### Distribution of M.Sc. / Ph. D. Courses for the Session 2009-10

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Course Contents

ES 611: MICRO ECONOMIC THEORY AND APPLICATIONS
(2+0)

Objective
This course is intended to provide an overview of microeconomic theory and its applications. The course starts with the theory of consumer behavior consisting of consumer’s utility maximization problem and demand theory. It intends to provide fundamental concepts and models in the theory of production and costs and sets out to provide a basic understanding of price and / or output determination under different types of market structures including factor markets. This course will also expose the students to the theory of general equilibrium and welfare economics.

Theory
UNIT I
UNIT II
UNIT III
UNIT IV

Suggested Readings
Objective
To introduce the students to the evolution of economic thought over a period of time, the background of emanation of thoughts and approaches, as acts of balancing and counter balancing events and criticisms. The course will also in a comprehensive way help the students to know and appreciate the contributions of the Galaxy of Economists.

Theory
UNIT 1
UNIT II
UNIT III
UNIT IV
The Era of globalization – Experiences of developing world - Rigidity of the past vs. emerging realism – The changing path of international Institutions to economic growth and development approaches.
UNIT V
Economic Thought in India – Naoroji and Gokhale – Gandhian Economics - Economic thought of independent India – Nehru’s economic philosophy - Experiences of the Structural adjustment programmes of the post liberalization era.

Suggested Readings
ES-613 LINEAR PROGRAMMING 1+1
Objective
The Course Objective of the course is to impart knowledge of Linear programming techniques.

Theory

UNIT I
Decision Making- Concepts of decision making, introduction to quantitative tools, introduction to linear programming, uses of LP in different fields, graphic solution to problems, formulation of problems.

UNIT II
Simplex Method: Concept of simplex Method, solving profit maximization and cost minimization problems. Formulation of farms and nonfarm problems as linear programming models and solutions.

UNIT III
Extension of Linear Programming models: Variable resource and price programming, transportation problems, recursive programming, dynamic programming.

UNIT IV
Game Theory- Concepts of game theory, two person constant sum, zero sum game, saddle point, solution to mixed strategies, the rectangular game as Linear Programme.

Practical
Graphical and algebraic formulation of linear programming models. Solving of maximization and minimization problems by simplex method. Formulation of the simplex matrices for typical farm situations.

Suggested Readings
Vaserstein. 2006. Introduction to Linear Programming. Pearson Education Publication

ES-614 AGRICULTURAL MARKETING AND PRICE ANALYSIS (2+1)
Objective
To impart adequate knowledge and analytical skills in the field of agricultural marketing issues, and enhance expertise in improving the performance of the marketing institutions and the players in marketing of agricultural commodities.

Theory
UNIT I

UNIT II

UNIT III
Role of Information Technology and telecommunication in marketing of agricultural commodities - Market research-Market information service - electronic auctions (e-bay), e-Chaupals, Agmarket and Domestic and Export market Intelligence Cell (DEMID) – Market extension.

UNIT IV

UNIT V

Practical

Suggested Readings

ES-615 agricultural development and policy analysis (2+0)

Objectives
• To provide orientation to the students regarding the concepts and measures of economic development
• To provide orientation on theories of economic growth and relevance of theories in developing countries.
• To make them to understand the agricultural policies and its effect on sustainable agricultural development
• To make them to understand the globalization and its impact on agricultural development.

Theory
UNIT I

UNIT II

UNIT III
Role of agriculture in economic / rural development – theories of agricultural development – Population and food supply - need for sound agricultural policies – resource policies – credit policies – input and product marketing policies – price policies.

UNIT IV
Development issues, poverty, inequality, unemployment and environmental degradation – Models of Agricultural Development – Induced Innovation Model - policy options for sustainable agricultural development.

UNIT V

Suggested Readings

ES – 616: Mathematics for Agricultural Economics (2+0)

Variables and functions; limit and continuity. Specific functions is economic theory. Differentiation, theorems of differentiation, differentiation of logarithmic trigonometric, exponential and inverse functions, function of a function, derivative of higher order, partial derivatives. Application of derivatives to determine average and
marginal values in economic analysis; determination of elasticities; points of inflexion; linear homogenous production functions; derivation of average and marginal curves.

Maxima and minima and their economic applications for optimization problems of cost, production, demand and supply.

Integration as a reverse process of differentiation, methods of integration, reduction formulae, definite integral, use of integration to determine relation between average and marginal value. Capitalization over time, estimation of returns from capital goods over time. Pareto distribution.

Set theory-set operations, finite and infinite sets, operations of set, function defined in terms of sets.

Solution of linear and quadratic equations involving one variable, simultaneous equations determinants evaluation and properties of determinants, Vectors and vector spaces, Matrices, notations and operations, laws of matrix algebra; transpose and inverse of matrix; application of determinants and matrices in solution of equation for economic analysis.

**Suggested Readings**

1. Allen, R.G.D.; Mathematical Analysis for Economics
   The Macmillan Press Ltd., London, Madras

2. Yamane, Taro; Mathematics for Economics
   Prentice Hall of India, New Delhi

3. Mehta, B.C., & Madnani G.M.K., Mathematics for Economists
   Sultan Chand & Sons, New Delhi.

4. Searle, Shayle R.; Matrix Algebra Useful for Statistics
   John Wiley & Sons

5. Berry, Tanuj , Mathematical Methods for Economists
   Archetypal Publications New Delhi

   Modern Publishers


**ES-617 : STATISTICAL METHODS FOR SOCIAL SCIENCES (2+1)**

Graphs and diagrams, Application of statistical methods for Social Sciences, Test of significance based on Z-test, t-test $\chi^2$ test and F-test. Correlation and regression heir test of significance, multiple regression analysis partial and multiple correlations and their test of significance. Non-parametric & distribution free statistics-sign test,
wilcoxon matched pairs, signed rank test, Mann-whitney U test, wald-wolforit run test, H-test, median test etc.

Scoring and scaling techniques, reliability and validity of test scores, rating scales. Factor analysis. Discriminant function and $D^2$-statistics, multivariate analysis.

Introduction to time series, components of time series – secular trend, linear and non-linear, periodic movements, cyclical fluctuations and irregular variations, Adjusting time series for trend, seasonal, cyclical-irregular variations. Forecasting methods, index numbers and their uses-method of their construction, problems in construction of index numbers.

**Practical**

Test of significance based on $Z$-test, $t$-test, $F$-test & $\chi^2$-test (2)
Correlation and regression (1)
Multiple regression and standard partial regression coefficient (1)
Ranking techniques (1)
Non-Parametric tests (1)
Factor analysis and Discriminant function analysis (1)
Analysis of time series data-secular trend, seasonal variation and cyclical-irregular variations (4)
Methods of construction of index numbers (2)

**Suggested Reading**

1. Snedecor, G.W., Cochran, W.C.; Statistical methods
   Oxford and IBH Publishing Co. New Delhi

2. Golden, C.H.; Methods of Statistical analysis
   Asia Publishing House Bombay.

3. Gupta, S.P.; Statistical Methods
   Sultan Chand & Sons, New Delhi.

   Prentice Hall of India Private Ltd., New Delhi


6. Panse V.G. and Sukhatme, P.V.; Statistical Methods for Agril. Workers
   Indian Council of Agricultural Research, New Delhi

ES 621: MACRO ECONOMICS AND POLICY (2+0)

Objective
Macro economics and Policy course is intended to expose the students to macroeconomic concepts and theory, the application of the macro economic theory, and implication of the macroeconomic policies.

Theory
UNIT I
UNIT II
Consumption function- Investment and savings - Concept of Multiplier and Accelerator - Output and Employment - Rate of interest - Classical, Neo classical and Keynesian version- Classical theory Vs Keynesian theory – Unemployment and Full employment.
UNIT III
UNIT IV
IS & LM frame work - General Equilibrium of product and money markets - Monetary policy - Fiscal policy- Effectiveness of Monetary and Fiscal policy - Central banking.
UNIT V
Business cycles - Balance of Payment - Foreign Exchange Rate determination.

Suggested Readings

Es-622 RESEARCH METHODOLOGY FOR SOCIAL SCIENCES (1+1)

Objective
To expose the students to research methodology used in social sciences. The focus will be on providing knowledge related to research process, data collection and data analysis etc.

Theory
UNIT I
Importance and scope of research in agricultural economics. Types of research - Fundamental vs. Applied. Concept of researchable problem – research prioritization – selection of research problem. Approach to research – research process.
UNIT II
Hypothesis – meaning - characteristics - types of hypothesis – review of literature – setting of Course Objective and hypotheses - testing of hypothesis.
UNIT III
Sampling theory and sampling design – sampling error - methods of sampling – probability and non-probability sampling methods - criteria to choose. Project proposals – contents and scope – different types of projects to meet different needs – trade-off between scope and cost of the study. Research design and techniques – Types of research design.
UNIT IV

UNIT V

Practical

Suggested Readings

ES-623 ECONOMETRICS (2+1)
Objective
The Course Objective of the course is to impart knowledge on econometric tools to the students of agricultural economics. Training in econometrics will help the student to analyze the economic problem by applying quantitative techniques.

Theory
UNIT I
Introduction – relationship between economic theory, mathematical economics, models and econometrics, methodology of econometrics-regression analysis.
UNIT II
Basic two variable regression - assumptions estimation and interpretation approaches to estimation - OLS, MLE and their properties - extensions to multi variable models-multiple regression estimation and interpretation.
UNIT III
Violation of assumptions – identification, consequences and remedies for Multicollinearity, heteroscedasticity, autocorrelation – data problems and remedial approaches - model misspecification.

UNIT IV
Use of dummy variables-limited dependent variables – specification, estimation and interpretation.

UNIT V
Simultaneous equation models – structural equations - reduced form equations - identification and approaches to estimation.

Practical
Single equation two variable model specification and estimation – hypothesis testing-transformations of functional forms and OLS application-estimation of multiple regression model - hypothesis testing - testing and correcting specification errors - testing and managing Multicollinearity - testing and managing heteroscedasticity - testing and managing autocorrelation - estimation of regressions with dummy variables - estimation of regression with limited dependent variable - identification of equations in imultaneous equation systems.

Suggested Readings

ES-624 AGRICULTURAL FINANCE AND PROJECT MANAGEMENT (2+1)
Objective
The Course Objective of the course is to impart knowledge on issues related to lending to priority sector credit management and financial risk management. The course would bring in the various appraisal techniques in project - investment of agricultural projects.

Theory
UNIT I
Role and Importance of Agricultural Finance. Financial Institutions and credit flow to rural/priority sector. Agricultural lending – Direct and Indirect Financing - Financing through Co-operatives, NABARD and Commercial Banks and RRBs. District Credit Plan and lending to agriculture/priority sector. Micro-Financing and Role of MFI’s - NGO’s, and SHG’s.

UNIT II
Lending to farmers – The concept of 3 C’s, 7 P’s and 3 R’s of credit. Estimation of Technical feasibility, Economic viability and repaying capacity of borrowers and appraisal of credit proposals. Understanding lenders and developing better working relationship and supervisory credit system. Credit inclusions – credit widening and credit deepening.

UNIT III

UNIT IV

UNIT V

Practical

Suggested Readings

ES-625 DAIRY BUSINESS MANAGEMENT (2 + 1)

Concept of dairy business management, managerial decision making, functions of management. Planning-objectives, classification of plans, planning related to finance, production and personnel aspects of the dairy. Organising-fundamentals of organizational design, departmentation, principles and delegation of authority. Responsibility and accountability. Staffing-Personnel management, planning, selection, introduction, orientation and training of unskilled and skilled personnel in dairy

Practical
Delineation of milk shed area.
Case studies for solving problem situations.
Demand forecasting
Estimation of cost of milk procurement and processing.
Break-even analysis and break-even charts.
Use of PERT in dairy industry.
Optimisation of product-mix.
Estimation of cost of inventory.
Economic lot size and other quantity standards.

Suggested Readings

Es-626 AGRICULTURAL PRODUCTION ECONOMICS (2+1)
Objective
To expose the students to the concept, significance and uses of agricultural production economics.

Theory
UNIT I
Nature, scope and significance of agricultural production economics- Agricultural Production processes, character and dimensions-spatial, temporal - Centrality of production functions, assumptions of production functions, commonly used forms -
Properties, limitations, specification, estimation and interpretation of commonly used production functions.

UNIT II
Factors of production, classification, interdependence, and factor substitution - Determination of optimal levels of production and factor application - Optimal factor combination and least cost combination of production - Theory of product choice; selection of optimal product combination.

UNIT III
Cost functions and cost curves, components, and cost minimization - Duality theory - cost and production functions and its applications - Derivation of firm's input demand and output supply functions - Economies and diseconomies of scale.

UNIT IV
Technology in agricultural production, nature and effects and measurement - Measuring efficiency in agricultural production; technical, allocative and economic efficiencies - Yield gap analysis -concepts-types and measurement - Nature and sources of risk, modeling and coping strategies.

Practical
Different forms of production functions - specification, estimation and interpretation of production functions - returns to scale, factor shares, elasticity of production - physical optima-economic optima-least cost combination- optimal product choice- cost function estimation, interpretation-estimation of yield gap - incorporation of technology in production functions- measuring returns to scale-risk analysis through linear programming.

Suggested Readings
Heady EO. *Economics of Agricultural Production and Resource Use*. Prentice- Hall.
The Course Objective of this course is to introduce the theoretical models and applications of microeconomic theory. In particular, the basic comparative statistical techniques and the more modern duality theory will be developed and applied to the models of maximization, unconstrained and constrained utility maximization, expenditure minimization, constrained profit maximization, and cost and expenditure minimization. These mathematical structures form the basic building blocks of neoclassical economics; this course will stress the development and application of these important models. We follow a calculus rather than a graphical approach to the theory. In the subsequent sections of the course, we provide a fairly rigorous exposure to price determination under different market situations, general equilibrium theory, causes and consequences of market failure and welfare economics including the theory of public choice.

Theory
UNIT I
UNIT II
Perfect competition – Monopoly, monopolistic competition and oligopoly. Oligopoly models – collusive and non-collusive models of oligopoly – Cournot model, Chamberlin model, Stackleberg solution.
UNIT III
UNIT IV
UNIT V
Practical
Suggested Readings
Objective
The Course Objective of the course is to impart knowledge on advanced econometric tools to the Research Scholars of agricultural economics. Training in advanced econometrics will help the Research Scholars to analyze the economic problem by applying quantitative techniques.

Theory
UNIT I
UNIT II
UNIT III
Dummy variables - Qualitative and truncated dependent variables – limited dependent variables – LPM, probit and logit models, their multinomial extensions.
UNIT IV
Autoregressive distributed lag models – panel data fixed and random effects models and their extensions.
UNIT V
Simultaneous equation methods – identification – estimation by indirect least squares 2SLS, PIML, SURE, 3SLS.

Practical

Suggested Readings

Objective
The main Course Objective of this course is to critically analyze the important marketing concepts, models, properties of agricultural commodity prices and forecasting, data
collection and analysis using current software etc., in order to make them policy decisions in the field of agricultural marketing.

**Theory**

UNIT I

Importance of market analysis in the agricultural system - types of marketing advantages and disadvantages - quantitative estimation - the distinguishing characteristics and role of agricultural prices - data sources for agricultural products and prices - softwares used in market analysis.

UNIT II

Role of various formal institutions in agricultural marketing - and functions - measuring their efficiency - public - private partnership – institutional arrangements. Successful case studies.

UNIT III


UNIT IV

Agricultural commodity marketing - spot and futures- marketing of derivatives- speculation, hedging, swap, arbitrage etc. commodity exchanges - price discovery and risk management in commodity markets- Regulatory mechanism of futures trading.

UNIT V

Lag operators and difference equations; stationary and stochastic processes; UNIT roots and co integration; conditional heteroscedasticity: ARCH and GARCH models - forecast evaluation; methods of forecasting. price indices and econometric estimation and simulation.

**Practical**

Estimation of demand/ supply forecasting, supply chain / value chain analysis for different commodities - Commodity models- multi market estimation- time series analysis - market integration studies- price discovery price volatility estimation - commodity price forecasting using econometric softwares.

**Suggested Readings**


Linear Programming: Objective, Assumptions, Formulation of Linear Programming Problem, Graphic Method, Simplex method, Transportation and Assignment Problems.
UNIT II
Inventory control Models: Costs Involved in Inventory Management, Types of Inventory, Economic Order Quantity (EOQ) Model, Continuous Review (Q) System, Periodic Review (P) System, Hybrid System, Simulation.
UNIT III
UNIT IV
Decision making under Risk and uncertainties, Decision problem, Maximax Criterion, Maximin Criterion, Minimax Regret Criterion, Laplace Criterion, Pay off Tables, Decision Trees, Expected Value of perfect Information.
UNIT V
Game Theory - Two-Person Zero-Sum Game, Simulation, Network analysis – PERT & CPM.

Suggested Readings

ES-721 ADVANCED MACRO ECONOMICS ANALYSIS
(2+0)
Objective
Advanced macroeconomics course will be offered to PhD students of Agricultural Economics with the following Course Objective.
• to understand the macroeconomic theory
• to examine the macroeconomic Policy issues
• to analyze the macroeconomic Policy implications

Theory
UNIT I
Review of Macro Economics concepts-Comparative statistics- Keynesian theory- Consumption Function and Theories of Consumption - Saving Function and Theories of Saving.
UNIT II
UNIT III
UNIT IV
UNIT V

Suggested Readings

ES-722 ADVANCED PRODUCTION ECONOMICS

(3+0)

**Objective**
To expose the students to the concept, significance and uses of advance production economics.

**Theory**

UNIT I
Agricultural Production process – Relationship between farm planning and production economics-scope of agricultural production and planning methods/ procedures in agro-economic research and planning.

UNIT II

UNIT III
Decision making with multiple inputs and outputs – MRT and product relationship-cost of production and adjustment in output prices-single input and multiple product decisions- Multi input, and multi product production decisions - Decision making with no risk -Cost of wrong decisions - Cost curves – Principles and importance of duality theory - Correspondence of production, cost, and profit functions - Principles and derivation of demand and supply functions .

UNIT IV

UNIT V
Simulation and programming techniques in agricultural production-Multiple Course Objective Programming – Goal programming and Compromise programming – applications.

**Practical**
Estimation of different forms of production functions- Optimal input and product choice from estimated functions-Derivation of demand and supply functions and estimation- Estimation of cost function and interpretations-Optimal product and input choice under multi input and output system-Estimation of factor shares from empirical functions estimated-Estimating production functions incorporating technology changes: Decomposition analysis and incorporation of technology- Estimation of efficiency measures – Stochastic, probabilistic and deterministic frontier production functions-Risk programming – MOTAD-Quadratic programming-Simulation models for agricultural production decisions-Goal programming – Weighted, lexicographic and fuzzy goal programming- Compromise programming.

**Suggested Readings**

**ES-723 QUANTITATIVE DEVELOPMENT POLICY ANALYSIS**
(1+1)
**Objective**
• The course trains the Scholars in the art of informed decision making and helps them to appreciate the value of the analytical basis in policy decisions.
• They are given hands on training on the estimation and use of various criteria such as elasticities in making QDPA more meaningful
• The scholars make extensive reviews to get acquainted with the analytica relevance and in drawing inferences.

**Theory**
UNIT I
UNIT II
Demand analysis for policymaking – Alternative approaches to demand analysis – Policy implications. Supply response – Alternative approaches to measurement of supply response – Nerlovian models of supply response – Policy implications.
UNIT III
Household behaviour and policy analysis – Household models.
UNIT IV

UNIT V
Social Accounting Matrices and multipliers --- Computable General Equilibrium models to assess economy wide impact of policy changes.

**Practical**

**Suggested Readings**

**SUPPORTING COURSES FOR OTHER DISCIPLINES**

**ES-627:** Statistics for Industrial Applications (3 +1)

Statistical Methods in Industrial Applications; Testing of Hypothesis. Tests of significance – Z, t, Chi-square and F tests; Analysis of variance, one way, two way classification, Transformations, Partial and Multiple Correlation and Regression; Non-linear Regression; Ranking techniques; Coefficient of concordance; Principles of experimental design-Industrial experimentation; Basic designs-CRD; RBD & LSD; Missing plot technique; Factorial experiments-main effects and interactions. 2^n series and mixed factorial experiments; Experimental designs in Sensory Evaluation; Response Surface Design and their applications in Dairy Industry; Introduction to sampling techniques and their application to consumer preference studies.

**Practical**
Tests of significance – Z, t, Chi-square and F tests.
Analysis of variance-one way and two way classification
Partial and multiple correlation and regression
Rank correlation and coefficient of concordance
Analysis of Industrial experiments – CRD; RBD and LSD
Missing plot technique
Factorial experiments – 2^2 and 2^3, mixed factorial experiments
Response Surface Design
Different methods of selecting samples.
**Suggested Readings**

   S. Chand & Co., New Delhi
   S. Chand & Co., New Delhi
   Penguin Books, U.K.
   Oxford and IBH Publishing Co., New Delhi
   Asia Publishing House, Bombay
   Wiley Eastern Pvt Limited, New Delhi
   Chapman & Hill, New York

**ES-628: DESIGN OF EXPERIMENTS**  (3+1)

Statistical methods for animal experiments, analysis of variance, transformation, linear and non-linear regression and correlation, including two independent variables.

Principles of experimental design, completely randomized, randomised block and latin square design, designs suitable for animal experimentation, missing plot technique, cross over design, switch over trails.

Factorial experiments, main effects and interactions, \(2^n\) and \(3^r\) series, mixed factorial experiments, principles of confounding-total and partial confounding. Balanced incomplete block designs, split plot design. Use of concomitant variates and analysis of covariance.

**Practical**

Test of significance based on Z-test, t-test, \(\chi^2\) test and F-test. (2)

Correlation and regression, multiple regression (2)

Analysis of data in CRD, RBD and LSD (2)

Missing plot technique (2)

Cross-over design (1)

Factorial experiments in \(2^n\) series (2)

Split plot design (1)

Analysis of covariance (1)

**Suggested readings**

1. Snedecor, G.W., Cochran, W.G.; Statistical methods
2. Panse V.G. and Sukhatme, P.V.; Statistical Methods for Agril. Workers
   Indian Council of Agricultural Research, New Delhi
   Wiley Eastern Pvt. Ltd., New York
4. Gupta, S.P., Statistical Methods
   Sultan Chand Publisher, New Delhi.
5. Amble, V.N., Statistical Methods for Animal Sciences
   Indian Council of Agril. Research, New Delhi
   Wiley Eastern Pvt. Ltd., New Delhi

CS-621: Software Packages for Statistical Computing
        (2 + 1)

Theory
General data analysis requirements in dairy research; introduction to statistical and other
standard software packages (SYSTAT; SPSS; MATLAB; and MS-Excel); data
preparation and job control commands for statistical analysis of data pertaining
descriptive statistics; tests of significance - t-test, Chi-square test and F-test; analysis of
variance (ANOVA); basic experimental designs - CRD; RBD and LSD; factorial
experiments; Correlation; simple and multiple linear regression; curvilinear regression;
stepwise regression; discriminant analysis; graphic features of the above listed software
packages; linear programming using appropriate software packages; least-squares
analysis; brief introduction to data mining techniques such as neural networks, genetic
algorithms and fuzzy logic for predictive modeling.

Practical
Statistical software packages and their operations; data preparation and data
generation; import and export of data from spreadsheet and database packages;
application of software packages to the problems related to: descriptive statistics; tests
of significance (t-test; Chi-square test and F-test); ANOVA; correlation; simple and
multiple linear regression; curvilinear regression; stepwise regression; discriminant
analysis; graphic features of the above noted software packages; linear programming
problem; least-squares analysis; neural network and fuzzy logic models for
prediction/classification.

Suggested Readings
   Delhi.
   Society of Agricultural Statistics, ICAR.
3. Chakrabarti, S., Cox, E., Frank, E., Güting, R. H., Han, J., Jiang, X., Kamber, M.,
   Lightstone, S. S., Nadeau, T. P., Neapolitan, R. E., Pyle, D., Refaat, M., Schneider,
   M., Teorey, T. J. and Witten, I. H., 2009. Data Mining: Know It All. Morgan
   Kaufmann. ISBN: 978-0-12-374629-0.

User reference guides/manuals for respective software packages
ORGANIZATION OF COURSE CONTENTS & CREDIT REQUIREMENTS

Code Numbers
- All courses are divided into two series: 600-series courses pertain to Master’s level, and 700-series to Doctoral level. A Ph. D. student must take a minimum of two 700-series courses, but may also take 600-series courses if not studied during Master’s programme.
- Credit seminar for Master’s level is designated by code no. 691, and the two seminars for Doctoral level are coded as 791 and 792, respectively.
- Similarly, 699 and 799 codes have been given for Master’s research and Doctoral research, respectively.

Course Contents
The contents of each course have been organized into:
- Objective – to elucidate the basic purpose.
- Theory units – to facilitate uniform coverage of syllabus for paper setting.
- Suggested Readings – to recommend some standard books as reference material. This does not unequivocally exclude other such reference material that may be recommended according to the advancements and local requirements.
- A list of journals pertaining to the discipline is provided at the end which may be useful as study material for 600-series courses as well as research topics.
- E-Resources - for quick update on specific topics/events pertaining to the subject.
- Broad research topics provided at the end would facilitate the advisors for appropriate research directions to the PG students.

Minimum Credit Requirements

<table>
<thead>
<tr>
<th>Subject</th>
<th>Master’s programme</th>
<th>Doctoral programme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major</td>
<td>28</td>
<td>17</td>
</tr>
<tr>
<td>Minor + Supporting</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>(minimum 6 for minor &amp; 3 for supporting)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seminar</td>
<td>01</td>
<td>02</td>
</tr>
<tr>
<td>Research</td>
<td>20</td>
<td>45</td>
</tr>
<tr>
<td>Total Credits</td>
<td>60</td>
<td>75</td>
</tr>
</tbody>
</table>

Compulsory Non Credit Courses: See relevant section

Major subject: The subject (department) in which the students takes admission

Minor subject: The subject closely related to students major subject. A suggested list of specified minor subjects is given in Table 1.

Supporting subject: The subject not related to the major subject. It could be any subject considered relevant for student’s research work.

Non-Credit Compulsory Courses: Please see the relevant section for details. Six Courses (PGS 501-PGS 506) are of general nature and are compulsory for Master’s Programme. Ph. D. students may be exempted from these courses if already studied During Master’s degree.