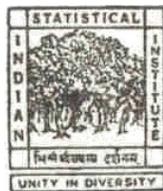# INDIAN STATISTICAL INSTITUITE

STUDENTS' BROCHURE

MASTER OF SCIENCE IN QUANTITATIVE ECONOMICS

203, BARRACKPORE TRUNK ROAD
KOLKATA 700108

INDIAN STATISTICAL INSTITUTE
STUDENTS' BROCHURE
M.S. (Q.E.) PROGRAMME

1. GENERAL INFORMATION

1.1 Scope

This is an advanced course in Economics and its applications with special emphasis on quantitative methods. On completion of the course, the students would be able to pursue an academic career in Economics or take up responsible positions in various private and public sector organizations.

1.2 Duration

The total duration of the M.S.(Q.E.) programme is four semesters. An academic year usually starts in July-August and continues till May, consisting of two semesters with a recess in-between. Usually, there is a study-break of one week before the semestral examinations in each semester. The timetable of the classes preferably should not have an off-day at the beginning or the end of the week.

1.3 Centre

The entire programme is usually offered independently at Kolkata and Delhi Center of the Institute. A student admitted in one center will not be permitted to seek a transfer to the other center except under very special circumstances (to be determined by the competent authority).

1.4 Course Structure

The M.S.(Q.E.). programme comprises five courses in each of the four semesters. Out of the total of twenty courses, eight are compulsory and twelve optional. The set of courses to be taken in a semester depends on the choice of optional courses. Some courses include assignments and /or projects.

1.5 Examinations and Scores

The final (semestral) examination in a course is held at the end of the semester. Besides, there is a mid-semestral examination in each course. The calendar for the semester is announced in advance. The mid-semestral examinations are held over a maximum period of two weeks.

The composite score in a course is a weighted average of the scores in the mid-semestral and semestral examinations, homework, assignments, and /or project work in that course; the weights are announced beforehand by the Dean of Studies, or the In-Charge, Students' Academic Affairs or the Class Teacher, in consultation with the teacher concerned . The minimum composite score to pass a course is 35%.

If the composite score of a student falls short of 45% in a course, the student may take a back-paper examination to improve the score. At most one back-paper examination is allowed in each course. Moreover, a student can take at most four back-paper examinations in the first year and two in the second year. The decision to allow a student to appear for the back-paper examination is taken by the appropriate Teachers' Committee. The back-paper examination covers the entire syllabus of the course. When a student takes back-paper examination in a course, his/her final score in that course is the higher of the back-paper score and the earlier composite score, subject to a maximum of 45%.

If a student gets less than 35% in at most one course after the back-paper examination, but gets 60% or more in average in other courses of that academic year excluding the course under consideration, the student can appear for a compensatory paper in the course under consideration. A student can appear in at most one compensatory paper every academic year. However, in the final year of the programme, the student can *either* appear in the compensatory paper, if the conditions stated above are met, *or* repeat the year if the existing rules so allow; and not do both. The student must inform the Dean of Studies or the In-Charge, Academic Affairs in writing in advance regarding his/her choice. No compensatory paper will be allowed in a course where backpaper is not allowed, e.g., Statistics Comprehensive in B. Stat. programme. The compensatory examinations for all subjects will be held once in an academic year. A student can score at most 35% in a compensatory paper. If a student scores more than 35% in a compensatory paper, the composite score in the course will be 35%. Any student who scores less than 35% in a compensatory paper will have to discontinue the programme regardless of the year of study in the academic programme.

There will be supplementary examination for mid-semestral, semestral, back-paper and compensatory examinations withing a month of the examination missed by a student due to medical or family emergenccies. The student should submit a written application to the Dean of Studies or the In-Charge, Academic Affairs for appearing in the supplementary examination, enclosing supporting documents. On receipt of such application from a student with supporting documents, the Dean of Studies or the In-Charge, Academic Affairs will decide, in consultaion with the relevant Teachers' Committee, on whether such examination will be allowed. The student can score at most 60% in the supplementary examinations to mid-semestral and semestral examinations. For the back-paper or the compensatory papers, the maximum the student can score in the supplementary examination, is 45% or 35% respectively.

A student may take more than the allotted quota of back-paper examinations in a given academic year, and decide at the end of that academic year which of the back-paper examination scores should be disregarded.

1.6 Satisfactory Conduct

A student is also required to maintain satisfactory conduct as a necessary condition for taking semestral examination, for promotion and award of degree. Unsatisfactory conduct will include copying in examination, rowdyism, other breach of discipline of the Institute, unlawful/unethical behaviour and the like. Violation of these is likely to attract punishments such as withholding promotion / award of degree, withdrawing stipend and/or expulsion from the hostel / Institute.

Ragging is banned in the Institute and any one found indulging in ragging will be given punishment such as expulsion from the Institute, or suspension from the Institute/classes for a limited period and fine. The punishment may also take the shape of (i) withholding Stipend/Fellowship or other benefits, (ii) withholding of results, (iii) suspension or expulsion from hostel and the likes. Local laws governing ragging are also applicable to the students of the Institute. Incidents of ragging may also be reported to the police.

The students are also required to follow the following guidelines during the examinations:

    i.Students are required to take their seats according to the seating arrangement displayed. If any student takes a seat not allotted to him/her, he/she may be asked by the invigilator to hand over the answer script (i.e., discontinue the examination) and leave the examination hall.

    ii.Students are not allowed to carry inside the examination hall any mobile phone with them–even

in switched-off mode. Calculators, books and notes will be allowed inside the examination hall only if these are so allowed by the teacher(s) concerned (i.e., the teacher(s) of the course), or if the question paper is an open-note/open-book one. Even in such cases, these articles cannot be shared.

iii.No student is allowed to leave the examination hall without permission from the invigilator(s). Further, students cannot leave the examination hall during the first 30 minutes of any examination. Under no circumstances, two or more students writing the same paper can go outside together.

iv.Students should ensure that the main answer booklet and any extra loose sheet bear the signature of the invigilator with date. Any discrepancy should be brought to the notice of the invigilator immediately. Presence of any unsigned or undated sheet in the answer script will render it (i.e., the unsigned or undated sheet) to be cancelled, and this may lead to charges of violation of the examination rules.

v.**Any student caught cheating or violating examination rules for the first time will get 'Zero' in that examination. If the first offence is in a back-paper examination, the student will get 'Zero' in the back-paper**. (The other conditions for promotion, as mentioned in Section 1.7 of the Students' Brochure, will continue to hold).

vi.**If any student is caught cheating or violating examination rules for the second/third time and he/ she**

(a)is in the final year of any programme and *not* already repeating, then he/she will have to repeat the final year without stipend;

(b)is in the final year of any programme and already repeating, then he/she will have to discontinue the pogramme;

(c)is *not* in the final year of any programme, then he/she will have to discontinue the programme even if he/she was not repeating that year.

Any student caught cheating or violating examination rules for the second/third time, will be denied further admission to any programme of the Institute.

Failing to follow the examination guidelines, copying in the examination, rowdyism or some other breach of discipline or unlawful/unethical behaviour etc. are regarded as **unsatisfactory conduct**.

The decisions regarding promotion in Section 1.7 and final result in Section 1.8 are arrived at taking the violation, if any, of the satisfactory conduct by the student, as described in this section.

1.7 Promotion

A student is considered for promotion to the next year of the programme only when his/her conduct has been satisfactory. Subject to the above condition, a student is promoted from First Year to Second Year if the average composite score in all courses taken in the first year is not less than 45%, and no composite score in a course is less than 35%, and at most 4 courses with composite course less than 45%.

1.8 Final Result

At the end of the second year, the overall average of the percentage composite scores in all the courses taken in the two-year programme is computed for each student. The student is awarded the M.S. (Q.E.) degree in one of the following categories according to the criteria he/she satisfies provided, in the second year, he/she does not have a composite score of less than 35% in a course, and his/her conduct is satisfactory.

Final Result	Score
M.S. (Q.E.), First Division with Distinction	(i) The overall average score is at least 75%, and (ii) the composite score in at most two courses is less than 45%.
M.S. (Q.E.), First Division	(i) Not in First Division with Distinction, (ii) the overall average score is at least 60%, and (iii) the composite score in at most four courses is less than 45%.
M.S. (Q.E.), Second Division	(i) Not in First Division with Distinction or First Division, (ii) the overall average score is at least 45%, and (iii) the composite score in at most four courses is less than 45%.

All others students are considered to have failed. The students who fail but obtain at least 35% average score in the second year, have not taken any compensatory examination in the final year and have satisfactory conduct are allowed to repeat the final year of the M.S. (Q.E.) programme without stipend; the scores obtained during the repetition of the second year are taken as the final scores in the second year. A student is not given more than one chance to repeat the second year of the programme.

1.9 Award of Certificate

A student passing the M.S. (Q.E.) degree examination is given a certificate which includes (i) the list of all courses taken in the two-year programme along with the respective composite scores, and (ii) the category (First Division with Distinction or First Division or Second Division) of his/her final result.

The certificate is awarded in the Annual Convocation of the Institute following the last semestral examinations.

1.10 Prizes and Medals

Students are awarded prizes in form of book awards for good academic performances in each semester as decided by the Teachers' Committee.

The best M.S. (Q.E.) student of the Institute, as decided by the Teachers' Committee based on the academic performance, is given the ISI Alumni Association – Mrs. M. R. Iyer Memorial gold medal.

1.11 Class-Teacher

One of the instructors of a class is designated as the Class Teacher. Students are required to meet their respective Class Teachers periodically to get their academic performance reviewed, and to discuss their problems regarding courses.

1.12 Attendance

Every student is expected to attend all the classes. If he/she is absent, he/she must apply for leave to the Dean of Studies or the Academic Coordinator. Failing to do so may result in disciplinary action.

1.13 Stipend

Stipend, if awarded at the time of admission, is valid initially for the first semester only. The amount of stipend to be awarded in each subsequent semester will depend on academic performance and conduct, as specified below, provided the requirements for continuation of the academic programme (excluding repetition) are satisfied; see Section 1.7.

Performance in course work:

All composite scores used in the following are considered after the respective back-paper examinations.

i.If all the requirements for continuation of the programme are satisfied, and the average composite score is at least 60% and the number of courses with scores less than 45% is at most one in any particular semester, the full value of the stipend is awarded in the following semester.

ii.If all the requirements for continuation of the programme are satisfied, and the average composite score is at least 45% and the number of courses with scores less than 45% is at most one in any particular semester, then half stipend is awarded in the following semester.

iii.In all cases other than i. and ii. above, no stipend is awarded in the following semester.

Attendance:

i.If the overall attendance in all courses in any particular semester is less than 75%, no stipend is awarded in the following semester.

Conduct:

i.The Dean of Studies, or the In-Charge, Students' Academic Affairs or the Class Teacher, at any time, in consultation with the respective Teachers' Committee, may withdraw the stipend of a student fully for a specific period if his/her conduct in the campus is found to be unsatisfactory.

Note: The net amount of the stipend to be awarded is determined by simultaneous and concurrent application of all clauses described above; but, in no case, the amount of stipend to be awarded or to be withdrawn should exceed 100% of the prescribed amount of stipend.

Stipends can be restored because of improved performance, but no stipend is restored with retrospective effect.

Stipends are given after the end of each month for eleven months in each academic year. The first stipend is given two months after admission with retrospective effect provided the student continues in the M.S. (Q.E.) programme for at least two months.

Contingency grants can be used for purchasing a scientific calculator and other required accessories for the practical class, text books and supplementary text books and for getting photostat copies of required academic material. All such expenditure should be approved by the Class Teacher. No contingency grants are given in the first two months after admission.

1.14 Library Rules

Any student is allowed to use the reading room facilities in the library and allowed access to the stacks. M.S. (Q.E.) students have to pay a security deposit of Rs. 250 (at Kolkata)/ Rs. 200 (at Delhi) in order to avail himself/herself of the borrowing facility. A student can borrow at most four books at a time.

Any book from the Text Book Library (TBL) collection may be issued out to a student only for overnight or weekend provided at least one copy of that book is left in the TBL. Only one TBL book is

issued at a time to a student. Fine is charged if any book is not returned by the due date stamped on the issue-slip. The library rules, and other details are posted in the library.

1.15 Placement

Students who have successfully completed the M.S. (Q.E.) programme are very well placed in government and semi-government departments, public and private sector undertakings, and industries/service organizations. Most of the students of the Institute get employment offers even before they complete the qualifying degree examinations.

There are Placement Committees in Kolkata and Delhi Centre, which arrange campus interviews by prospective employers.

1.16 Hostel Facilities

The Institute has hostels for male and female students in its premises in Kolkata and Delhi. However, it may not be possible to accommodate all students in the hostels. Limited medical facilities are available free of cost at Kolkata and Delhi campuses. Students, selected for stay in the hostels, have to pay Rs. 605(at Kolkata)/ Rs. 650 (at Delhi) as hostel deposit, whereas the hostel rent of Rs. 60 (at Kolkata)/ Rs.75 (at Delhi) is deducted from their monthly stipend.

The Institute campus in Kolkata is about 12 km from the city centre. The Delhi campus is about 20 km. from the city centre.

1.17 Change of Rules

The Institute reserves the right to make changes in the above rules, course structure and the syllabi as and when needed.

2. DETAILED COURSE STRUCTURE

Semester I

Econ271A: Microeconomics I

Econ272A: Game Theory I

Stat271: *Statistics

Math271: *Mathematical Methods

One Optional Course

* Students having Mathematics and/or Statistics as major/honours subjects at their Bachelor's level, are required to take suitable other courses (in consultation with the Class Teacher) in lieu of Math 271 and Stat 271 courses.

Semester II

Econ271B: Microeconomics II

Econ273A: Econometric Methods I

Econ274A: Macroeconomics I

Two Optional Courses

Semester III

Econ274B: Macroeconomics II

Four Optional Courses

Semester IV

Five Optional Courses

2.1 List of Compulsory Courses

Econ271A: Microeconomics I
Econ271B: Microeconomics II
Econ272A: Game Theory I
Econ273A: Econometric Methods I
Econ274A: Macroeconomics I
Econ274B: Macroeconomics II
Stat271: Statistics/ suitable other course
Math271: Mathematical Methods / suitable other course

2.2 List of Optional Courses

Econ272B: Game Theory II
Econ273B: Econometric Methods II
Econ275: Agricultural Economics
Econ276: Industrial Organization
Econ277A: Economic Development I
Econ277B: Economic Development II
Econ278: Modern Growth Theory
Econ279A: Selected Topics I
Econ279B: Selected Topics II
Econ280: Social Choice and Political Economy
Econ281: Incentives and Organizations
Econ282: Privatization and Regulations
Econ283A: Econometric Applications I
Econ283B: Econometric Applications II
Econ284: Bayesian Econometrics
Econ285: Inter temporal Economics
Econ286: Theory of Planning
Econ287: Social Accounting
Econ288: Public Economics
Econ289: Regional Economics
Econ290A: International Economics I
Econ290B: International Economics II
Econ290C: Advanced Topics in International Economics
Econ291: Mathematical Programming with Applications to Economics
Econ292: Monetary Economics
Econ293: History of Economic Thought
Econ294: Environmental Economics
Econ295X: Theory of Finance I
Econ295Y: Theory of Finance II
Econ295C: Theory of Finance III
Econ296: Political Economy and Comparative Systems
Econ297: Law and Economics
Stat272: Sample Survey: Theory and Practice
Stat273: Time Series Analysis and Forecasting
Comp271: Computer Programming and Applications

3. BRIEF SYLLABI

3.1 Compulsory Courses

Econ271A: Microeconomic Theory I

Theory of consumer behaviour: preference ordering, utility function, budget set, demand, duality theory, theory of revealed preference, aggregate demand.
Theory of the firm: production set, cost minimization, profit maximization, supply, duality theory, aggregate supply.
Equilibrium in a single market, stability, comparative statics.
Imperfect competition and market structure. Strategic consideration.
Decision-making under uncertainty : lotteries, measures of risk. Stochastic dominance.

Econ271B: Microeconomic Theory II

General equilibrium of an exchange economy.
General equilibrium with production.
Welfare economics : the fundamental theorems of welfare economics, core of an economy, introduction to Social Choice theory.
Asymmetric information, market failure, theory of second best and strategic interactions.
Introduction to non-Walrasian equilibrium.

Econ272A: Game Theory I

Non-Cooperative Games.
Games in normal form.
Rationalizability and iterated deletion of never-best responses.
Nash equilibrium : existence, properties and applications.
Two-person Zero Sum Games.
Games in extensive form : perfect recall and behaviour strategies.
Credibility and Subgame Perfect Nash Equilibrium.
Bargaining.
Repeated Games; Folk Theorems.
Introduction to Cooperative Games (TU games).

Econ273A: Econometric Methods I

Nature of Econometrics, Review of CLRM, Alternative measures of goodness of fit, use of dummy variables as regressors.
Specification problems in CLRM.
Problems due to the nature of the error term : Nonspherical disturbances and their implications for the properties of the OLS estimators of CLRM parameters, Aitken theorem and Generalised Least Squares (GLS) methods of estimation, Heteroscedasticity - nature of the problem, tests and estimation techniques.
Autocorrelations -nature of the problems, tests and estimation techniques.
Problems due to the nature of the regressors: Multicollinearity - nature of the problem, and its

consequences, detection of multicollinearity, and possible solutions, stochastic regressors - problem of errors in variables and its consequences for OLS estimator of CLRM parameters, instrumental variable methods of estimation.

Model evaluation and other diagnostic tests: Chow test, Ramsay's RESET, Bera-Jarque test of normality of errors, Hausman specification test.

Autoregressive and Distributed Lag (ADL) relationships: Specification, estimation and tests, Exogeneity tests, Wu-Hausman test.

Simultaneous Equations System: Structural and reduced forms, least squares bias problem, identification problem, estimation methods, introduction to VAR.

Econ274A: Macroeconomic Theory I

Review of Keynes, Classics and Structuralist macroeconomics.
Friedman and New Classical Economics.
New Keynesian Economics.
Introduction to macro models of optimal behaviour over time: Ramsay-Solow and Overlapping Generations model.
Real Business Cycle Theory.

Econ274B: Macroeconomic Theory II

Selected topics out of the following list :
Open Economy Issues
Overlapping Generations models: advanced topics
Public Debt
Asset Pricing
Optimal taxation
Theories of Inflation
Equilibrium search and matching
Growth and Distribution
Modern theories of Unemployment

Stat271: Statistics

Probability Theory:
Sample space, events, combinatorics, classical and axiomatic definitions of probability, equally likely probability models, marginal and conditional probabilities, independence, Bayes' formula, random variables, distribution function, expectation, variance and other moments, discrete random variables - binomial, Poisson, geometric, illustrations; continuous random variables - uniform, normal, exponential, logistic, illustrations through data: bivariate normal distributions and its properties; Chebyshev's inequality, weak law of large numbers, central limit theorem.

Statistical Inference:
Estimation of parameters of a statistical model: basic concepts - parameter and statistic, estimator and estimate, sampling distribution, sampling variance and mean square error, properties of an estimator - unbiasedness, consistency, efficiency, Cramer-Rao inequality, point and interval estimation, methods of estimation - least squares, methods of moments, maximum likelihood method.

Testing of hypotheses - type I and II errors, level, size and p-value of a test, power of a test, testing hypotheses about the mean and the variance of a normal population.

Small sample distributions : X , t and F distributions and examples of their applications.

It is presumed that the students have adequate background in statistical methods. The teacher concerned will have the flexibility to adjust the contents of the syllabus wherever necessary.

Math271: Mathematical Methods

Linear Algebra
Vectors and Vector Spaces: Vector Operations; Scalar Product; Linear Dependence; Vector Spaces and Subspaces; Basis of a Vector Space.
Matrix Algebra : Basic Operations; Trace of a Matrix; Rank and Inverse of a Matrix; Vector and Matrix Differentiation; Orthogonal, Symmetric, Idempotent and Definite Matrices – Definition and Properties; Rank Factorization.
Characteristic Value Problem and Quadratic Forms : Characteristic roots and vectors of a square matrix; Similarity; Characteristic value problem of a symmetric matrix and properties of eigen vectors; Quadratic Forms.
Real Analysis
Introduction to real number system, elements of set theory, selected results in point set topology, compactness, convergence, continuity.
Static Optimization Theory
Optimization under inequality constraints, Kuhn-Tucker theory.
Dynamic Optimization Theory
Introduction to methods of control theory.

3.2 Optional Courses

Econ272B: Game Theory II

Games of Incomplete Information
Bayes-Nash equilibrium.
Applications to industrial organization.
Reputation models.
Auction theory
First and second price auctions.
The Revenue Equivalence Theorem.
Revenue optimal auctions in the independent values case.
Efficient auctions in the common-values case.
The theory of equilibrium selection
Sequential and trembling hand perfect equilibria.
Forward induction.
Mechanism Design
Strategy-proof mechanisms: the Gibbard-Satterthwaite Theorem.
Transferable utility and Groves-Clarke theory.
Bayesian Incentive compatibility.
Topics in evolutionary game theory
Advanced topics in cooperative games

Econ273B: Econometric Methods II

Discrete and Limited Dependent Variables Model: types of discrete choice models, linear probability

model, the probit and the logit models and Tobit model.

Analysis of Panel Data: Fixed effects model, random effects model (error components model), fixed or random effects? – Wu-Hausman test, Swamy's random coefficient model.

Specification testing and Diagnostic Checking: inferential problems in misspecified or inadequately specified models; tests based on ML principle – W, LR and Rao's (RS) tests; White's information matrix test; tests for non-nested hypothesis – Davidson and McKinnon's J test and the encompassing test.

Cointegration: a general cointegrated system, two variable model: Engle-Granger method, system estimation method – Johansen procedure; error correction model and tests for cointegration; vector autoregression and Granger causality.

ARCH model: properties of ARCH/GARCH model, different interpretations, various generalisations, estimation and testing.

Other methods of testing (excluding LS and ML methods): generalized method of moments (GMM) and method of least absolute deviation : basics of nonparametric regression – idea of smoothing, smoothing techniques, the kernel method and choosing the smoothing parameter.

Introduction to Bayesian Econometrics: Bayes' theorem, prior probability density functions, point estimates of parameters and prediction.

Econ275: Agricultural Economics

Growth and Fluctuations of Agricultural Output

Surplus Labour

Farm Efficiency

Tenurial Efficiency

Interlinked Factor Markets

Marketable Surplus

New Technology

Effect of Liberalization on Agriculture

Econ276: Industrial Organization

Structure conduct performance paradigm.

Static oligopoly models, homogeneous goods, Cournot and Bertrand models, differentiated products, horizontal and vertical differentiation, models with free entry, contestable markets, Cournot and price setting, models with free entry.

Measures of concentration and performance.

Dynamic oligopoly models : entry deterrence, limit pricing, attrition and reputation models, collusion and cartels.

Price discrimination, price dispersion and search theory.

R&D and adaptation/adoption of technology: private vs. social incentives for R&D models of adoption, diffusion and transfer of technology.

Mergers and takeovers, firm size and vertical integration, corporate finance.

Regulation of monopolies, rate of return regulation, regulation of firms with unknown costs/demands.

Multinational firms.

Quality, durability and warranty.

Advertising.

Joint venture, licensing and patents.

Econ277A: Economic Development I

The Dual Economy: Surplus Labour, Wage Rigidity and Unemployment

Underdevelopment as a Path Dependant Process: Vicious Circles, Balanced vs. Unbalanced Growth and Big Push Theory.
Growth, Development and Income Distribution
Rural Markets and Institutions

Econ277B: Economic Development II

Economic Development and Planning of Dual Economics : Choice of Techniques, Marketable Surplus, Rural-Urban Migration, Unemployment.
Role of trade and factor mobility in economic development; international technology transfer and relative technological backwardness of less developed countries.
Endogenous growth: increasing returns and technological progress; multiple equilibria and underdevelopment trap.

Econ278: Modern Growth Theory

Review of traditional growth models, efficiency results, barriers to growth, technical progress.
AK models of growth - alternative foundation.
Education and growth.
Market structure and innovation.
Obsolescence, Schumpeterian growth.
Distribution and Political Economy of growth.
Open growing economies, trade policies.

Econ279A: Selected Topics I

To be determined by the instructor.

Econ279B: Selected Topics II

To be determined by the instructor

Econ280: Social Choice and Political Economy

Selected topics from the following :
Classical aggregation theory : Arrow's theorem, Harsanyi's theorem, aggregation with rich informational structures.
Stochastic Dominance, Lorenz and Generalized Lorenz orderings, Ethical approaches to measurement of inequality and poverty.
Classical voting theory : the Gibbard-Satterthwaite theorem, results on restricted domains, the median voter result, stochastic outcome functions.
The theory of implementation in complete and incomplete information settings.
The theory of elections, legislatures and agenda control.
The theory of interest groups : lobbying, bureaucracies, endogenous coalition formation.
Models of corruption, political economy of the state.

Econ281: Incentives and Organizations

Theory of incentives : adverse selection, moral hazard, multiple agents, contract dynamics.
Organization theory : team theory, message space size, costly information processing models.
Incentive-based approaches : supervision, managerial slack, limited commitment.

Applications to the theory of the firm : decentralization, hierarchies, transfer pricing, managerial compensation, cost allocation.

Econ282: Privatization and Regulations

Regulation of competition, externalities and natural monopolies, vertical integration, mergers and takeovers, bureaucracies and corruption.
Public sector performance in India and other developing countries.
Privatization, theory and experiences.

Econ283A: Econometric Applications I

Analysis of economic inequality and allied size distributions: Measures of inequality, poverty concept and measurement, empirical implications of the theories of industry evolution on firm-size distribution, relationship of size, growth and age of firms.
Demand analysis: Demand function and elasticities of demand, Engel curve analysis, aggregation issue, methodologies for estimation of unconstrained demand functions using aggregated data and using micro data.
Production analysis: Production function – theoretical properties, various forms, elasticities of substitution, problems of estimation.

Econ283B: Econometric Applications II

Some subset of the following topics will be covered depending upon the interest of the instructor and the students.
Income and allied size distributions: Stochastic models of income distribution, Measurement of income inequality, problems of measurement, Indian studies on inequality and poverty.
Advanced demand analysis: Demand systems, zero expenditure and corner solutions, nonlinear budget frontiers, rationing, sources of dynamics in consumer behaviour, durable goods, non-parametric demand analysis.
Production analysis: Frontier production function, measurement of productivity and technical change, flexible forms, aggregation, properties and estimation of multi-output production and cost functions.
Application of Econometrics to Macro-Economic Problems: Macro-econometric models-economic issues in the specification and estimation, illustrative applications, uses in forecasting and policy evaluation.
Estimation of structural models of firm behaviour: Dynamic programming models, policy effects on productivity, capital formation and product-mix of firms, models of firm heterogeneity – measurement of product quality and efficiency differences among firms.
Empirical models of the labour market: Duration analysis, labour supply and labour demand functions including the impact of unionisation, studies on the Indian labour market.

Econ284: Bayesian Econometrics

Principles of Bayesian analysis.
Simple univariate normal linear regression models.
Analysis of single equation nonlinear models.
Multivariate regression models.
Comparison and testing of hypothesis.
Simultaneous equations econometric models.

Econ285: Intertemporal Economics

Models of intertemporal accumulation.
Efficient programmes, characterizations of efficiency, efficiency and present value maximization.
Optimal programmes, optimality criteria in discounted and undiscounted models, existence of optimal programmes.

Econ286: Theory of Planning

Political economy of the state, alternative viewpoints.
Modeling government behaviour, rational choice models, median voter model, legislatures and special interest groups, bureaucracy models.
Planning models, centralized planning, informationally decentralized planning processes, Lange-Lerner, MDP procedures, team theory.
Incentives within the public sector.
Performance incentives for managers, decentralized organisation of production, multidivisional firms, cost centres and profit centres, cost allocation transfer pricing, labour policies : Soviet and East European firms.
Cost-benefit analysis.
Pricing public sector outputs, marginal cost and average cost pricing, peak load pricing, priority pricing.

Econ287: Social Accounting

The economic process and various concepts.
A system of social/national accounts.
National accounts and various estimates.
'Real' gross domestic product and 'real' national income.
Estimation of national income in India.
Preparation of an input-output (IO) table.

Econ288: Public Economics

Welfare objectives of the State: interpersonal utility comparisons.
Principles of taxation.
Theory of Second Best, problems of externalities & public goods.
Incentives and mechanism design, Gibbard-Satterthwaite theorem.
Tax incidence in static (partial and general equilibrium) models.
Tax incidence in Dynamic Models.
Optimal taxation and public production.
Dynamics, incidence and efficiency analysis of taxes.
Economics of corruption.
Economics of Public Sector Enterprises.
Procurement policies: incentive contracts and auction theory.
Regulation of private firms.

Econ289: Regional Economics

Introduction to regional planning.
Review of the Indian situation.

Concepts and techniques used in regional planning.
Regional decision making and regional balance.
Functional spatial configuration and regional synthesis.

Econ290A: International Economics I

Various comparative-advantage based competitive theories of international trade including the
Ricardian model, the Heckscher-Ohlin model and the sector specific model and their generalizations.
Theory of commercial policy, tariffs, taxes and quantitative restrictions in traditional trade models.
Imperfectly competitive models and intra-industry trade models of international trade.
Trade, growth and development.
International factor movements.

Econ290B: International Economics II

Dynamics of Small Open Economies in Infinite Horizon and Overlapping Generations Models.
Non traded goods, Real Exchange Rate and the Terms of Trade.
Uncertainty and International Financial Markets.
Money and Exchange rates under flexible and fixed prices.
Sovereign Debt.

Econ290C: Advanced Topics in International Economics

Political economy of trade policy.
International trade and endogenous growth.
Trade and environment.
Trade and distribution.
Exchange rate dynamics in a small country setting.
Agency problems and international lending.
The New-Keynesian Models of the Open Economy.
International Capital Mobility and Development.

Econ291: Mathematical Programming with Applications to Economics

Static Linear and Non-linear Programming Problems
Dynamic Problems: Calculus of Variations, Optimal Control Theory and Dynamic Programming

Econ292: Monetary Economics

Transaction, precautionary and speculative demands for money.
Money in an overlapping generation model, general equilibrium Baumol-Tobin model, cash-in-advance
model.
Currency and credit with long lived agents in overlapping generations set-up.
Monetary policy, (non-) neutrality.
Money, inflation and stability, money vs. interest rate targeting.

Econ293: History of Economic Thought

Introduction – relevance of the subject, the idea of a mainstream.
Mercantilism – economic and political background, issues and doctrines.
The physiocratic breakthrough – focus upon production, the framework of reproduction and concept of

produit net, tableau economique and the concept of circular flow, the physiocratic system.

Classical political economy (CPE) – Adam Smith's break and continuity with mercantilism; the physiocratic input: transformation of the framework of reproduction through the motion of stock; the framework of value, distribution and accumulation; the idea of free competition: price formation through equalization of rates of profit – natural rule and market price; Ricardo's "elimination" of rent; the Ricardian system and its evolution through time.

Marx and the Marxist tradition – the labour standpoint : view of history, concept of surplus and class analysis.

The marginalist revolution – unresolved problems of CPE; fresh search for first principles; unification of different branches economic theory under marginal calculations and demand – supply analysis.

The Walrasian tradition – the idea of a general equilibrium, mathematical development : connection with optimisation, the 'welfare ' branch.

The Marshallian tradition – the idea of a 'short period ', theory of the firm and market structure, the Keynesian breakthrough – re-emergence of macro analysis, macro-micro relations.

The Mengerian tradition – subjectivism and methodological individualism, 'new institutional economics '.

The 'present' as history – any mainstream ?

Econ294: Environmental Economics

Theories of externalities and public goods.
Trade and environmental policy.
Design of environmental policy.
Marketable pollution permits.
Choice between permits and taxes.
Methods of measuring the benefits of environmental improvements.
Models of resource depletion, exhaustible and renewable resources.

Econ295X: Theory of Finance I

Preference representation under uncertainty : stochastic dominance and measures of risk. Portfolio frontier, value maximization and the separation theorem.
CAPM, valuation of security.
Asymmetric information and efficiency.

Econ295Y: Theory of Finance II

Modigliani- Miller theorem.
Agency costs and management.
Debt vs. equity.
Corporate law and governance.
Takeovers, mergers, acquisitions and their disciplinary impact on opportunistic behaviour. Value of large vs. small shareholders.
Financial institutions and the market for corporate control.

Econ295C: Theory of Finance III

Advanced Topics in
Banking Finance

Market Microstructure
Regulation and Incentives

Econ296: Political Economy and Comparative Systems

Classical political economy : Crystallization of the concept of "social structure" in the concept of "class", class division and boudary of production ("productive" vs "unproductive" class/labour) in Quesnay and Smith, the systems of social accounting policy aspects, reaction against "mercantilism : theoretical structure of classical political economy, value, distribution and accumulations, the Ricardian system, the post Ricardian scene, emergence of "socialist" doctrines.
Marxian political economy : the broader perspectives and view of history, "modes of production" (feudalism, capitalism and socialism), the political economy of capitalism, surplus value, theories of crises.
Further developments in the political economy of capitalism: developments within a "class" framework, Kalecki's theory of effective demand and business cycles, abandoning the "class" framework or the turning point in the history of economic thought, birth of "welfare economics", "competition" and "monopoly", Keynes ' theory of effective demand and its link up with the theory of growth.
Political economy of socialism : doctrines and experiences.
Political economy of LDCs : the intrinisic heterogeneity and amorphousness of LDCs, the "goal" of development in a historical perspective, the concept of "dual economy", global perspectives.

Econ 297: Law and Economics

Role of Property Rights in Economic Transactions
Allocating and Establishing Ownership Rights
Conflicting Property Rights and Externalities
Common Property
The Coase Theorem

Legal Aspects of Complete and Incomplete Contracts
Notion of Contracts and Contracting Costs
Complete and Incomplete Contracts
Breach of Contract and Remedies

Economics of Tort-Liability Rules-Accident Laws
Theories of Tort-Liability and Incentives for Precaution
A Game Theoretic Analysis of Tort-Liability Rules
Products Liability
The Role of Uncertainty and Insurance

Crime and Punishment
Criminal Intents and Public Harm
Rational Crime and Optimal Deterrence
Economic Goal of Criminal Law
Fines versus Imprisonment

Selected Topics
Aspects of Intellectual Property Rights and the WTO
Law and Corporate Governance
Environmental laws

Stat272: Sample Survey : Theory and Practice

Introduction.
Sampling techniques.
Planning and conduct of sample surveys.
Non-sampling errors.
Experience of Indian surveys on selected topics.

Stat273: Time Series Analysis and Forecasting

Exploratory Analysis of Time Series: graphical display, classical decomposition method, estimation and elimination of trend and seasonal components.
Stationary Stochastic Time series models: weak and strong stationarity, AR, MA and ARMA processes - their properties, conditions for stationarity and invertibility, autocorrelation function (ACF), partial autocorrelation function (PACF), identification based on ACF and PACF, estimation, order selection and diagnostic checks.
Modelling Non-Stationary Processes: ARIMA models, determination of the order of integration, tests of nonstationarity (unit root tests) - Dickey-Fuller (DF), augmented DF, Phillips-Perron tests, trend stationarity and difference stationary processes.
Forcasting based on ARIMA models: minimum MSE forecast, forecast error and optimality of exponential smoothing.
Modelling Seasonal Time Series: seasonal ARIMA models, estimation and forecasting.
Intervention Analysis and Detection of Outliers: different types of intervention, implications of interventions, additive and innovational outliers, procedure for detecting outliers.
Single output Transfer Function Noise Model: cross correlation function and its properties, identification, estimation and diagnostic checking.
State Space Models: state space representation of ARIMA models, basic structural model and Kalman recursion.
Elements of Spectral Analysis: spectral density function (sdf) and its properties, sdf of AR, MA and ARIMA processes and periodogram analysis.

Comp271: Computer Programming and Applications

Elements and characteristics of a computer system, Basic computer operations, storage information, Compiler and high level languages, Algorithm, Analysis of algorithm, Flow chart, data-structure, Sorting and searching techniques.
Program development in C/FORTRAN :
FORTRAN: constants; simple & subscripted variables; records; arithmetic, string, logical & related operators; arithmetic, string and logical expressions; specification statements; arithmetic, string and logical assignment statements; control statements; I/O statements; statement function statement; block data statement; function & subroutine subprograms.
C: Constant, Variables and data types, operators and expression, Decision making and branching, looping, arrays, user defined functions, Standard library, Structures and Unions, pointers, File management, C Preprocessor.
Solution of elementary numerical analysis problems using C/FORTRAN Language.