Theory (APT)

Textbooks

- Brealey, R. and S. Myers, Principles of Corporate Finance, New York, MGH
- Copeland, T. E. and J. F. Weston, Financial Theory and Corporate Policy, Addison Wesley
- Damodaran, A., "Investment Valuation: Tools and Techniques for Determining the Value of Any Asset", John Wiley & Sons
- Le Roy, S. F., and Werner, J. Principles of Financial Economics, CUP
- Elton, E.J and M.J. Gruber, Modern Portfolio Theory & Investment Analysis, John Wiley & Sons.

DE:07 INTERNATIONAL FINANCE

1: The Balance of Payments and Foreign Exchange Market

- Balance of payment accounts Foreign exchange market, Demand & supply of foreign exchange, Effects of exchange rate changes on domestic prices and terms of trade, Marshall-Lerner condition, J-curve effect

2: Theories of Exchange Rates

- Parity conditions,-Purchasing power parity and interest rate parity, The monetary theory of exchange rates, Sticky price models- theories of overshooting, Portfolio-balance approach to exchanges rates, Currency substitution.

3: Exchange Rates Models with Uncertainty

- Market efficiency and rational expectations, The 'news' model and exchange rate volatility, Models of risk premium

4: International Capital Flows and Financial Crises

- Financial crises, varieties, definitions. Models of currency and financial crisis. Crisis in emerging countries

5: Institutional Structure of International Finance

- History of exchange rate regimes (Classical gold-standard system, Bretton woods, Post Bretton woods era) Different Exchange Rate Regimes, Monetary unions, Role and functions of International Monetary Fund

Textbooks

- Krugman, Paul R., Maurice Obstfeld and Marc J. Melitz, International Economics: Theory & Policy, 9th edition, Addison-Wesley, 2012.
- Copeland, Laurence S. Exchange Rates and International Finance, 4th edition Pearson Education Limited, 2005.

DE:08 ENVIRONMENTAL ECONOMICS

1: Introduction

- Economy-Environment interaction; Environmental Kuznet's Curve hypothesis – theory and empirical evidence; Sustainable Development – weak and strong sustainability criteria; System of Environmental-Economic Accounting

2: Externalities and Public Goods

- Market Failure; Characteristics of public goods; Externalities; Pigouvian and Coasian solutions; Property rights; Collective action

3: Environmental Policy

- Command and control policy; Market based instruments – pollution taxes, tradeable permits, subsidies; Choice of policy instruments – price vs. quantity instruments

4: Environmental Valuation

- Concept of value; Relevance of environmental valuation; Methods of environmental valuation - Physical linkage methods, Abatement cost methods, Behavior linkage methods – Revealed and Stated preference; Benefit transfer

5: International Environmental Issues

- Transboundary pollution; Causes and consequences of ozone depletion and climate change; Protocols relating to climate change, Ozone depletion and biodiversity

Textbooks

- B. C. Field and M. K. Field (2020), *Environmental Economics: An Introduction*, (8th edition), McGraw-Hill.
- Kolstad, C. (2012), *Intermediate Environmental Economics*, (2nd Edition), Oxford University Press.

DE:09 INTRODUCTION TO TIME SERIES ANALYSIS

1: Univariate Time-Series Models

- Introduction to stationary processes, auto covariance functions, autocorrelation and partial autocorrelation, autoregressive and moving average models.

2: Box-Jenkins Approach

- Conditions for stationary and invertible process, Box-Jenkins approach, forecasting.

3: Multivariate and Multiple Equation Models

- Motivation for multivariate model, Autoregressive Distributive Lag Models, Simultaneity and Vector autoregressive (VAR) models, Testing for order of VAR models, Block significance and tests for causality including Granger causality, Forecasting, Impulse response function, Variance decomposition.

4: Modeling Non-Stationary Time-series processes

- Deterministic and stochastic trends, Integrated process and random walk, random walk with drift, Unit root and tests for unit root- Dickey-Fuller and Augmented Dickey Fuller tests, Phillips-Perron Test and KPSS test, Unit Roots and Structural Breaks, Unit roots in regression residuals and spurious regression.

5: Cointegration and ECM

- Cointegration and its testing using Engel-Granger method, Lead-lag and Long Run relationships, Characteristic Root, Rank and Cointegration, Testing for and estimating cointegrating systems using the Johansen method based on VARs, Vector Error Correction Models.

Textbooks

- Shumway & Stoffer, Time Series Analysis and its applications, with examples in R, Springer.
- Brockwell & Davis, Introduction to Time Series and Forecasting, Springer.
- Walter Enders, Applied Econometric Time Series, Wiley.
- Prado & West, Time Series: Modeling, Computation, and Inference Chapman & Hall

DE:10 HISTORY OF ECONOMIC THOUGHT

1. Introduction, the rise of capitalism and the methodology of economics. The Mercantilists and the Physiocrats.
2. The Classical School: Adam Smith, Thomas Robert Malthus and David Ricardo
3. Karl Marx and Marxian economics
4. Thorstein Veblen and the institutional economics; Theories of imperialism: Hobson, Lenin, etc
5. The Keynesian Revolution and Post-Keynesians; Heterodox Economics and Its Future

Textbooks

- The Worldly Philosophers by Robert L. Heilbroner, Simon and Schuster, New York, NY, 1999, ISBN 978-0684862149.
- E. K. Hunt and Mark Lautzenheiser, 2011. History of Economic Thought: A Critical Perspective. New York: M. E. Sharpe, Inc.
- Ken Cole. 1995. Understanding Economics. London: Pluto Press.
- William J. Barber. 1985. A History of Economic Thought. Middlesex: Penguin Books.
- Daniel R. Fusfeld. 2002. The Age of the Economist. Boston: Pearson Education.
- E. Ray Canterbury. 2002. A Brief History of Economics. New Jersey: World Scientific Publishing.

DE:11 DISSERTATION/PROJECT (Under the supervision of a faculty)
