

**UNIVERSITY OF MADRAS**  
**B.A. ECONOMICS (ECONOMETRICS)**  
(With effect from 2019-2020)  
**REGULATIONS**

**ANNEXURE-II**

**SCHEME OF EXAMINATION: FIRST SEMESTER**

COURSE COMPONENT	SUBJECTS	CREDITS	INS.HOURS	MAXIMUM MARKS		
				INT.	EXT.	TOTAL
Part I	Language - I	3	4	25	75	100
Part II	English - I	3	4	25	75	100
Part III	Core Paper I - Mathematical Methods - I	4	5	25	75	100
	Core Paper – II Statistical Methods - I	4	5	25	75	100
	Allied Paper-I Principles of Sociology	5	6	25	75	100
Part IV	Basic Tamil/Adv.Tamil/Non-Major Elective- I	2	2	25	75	100
	Soft Skill- I	3	2	25	75	100
	<b>Total Credits</b>	<b>24</b>				

Non Major Elective-I : Principles of Marketing

**SECOND SEMESTER**

COURSE COMPONENT	SUBJECTS	CREDITS	INST.HOURS	MAXIMUM MARKS		
				INT	EXT	TOTAL
Part I	Language Paper - II	3	4	25	75	100
Part II	English Paper - II	3	4	25	75	100
Part III	Core Paper –III Mathematical Methods – II	4	5	25	75	100
	Core Paper – IV Statistical Methods – II	4	5	25	75	100
	Allied Paper – II Economics of Insurance	5	6	25	75	100
Part IV	Basic Tamil/Adv. Tamil/Non Major Elective-I	2	2	25	75	100
	Soft Skill – II	3	2	25	75	100
	<b>Total Credits</b>	<b>24</b>				

Non Major Elective-II : Basics of Capital Market

**THIRD SEMESTER**

COURSE COMPONENT	SUBJECTS	CREDITS	INST HOUR	MAXIMUM MARKS		
				INT	EXT	TOTAL
Part I	Language Paper - III	3	6	25	75	100
Part II	English Paper - III	3	6	25	75	100
Part III	Core Paper –V Micro Economic Analysis – I	4	5	25	75	100
	Core Paper – VI Basic Econometrics – I	4	5	25	75	100
	Allied Paper – III Health Economics	5	6	25	75	100
Part IV	Soft Skill - III	3		40	60	100
	Environmental Studies		2	25	75	100
	<b>Total Credits</b>	<b>22</b>				

**FOURTH SEMESTER**

COURSE COMPONENT	SUBJECTS	CREDITS	INST. HOURS	MAXIMUM MARKS		
				INT	EXT	TOTAL
Part I	Language Paper - IV	3	6	25	75	100
Part II	English Paper - IV	3	6	25	75	100
Part III	Core Paper – VII Micro Economic Analysis – II	4	5	25	75	100
	Core Paper – VIII Basic Econometrics – II	4	5	25	75	100
	Allied Paper – IV Introduction to Operation Research	5	6	25	75	100
Part IV	Soft Skill - IV	3		40	60	100
	Environmental Studies	2	2	25	75	100
	<b>Total Credits</b>	<b>24</b>				

**FIFTH SEMESTER**

COURSE COMPONENT	SUBJECTS	CREDITS	INST HOURS	MAXIMUM MARKS		
				INT	EXT	TOTAL
Part III	Core Paper – IX - Mathematical Economics - I	4	6	25	75	100
	Core Paper-X - Principles of Macro Economics	4	6	25	75	100
	Core Paper – XI Econometric Methods - I	4	6	25	75	100
	Core Paper-XII International Economics	4	6	25	75	100
	Elective – I Indian Economy – I	5	4	25	75	100
PART IV	<b>Value Education</b>	<b>2</b>	<b>2</b>	<b>25</b>	<b>75</b>	<b>100</b>
	<b>Total Credits</b>	<b>23</b>				

**SIXTH SEMESTER**

COURSE COMPONENT	SUBJECTS	CREDITS	INST HOURS	MAXIMUM MARKS		
				INT	EXT	TOTAL
Part - III	Core Paper XIII Mathematical Economics – II	4	6	25	75	100
	Core Paper XIV Public Finance	4	6	25	75	100
	Core Paper XV Econometric Methods - II	4	6	25	75	100
	Elective –II Indian Economy - II	5	6	25	75	100
	Elective – III Computer Application in Econometrics	5	6	25	75	100
Part V	Extension Activities	1	-			
	<b>Total Credits</b>	<b>23</b>				

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**UNIVERSITY OF MADRAS**  
**B.A. Economics (Econometrics)**  
**SYLLABUS**

**Core Paper I: Mathematical Methods-I**

Unit – I

Definition of a Matrix and Vector – Basic Matrix Operations – Addition, Subtraction and Multiplication of Matrices.

Unit – II

Types of Matrices – Transpose of a Matrix – Properties of Transpose – Partitioned Matrices – Minor and Rank of a Matrix.

Unit – III

Determinants of a Matrix – Properties – Inverse of a Matrix of order 2 and 3 using Co-factor Method and Gauss Elimination Method – Solving simultaneous Equations using Matrix Inversion method and Cramer's rule.

Unit – IV

Elements of Game Theory – Basic Concepts – Two persons Zero Sum – Two person Constant Sum Game – Saddle Point Solution – Dominated Strategies Method – Maximin and Minimax criterion – Case of no Saddle Point – Solution of Mixed Strategy Game (2x2 matrix only – Simple problems)

Unit – V

Linear programming – Maximization and Minimization – Graphical Method – Simplex Method – A note on Primal and Dual programmes – Statement of Duality Theorems.

**Books Recommended**

1. Fundamental Methods of Mathematical Economics – Chiang A.C. (McGraw Hill, New Delhi, 1974)
2. Mathematics for Economists – Edward T. Dowling (Schaum Series)
3. Theory and Problems of Mathematical Methods for Business and Economics – Edward T. Dowling (Schaum Series)
4. Mathematical Analysis Business and Economics Application – Weber, Jean E – Harper & Row Publications, New York.
5. Maths for Economics – Geoff Renshaw – Oxford University Press, 4<sup>th</sup> Edition
6. Mathematical Methods for Economists – Mehta, and Madnani, G.M. - Sultan Chand, New Delhi.

## Core Paper II : Statistical Methods - I

### Unit I: Descriptive Statistics/Summary Statistics:

Measures of Central Tendency – Minimum, Maximum, Mean, Median, Mode

Measures of Dispersion – Standard deviation, Variance

Measures of deviation from Normality – Skewness, Kurtosis

Frequency Distributions – Univariate, Bivariate

Graphical Illustrations

### Unit II: Probability:

Introduction to Probability & Concepts

Addition Rule of Probability

Multiplication Rule of Probability

Conditional Probability & Baye's theorem

Theoretical Probability Distributions – Binomial, Poisson, Normal distributions

### Unit III: Random Variables & Probability Distributions:

Random Variables – Discrete, Continuous

Probability Density Function

Joint Probability Density Function

Marginal Probability Density Function

Conditional Probability Density Function

Characteristics/Moments of Probability Distributions – Expected Value, Variance

### Unit IV: Inferential Statistics:

Estimation – Point estimation, Interval estimation

Statistical Hypothesis Testing and Significance

Steps in hypothesis testing – Types of hypothesis, Levels of Significance, Degrees of Freedom, Type I and Type II Errors, One-Tail and Two-Tail Tests, Standard Error, p-Values

### Unit V: Tests of Significance of Means:

Small Sample Test: Student's t Distribution – Properties of t distribution, Applications of t test, Large Sample Test: Standard Error – Applications & Uses

ANOVA – One-way & Two-way

### Books Recommended:

1. Alexander M. Mood, Franklin A. Greybill and Duance C. Boes: Introduction to Theory of Statistics, Third Edition, McGraw Hill.
2. Murray R. Spiegel: Theory and Problems of Probability and Statistics, McGraw-Hill Schaum's Outline Series
3. Seymour Lipschutz and John Schiller: Introduction to Probability and Statistics, Hill Schaum's Outline, McGraw Hill
4. P.K. Viswanathan: Business Statistics: An applied Orientation, Pearson Education
5. Damodar Gujarati: Essentials of Econometrics, McGraw Hill.
6. Thomas H. Wonnacott and Ronald J. Wonnacott, Introductory Statistics.

## **Allied Paper I : Principles of Sociology**

### **Unit-I**

Nature, Scope and development of Sociology - Uses of Sociology- Sociology and other social sciences - History, Economics, Politics, Anthropology, Psychology.

### **Unit-II**

Basic concepts of Sociology - Institution -Association - community - Society - Social Interaction -Social Processes -Types of Social Processes

### **Unit-III**

Individual and society - The process of socialization -Agencies of socialization - Various stages of socialization Culture Definition - Elements - Functions - Cultural lag Ethnocentrism.

### **Unit-IV**

Groups – Definition – Characteristics – Types Groups – Primary and Secocndary Groups – Major Social Institutions – Family - Marriage – Religion .

### **Unit – V**

Social Stratification - Definition - Characteristics – Functions – Forms of Social Control – Definition – Agencies – and Types of Social Control – Social Change Factors of Social Change – Theories of Social Change.

### **Books Recommended:**

1. Shankar Rao C.N. (2007), Sociology:Primary Principles of Sociology, 3/E ISBN 97881211910361, New Delhi S.Chand and Co.
2. Rajendra Sharma (1997) , Fundamentals of Sociology, Atlantic , New Delhi.
3. Gilbert Pascal (1973), Fundamentals of Sociology, Orient Longman, New Delhi.
4. Thomson, Harry M (1995), Sociology: systematic Introduction, Allied Publishers, India.
5. Gidden Antony (2001), Sociology (4/E) Polity Press, UK

**Non Major Elective I  
Principles of Marketing**

**Unit – I: Introduction and Concepts of Marketing**

Marketing – Meaning and Definition – Features of Marketing – Objectives and Functions of Marketing – Role of Marketing in Economic Development – Classification of Marketing functions – Buying and Assembling – Grading and Standardisation.

**Unit – II: Product Life Cycle and Product Planning**

Product – Meaning – Classification of Products – Product Life Cycle – Product planning – Importance of the product – Product Mix – Factors determining product Mix.

**Unit – III: E-Marketing and Sales Promotion**

E-Marketing – Strategies of E-Marketing – Benefit of E-Marketing – Disadvantages of E-Marketing – Sales promotion – Objectives – Importance and Limitation of Sales promotion – Advertising – Advantages of Advertising.

**Unit-IV: Buyer Behaviour**

Definitions, Characteristics, Importance, Factors, Influencing Buyer Behaviour, Problems in Buyer Behaviour Study, Buyer Motives – The Buying Process , Market Segmentation – Definition, Methods of Market Segmentation Benefits.

**Unit – V: Marketing Research**

Meaning, Scope of Marketing Research – Marketing Research Process – Steps involved in Marketing Research Process – Characteristics of Good Marketing Research – Advantages of Marketing Research .

**Book for Study :**

1. Rajan Nair. N and Sanjith.R.Nair, Marketing, Sultan Chand.
2. Philip Kotler, Principles of Marketing, Prentice Hall Series

**Books Reference:**

1. Sherleker, Marketing Management, Himalaya Publishing House
2. Gupta, Marketing Management, CB Sultan Chand.
3. Modern Marketing - R.S.N.Pillai and Bagavathi, Sultan and Chand Company Pvt Ltd.

### **Core Paper III : Mathematical Economics - II**

#### Unit – I

Meaning of Input – Output Analysis – Open and Closed Models, Structure of Input-Output Model – Input-Output transactions Model – Input-Output Co-efficient Matrix – Hawkins – Simon Conditions – Assumptions – Uses and Limitations.

#### Unit – II

Constrained Optimisation –Lagrangian Multiplier Method – Problems on Utility Maximisation with Budget Constraint – Cost Minimisation Subject to Product function.

#### Unit – III

Homogenous Functions – Euler’s Theorem – Problems – Cobb-Douglas Production Function – Properties – CES Production Function – Properties.

#### Unit – IV

Difference Equation – Definition and Classification of Difference Equation –Linear Difference Equations – Solutions of Difference Equations – Linear First order Difference Equation – Harrod Model.

#### Unit – V

Application of Integration – Findings of Total Utility, Total Cost, Total Revenue and Consumption Functions – Consumers Surplus – Producers Surplus – Problems.

#### **Books Recommended**

1. Fundamental Methods of Mathematical Economics – Chiang A.C. (McGraw Hill, New Delhi, 1974)
2. Mathematics for Economists – Edward T. Dowling (Schaum Series)
3. Theory and Problems of Mathematical Methods for Business and Economics – Edward T. Dowling (Schaum Series)
4. Mathematical Analysis Business and Economics Application – Weber, Jean E – Harper & Row Publications, New York.
5. Maths for Economics – Geoff Renshaw – Oxford University Press, 4<sup>th</sup> Edition
6. Mathematical Methods for Economists – Mehta, and Madnani, G.M. - Sultan Chand, New Delhi.

## **Core Paper IV: Statistical Methods – II**

### **Unit I: Measures of Linear Relationships**

Introduction to Correlation – Definition, Types

Estimation of Correlation Coefficients– Simple, Partial, Multiple

Properties of Correlation Coefficient

Testing the significance of correlation coefficient – t, Standard Error

### **Unit II: Simple Linear Regression Analysis/Models**

Introduction to Simple Linear Regression Models

Regression vs. Causation

Properties & Estimation of Regression Coefficients

Goodness of Fit Measure/Summary Measure – Coefficient of Determination

### **Unit III: Multiple Linear Regression Models**

Introduction to Multiple Linear Regression Models

Properties & Estimation of Partial Regression Slope Coefficients

Goodness of Fit Measure/Summary Measure – Coefficient of Determination

### **Unit IV: Non-Parametric tests**

An Introduction to Non-Parametric Tests

Difference between Parametric and Non-Parametric tests

Sign Test – Paired Samples

Mann Whitney U Test – Two Independent Samples

Kruskal Wallis H Test – More than two Independent Samples

Run's Test for Randomness

Chi-square Test

### **Unit V: Minor Assignment**

Estimate, analyze and draw inference on an economic data using any of the statistical tools in the syllabus.

### **Books Recommended:**

1. Alexander M. Mood, Franklin A. Greybill and Duance C. Boes: Introduction to Theory of Statistics, Third Edition, McGraw Hill.
2. Murray R. Spiegel: Theory and Problems of Probability and Statistics, McGraw-Hill Schaum's Outline Series
3. Seymour Lipschutz and John Schiller: Introduction to Probability and Statistics, Hill Schaum's Outline, McGraw Hill
4. P.K. Viswanathan: Business Statistics: An applied Orientation, Pearson Education
5. Damodar Gujarati: Essentials of Econometrics, McGraw Hill.
6. Thomas H. Wonnacott and Ronald J. Wonnacott, Introductory Statistics.



## **Allied Paper II- Economics of Insurance**

### **UNIT I**

Definition of Insurance- Origin and history of Insurance, General principles of Insurance. Types- Life Insurance, Fire Insurance, Marine Insurance and Crop Insurance. Difference between life and other types of Insurance.

### **UNIT II**

Life Insurance- Objectives, Different types of Life Policies, Annuities, Assignments, Nominations, Lapses and Revival of policies.

### **UNIT III**

Risk and Insurance- Classification of Risk, Surrender value- paid up value- loans- claims- procedures for claims and settlement of claims.

### **UNIT IV**

Marine Insurance- marine perils, Types of marine policies and clauses in general. Use of warranties and conditions- proximate clause, subrogation and conciliation.

### **UNIT V**

Fire Insurance- Characteristics, Fixation of premium- fire waste and hazards of fire- physical and moral types of fire policies- cover note, survey and inspection-

### **Books Recommended:**

1. Principles and Practice of Insurance- M N Mishra
2. Principles and Practice of Insurance- Dr A Murthy
3. Principles and Practice of Insurance- Dr P Periyasamy
4. Element of Insurance- M Premavathy
5. Principles of Insurance Law- M N Srinivasan
6. Theory and Practice of Insurance- M Arif Khan
7. Insurance Principles and Practices- K S Sharma

## **Non Major Elective II: Principles of Marketing**

### **Unit – I: Introduction and Concepts of Marketing**

Marketing – Meaning and Definition – Features of Marketing – Objectives and Functions of Marketing – Role of Marketing in Economic Development – Classification of Marketing functions – Buying and Assembling – Grading and Standardisation.

### **Unit – II: Product Life Cycle and Product Planning**

Product – Meaning – Classification of Products – Product Life Cycle – Product planning – Importance of the product – Product Mix – Factors determining product Mix.

### **Unit – III: E-Marketing and Sales Promotion**

E-Marketing – Strategies of E-Marketing – Benefit of E-Marketing – Disadvantages of E-Marketing – Sales promotion – Objectives – Importance and Limitation of Sales promotion – Advertising – Advantages of Advertising.

#### **Books Recommended:**

1. Rajan Nair. N and Sanjith.R.Nair, Marketing, Sultan Chand.
2. Philip Kotler, Principles of Marketing, Prentice Hall Series
3. Sherleker, Marketing Management, Himalaya Publishing House
4. Gupta, Marketing Management, CB Sultan Chand.
5. Modern Marketing - R.S.N.Pillai and Bagavathi, Sultan and Chand Company Pvt Ltd.

## **Core Paper V: Micro Economic Analysis - I**

### **Unit- I: Principles of Economics**

1. Scarcity and Choice
2. Opportunity Cost
3. The Marginalist Principle
4. The Efficiency Principle
5. The Incentive Principle

### **Unit – II: The Market Mechanism**

1. Law of demand – determinants of demand – exceptions to law of demand – market demand and individual demand – normal, inferior, substitute and complement goods
2. The law of supply – determinants - market and individual supply - shift in supply curve
3. Equilibrium Price - Changes in supply and demand

### **Unit – III: Elasticity**

4. The concept of elasticity - demand and supply elasticity
5. Types - Price, Income, Cross Elasticity – Nature (Magnitude) of elasticity
6. Applications of elasticity in Economics

### **Unit – IV: Markets and Welfare**

1. Consumer surplus – willingness to pay – using demand curve to measure consumer surplus
2. Producer surplus – cost and willingness to supply – using supply curve to measure producer surplus
3. Market efficiency – evaluating market equilibrium – market failure

### **Unit – V: Economics of Production**

1. The production function (basic introduction)
2. Cost concepts – Total, Variable, Fixed Marginal and average cost – relationship between MC and AC
3. Short run and long run costs
4. Profit maximization

### **Books Recommended:**

1. Gregory Mankiw (2014), *Economics: Principles and Applications*, New Delhi: Cengage Learning India.
2. H.L. Ahuja (2016), *Advanced Economic Theory*, S.Chand Publishing, New Delhi.
3. D.N. Dwivedi, “Micro Economics – Theory and Applications”, Pearson Education.
4. M.L.Seth :PrincipleofEconomics, L.N. Agarwal.

## **Core Paper VI: Basic Econometrics I**

### **Unit I: Introduction to Econometrics**

Meaning – What is Econometrics

Classical Econometric Methodology

Analysis of economic problems - Demand theory and Keynes Consumption theory

### **Unit II: Two-variable Linear Regression Analysis**

Population & Sample Regression Function (PRF, SRF)

Linearity in the Variables and Parameters

Probability Distribution & Significance of the Stochastic Disturbance Term

### **Unit III: Two-variable Regression- Problem of Estimation**

Introduction to the Method of Ordinary Least Squares (OLS)

Derivation & Properties of OLS estimators

Assumptions of the Classical Linear Regression Model

Gauss Markov Theorem – Derivation of BLUE Estimators

Estimation of a two-variable model – Reporting & Interpreting the Regression Results

Goodness of Fit Measures - Coefficient of Determination

### **Unit IV: Two-variable Regression-Interval Estimation & Hypothesis Testing**

An Introduction to Interval Estimation & Hypothesis testing

Estimation of Confidence Intervals for regression coefficients

Testing the significance of the coefficients – Confidence Interval Approach

Testing the significance of the coefficients – Tests of Significance Approach

Standard Error – Reliability of estimators

Testing the overall significance of the Model: Regression Analysis & ANOVA

### **Unit V: Multiple Linear Regression Analysis**

Introduction to Multiple Linear Regression Models

Significance of the Model using Economic Illustrations

Assumptions & Properties of a Multiple Regression Model

Estimation of a three-variable model - Reporting & Interpreting the Regression Results

Standard Error – Reliability of estimators

Coefficient of Determination – Goodness of Fit Measures

### **Books Recommended:**

1. Geoffrey M. Wooldridge, 'Introduction to Econometrics' – 3<sup>rd</sup> edition, Pearson Publishers
2. Damodar.N. Gujarati, 'Basic Econometrics'
3. Racine and Li, 'Non-parametric Econometrics- A premier'
4. A.C. Cameron and P.K. Trivedi, 'Micro Econometrics- Methods and Application', Cambridge University Press.

### **Allied Paper III : Health Economics**

#### **COURSE OUTLINE:**

- Unit I:** Health and Economic Development- Investment in man -Health and Social Welfare- Determinants of Health- Income and Health Linkages- Economic Analysis of Health care.
- Unit-II:** Demand for Health Care Services- Preference for Health care using Indifference Curves- Budget Constraints- Income and Price effects for Health care- Elasticity of Demand for Medical care.
- Unit-III:** Supply of Health care services- Physicians and Medical Personnel as Health care providers- Non labour inputs- Hospitals- Interaction of Demand and Supply of Health care.
- Unit-IV:** Health Indicators- Birth rate- Fertility- Morbidity- Mortality- IMR – CMR- MMR- Disability Adjusted Life Year (DALY)- Quality Adjusted Life Year (QALY)- Sex ratio.
- Unit- V:** Health Insurance- Medical Ethics- Medical Tourism.

#### **Books Recommended:**

1. William Jack, Principles of Health Economics for Developing Countries, World Bank Institute Development Studies 1999.
2. World Development Report, Investing in Health, The World Bank 1993.
3. M. Grossman, 'The Shadow price of Health in the Economics of Health' Vol. 1 by A.J. Culyes (ed) (1991), Edward Elger publishing Ltd, UK.
4. Volan Brian (1993) Economics Incentives, Health Status and Health services, Utilisation, Journal of Health Economics, Vol II.
5. Banerjee, D. (1975), Social and Cultural Foundations of Health Service Systems of India, Inquiry, Supplement to Vol. XII, June.
6. Edwin G Dolan and John C Goodman: Economics of Public Policy: 4<sup>th</sup> Edition: West Publishing Company, New York

## **Core Paper VII: Micro Economic Analysis – II**

### **Unit-I: Introduction**

1. Nature and Techniques of Economic Analysis
2. Positive and Normative Economics
3. Inductive and deductive methods

### **Unit-II: Cardinal Approach to the Theory of Demand**

1. Marshallian cardinal utility – Law of Diminishing Marginal Utility – Assumptions
2. Consumer's Equilibrium – Law of Equimarginal utility – Limitations

### **Unit-III: Ordinal Approach to the Theory of Demand**

1. Indifference curve and its Properties
2. Ordinal utility – Hicks and Allen - Price, income and substitution effects.
3. Consumer's equilibrium – Applications of indifference curve analysis.

### **Unit-IV: Theory of Production**

1. Stages in production – Law of variable proportions – Laws of Returns to Scale – Iso-quant
2. Producer's Equilibrium – Least-cost combination of input - Expansion path
3. Homogenous production function – Cobb Douglas

### **Unit-V: Cost and Revenue concepts**

1. Types of Costs – Fixed and Variable Costs – Average, Marginal and Total Costs
2. Traditional and Modern Cost -Short and Long run Cost Curves
3. Derivation of cost from production function - Optimum firm.
4. Total, Average and Marginal Revenue – Break even analysis

### **Books Recommended:**

1. Gregory Mankiw (2014), *Economics: Principles and Applications*, New Delhi: Cengage Learning India.
2. H.L. Ahuja (2016), *Advanced Economic Theory*, S.Chand Publishing, New Delhi.
3. D.N. Dwivedi, "Micro Economics – Theory and Applications", Pearson Education.
4. M.L.Seth :PrincipleofEconomics, L.N. Agarwal.

## **Core Paper VIII: Basic Econometrics II**

### **Unit I: Three-Variable Regression - Hypothesis Testing**

Hypothesis testing – Partial Regression Coefficients

Testing the overall significance of the Model: Regression Analysis & ANOVA

Relationship between  $R^2$  and F

Assess the Incremental contribution of an additional explanatory Variable using ANOVA

### **Unit II: Functional Forms of Regression Models**

An Introduction to Non-Linear Relationships

Log-Linear Models – How to measure elasticity

Semi-Log Models – How to measure growth rates

Intercept-less Regression models

### **Unit III: General Linear Models (Matrix Approach)**

Introduction to k-variable Linear Regression Model, Assumptions

Derivation of The Population & Sample Regression Function (PRF, SRF)

Derivation & Properties of OLS Vector (Estimated  $\beta$ )

Gauss Markov Theorem – Derivation of BLUE Estimators

Estimation of the model using Matrix Approach– Reporting & Interpreting the Regression Results

Goodness of Fit Measures - Coefficient of Determination

### **Unit IV: Hypothesis Testing – Matrix Notation**

Hypothesis Testing – Individual Coefficients

Testing the overall significance of the Model: Regression Analysis & ANOVA

### **Unit V: Problem Assignments**

Example I: Estimating Demand/Supply Function, Computing Elasticity

Example II: Estimating Consumption Function, Compute & Test the significance of MPC,

Example III: Estimating COBB Douglas Production Function, Computing output elasticity with respect to Labour and Capital Inputs, Testing the significance of the coefficients and of the model, Assessing the marginal contribution of additional regressor.

Example IV: Compute Growth Rates

### **Books Recommended:**

1. Geoffrey M. Wooldridge, ‘ Introduction to Econometrics’ – 3<sup>rd</sup> edition, Pearson Publishers
2. Damodar.N. Gujarati, ‘Basic Econometrics’
3. Racine and Li, ‘Non-parametric Econometrics- A premier’
4. A.C. Cameron and P.K. Trivedi, ‘Micro Econometrics- Methods and Application’, Cambridge University Press.

## **Allied Paper IV: Introduction to Operations Research**

### Unit 1

Introduction - Nature and scope of Operations Research - Transportation Model - Definition - Methods of finding Initial Basic Feasible Solution - North-West Corner Rule, Least Cost Method, Vogel's Approximation Method - Solution of a Transportation Problem – MODI Method – A note on Unbalanced Transportation problem - Assignment Problem – Hungarian Method

### Unit 2

Structure of Decision Making Problems - Types of decision making - Decision making under Uncertainty -Maximin, Minimax, Maximax, Hurwicz and Minimax regret criteria - Decision Making under Risk – Expected Value Criterion, Expected Opportunity Loss Criterion, Expected Value Perfect Information – Decision Tree Analysis

### Unit 3

Meaning, Objectives and Types of inventory - Factors affecting inventory control - Benefits of inventory control - Economic order quantity models – Quantity discount models

### Unit 4

Meaning, objectives and Basic Components of a Network - Management applications of network analysis - Construction of network for projects – problems - Network computations - Earliest completion time of a project - Critical Path Method - Program Evaluation Review Technique

### Unit 5

Queuing Theory : Meaning - Benefits - Elementary Queuing System - Arrival Pattern - Queue and Service Facility - Single Server and Multi Server Models

### BOOKS RECOMMENDED

1. Richard Bronson and GovindasamyNaadimuthu - Operations Research (Schaum's Outlines)
2. Wagner .H - Principles of Operations Research
3. Philip D.T. and Ravindran A., "Operations Research", John Wiley, 1992.
4. Taha H.A., "Operations Research", Sixth Edition, Prentice Hall of India, 2003.
5. Kapoor V.K. - Operations Research - Sultan Chand & Sons
6. Gupta P.K. &Hira D.S- Operations Research and Quantitative Analysis - S. Chand & Co. Ltd.,



## V SEMESTER

### Core Paper IX: Mathematical Economics - I

#### Unit – I

Functions and diagrams in Economics, Polynomial functions, Constant function, Linear function, Quadratic function, Cubic function, Rational function, Logarithmic and Exponential functions, Tracing parabola, Ellipse, Hyperbola and Rectangular Hyperbola – Concept of Slope.

#### Unit – II

Cost functions, Total Cost, Fixed Cost, Variable Cost, Average Cost, Average Fixed Cost, Average Variable Cost and Marginal Cost. Problems on Cost minimization, AC – MC relationship with Proof – Problems.

#### Unit – III

Elasticity of Demand, Price elasticity, Income elasticity, Cross elasticity and Partial elasticity – Nature of Goods – Substitute goods and Complementary goods.

#### Unit – IV

Revenue Functions: Total Revenue, Marginal Revenue and Average Revenue, Relationship between TR and MR, Relationship between AR and MR, Relationship among AR, MR and Elasticity of demand.

#### Unit – V

Profit Maximisation under Perfect Competition, Monopoly – Price discrimination.

#### Books Recommended

1. Fundamental Methods of Mathematical Economics – Chiang A.C. (McGraw Hill, New Delhi, 1974)
2. Mathematics for Economists – Edward T. Dowling (Schaum Series)
3. Theory and Problems of Mathematical Methods for Business and Economics – Edward T. Dowling (Schaum Series)
4. Mathematical Analysis Business and Economics Application – Weber, Jean E – Harper & Row Publications, New York.
5. Maths for Economics – Geoff Renshaw – Oxford University Press, 4<sup>th</sup> Edition
6. Mathematical Methods for Economists – Mehta, and Madnani, G.M. - Sultan Chand, New Delhi.

## **Core Paper X: Principles of Macro Economics**

### **UNIT-1 : INTRODUCTION TO MACROECONOMICS.**

Scope of Macro Economics - central questions in Macro Economics – National Income Accounting – Measurement of Gross Domestic Product (GDP) – Problems in GDP measurement – Nominal Vs. Real GDP – Is the GDP a measure of economic well being ?

### **UNIT-2 : CLASSICAL MACRO ECONOMICS.**

A : Elements of classical Economics – Say’s Law of Markets – Production – Employment – Labour supply – Price wage flexibility – Determinants of output and employment – Equilibrium output and employment.

B : Money, Prices and Interest – the Quantity Theory of Money – Equation of Exchange – Cambridge Approach – Classical Aggregate Demand curve – Classical theory of Interest – Neutrality of Money.

### **UNIT – 3 : KEYNESIAN MACRO ECONOMICS.**

A : The role of aggregate demand – components of aggregate demand – Problem of unemployment – Consumption and Investment functions – Determining equilibrium Income – Role of Multiplier and Accelerator.

B : Keynesian approach to Money, Interest and Income – Money in the Keynesian system – Liquidity Preference – Transactions Demand and speculative demand for Money – Integration of Money and Goods markets – IS-LM Model.

### **UNIT – 4 : AGGREGATE SUPPLY : WAGES , PRICES AND UNEMPLOYMENT.**

Inflation and unemployment – The Phillips curve – The Policy trade-off – Inflation – Expectations Augmented Phillips curve – Rational expectations – Unemployment and sticky wages – Phillips curve to aggregate supply curve – Supply shocks.

### **UNIT – 5 : MACRO ECONOMIC POLICY.**

A : Monetary Policy – Goals – Monetary Policy and Aggregate Demand – Intermediate Targeting on monetary aggregates – Rules Vs Discretion – Interest rates in Long-run and Short-run – Money stock Vs. Interest rate targets.

B : Fiscal Policy – Goals – Fiscal policy and Aggregate demand – Budget multiplier – The crowding out effect.

C : Macro Economic Policy in an Open Economy.

Open economy IS-LM Model – Monetary and Fiscal policy in an open economy – Fixed Exchange Rates and Flexible Exchange rates.

### **Books Recommended:**

1. Gregory Mankiw, N, Principles of Macro Economics, Thomson-South Western.
2. Michael Parkin, Macro Economics, Addison Wesley
3. Paul Samuelson, William D. Nordhaus Economics, McGraw Hill – Irwin.
4. Rudiger Dornbusch, Stanley Fischer, Richard Startz, Macro Economics, McGraw Hill company.
5. Richard T. Froyen, Macro Economics, Theories and Policy, MacMillan.

## **Core Paper XI : Econometric Methods – I**

### **Unit I: Regression on Dummy Independent Variables**

Nature of Dummy Variables

Applications of Dummy Variables – Testing for Gender analysis, Spatial/Regional analysis, Seasonal analysis, Structural Stability of the model

### **Unit II: Regression on Dummy Dependent Variables**

Dummy Dependent Variables

The Logit Model – Introduction & Estimation

### **Unit III: Regression on Dummy Dependent Variables**

The Probit Model – Introduction & Estimation

### **Unit IV: Auto Regressive and Distributed-Lag Models**

Role of Time/Lag in Economics

Reasons for lags

Distributed Lag Models –Koyck Model, Adaptive Expectations Model, Partial Adjustment Model

Auto-Regressive Models – Method of Instrumental Variables

Causality – The Granger Test

### **Unit V: Time Series Econometrics**

Stationarity Stochastic Process

Tests of Stationarity – Correlogram, Unit Root

Cointegration

### **Books Recommended:**

1. William Greene, 'Econometric Analysis', Pearson Education
2. Woolridge, 'Introduction to Econometrics'.
3. Racine and Li, 'Non-parametric Econometrics- A premier'
4. A.C. Cameron and P.K. Trivedi, 'Micro Econometrics- Methods and Application', Cambridge University Press.

## **Core Paper XII : International Economics**

### **UNIT-I**

Importance of international trade-difference between inter regional and international trade-Smith's theory of absolute costs- Ricardo's theory of comparative costs- Heckscher-Ohlin theory

### **UNIT-II**

The terms of trade- types-determination of terms of trade-Free trade vs protection-Tariffs- import quotas-international cartels

### **UNIT-III**

Balance of payment-structure of BOP-disequilibrium in BOP –measures to correct deficit in BOP-adjustment mechanisms of BOP .

### **UNIT-IV**

Foreign exchange rate: meaning of foreign exchange rate –determinants –causes of changes in the exchange rate. Foreign exchange rate policy –fixed exchange rate and flexible exchange rates –Devaluation.

### **UNIT-V**

International economic relation; foreign aid-IMF-the world bank-GATT-WTO-NIEO.

### **Books Recommended:**

1. Paul Krugman and Maurice Obstfeld, International economics.
2. Rana & Verma; International economics.
3. Mithani; International economics.
4. Salvatore D; International economics
5. Bhagwati J; International trade.
6. Bosodersten; International economics
7. C.P. Kindleberger; International economics

## **Elective Paper I: Indian Economy-I**

### **UNIT-I**

Economic development and growth-Basic characteristics of the Indian economy-major issues of development-obstacles to development.

### **UNIT-II**

Structure of Indian economy-National income – sectoral contribution and economic transition in India - -natural resources in the process of economic development population size and growth –demography composition – new population policy

### **UNIT-III**

Objectives of planning in India –development strategy in India-broad achievements and failures-new economic reforms –liberalization, privatization and globalization-rationale behind economic reforms-progress of privatization and globalization.

### **UNIT-IV**

The place of agriculture in the national economy-trends in production and productivity in agriculture –green revolution-progress of agriculture under the five year plans –land reforms –rural credit –agricultural marketing and food security in India.

### **UNIT-V**

Poverty and inequality in India –unemployment in India-causes for rising of prices – regional disparities in India.

### **Books Recommended:**

1. Uma Kapila, Indian Economy
2. GavravDattand Ashwani Mahajan, Indian Economy
3. SangivVerma, The Indian Economy
4. Government of India-Economic surveys.

**VI SEMESTER**  
**Core Paper XIII : Mathematical Economics - II**

Unit – I

Meaning of Input – Output Analysis – Open and Closed Models, Structure of Input-Output Model – Input-Output transactions Model – Input-Output Co-efficient Matrix – Hawkins – Simon Conditions – Assumptions – Uses and Limitations.

Unit – II

Constrained Optimisation –Lagrangian Multiplier Method – Problems on Utility Maximisation with Budget Constraint – Cost Minimisation Subject to Product function.

Unit – III

Homogenous Functions – Euler’s Theorem – Problems – Cobb-Douglas Production Function – Properties – CES Production Function – Properties.

Unit – IV

Difference Equation – Definition and Classification of Difference Equation –Linear Difference Equations – Solutions of Difference Equations – Linear First order Difference Equation – Harrod Model.

Unit – V

Application of Integration – Findings of Total Utility, Total Cost, Total Revenue and Consumption Functions – Consumers Surplus – Producers Surplus – Problems.

**Books Recommended**

1. Fundamental Methods of Mathematical Economics – Chiang A.C. (McGraw Hill, New Delhi, 1974)
2. Mathematics for Economists – Edward T. Dowling (Schaum Series)
3. Theory and Problems of Mathematical Methods for Business and Economics – Edward T. Dowling (Schaum Series)
4. Mathematical Analysis Business and Economics Application – Weber, Jean E – Harper & Row Publications, New York.
5. Maths for Economics – Geoff Renshaw – Oxford University Press, 4<sup>th</sup> Edition
6. Mathematical Methods for Economists – Mehta, and Madnani, G.M. - Sultan Chand, New Delhi.

### **Core Paper XIV: Public Finance**

**Unit I:** Meaning and scope of public finance – Role of Government – Distinction between private finance and public finance – principle of maximum social advantage

**Unit II:** Sources of Public Revenue- difference between tax revenue and non-tax revenue – classification of taxes – canons of taxation – taxable capacity – factors determining taxable capacity

**Unit III:** Principles of public expenditure – classification of public expenditure – causes and effects of public expenditure

**Unit IV:** sources of public debt – classification of public debt – effects of public debt – repayment and management of public debt.

**Unit V:** Meaning and objectives of budget – budgetary procedure in India – meaning and principles of federal finance – functions of NITI Aayog – Finance Commissions – Analysis of latest Finance Commission recommendations.

#### **Books Recommended:**

1. Richard A Musgrave & Peggy B. Musgrave, ‘public finance in theory and practice’, international edition 5<sup>th</sup> edition 2006.
2. H.L. Bhatia, ‘ Public Finance’, Vikas Publishing House, New Delhi.
3. Lekhi, ‘Public Finance’, Kalyani Publishers, Ludhiana, New Delhi,2007
4. S. K. Singh, ‘ Public Finance in Theory and Practice’, S. Chand and Company Limited
5. B.P. Tyagi, ‘ Public Finance’, Jai Prakash Nath& Co. Gah. Nauchandi
6. D.M. Mithani, ‘Public Finance’.

## **Core Paper XV: Econometric Methods – II**

### **Unit I: Regression on Dummy Independent Variables**

Nature of Dummy Variables

Applications of Dummy Variables – Testing for Gender analysis, Spatial/Regional analysis, Seasonal analysis, Structural Stability of the model

### **Unit II: Regression on Dummy Dependent Variables**

Dummy Dependent Variables

The Logit Model – Introduction & Estimation

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Auto-Regressive Models – Method of Instrumental Variables

Causality – The Granger Test

### **Unit V: Time Series Econometrics**

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Tests of Stationarity – Correlogram, Unit Root

Cointegration

### **Books Recommended:**

1. William Greene, 'Econometric Analysis', Pearson Education
2. Woolridge, 'Introduction to Econometrics'.
3. Racine and Li, 'Non-parametric Econometrics- A premier'
4. A.C. Cameron and P.K. Trivedi, 'Micro Econometrics- Methods and Application', Cambridge University Press.



## **Elective Paper II: Indian Economy-II**

### **UNIT-I**

The role of industrialization-review of industrial growth under planning-small scale industries ; role, problems, and policy perspective to help small scale industries-industrial policies; 1956,1977,1991.

### **UNIT-II**

Features of industrial labour- causes for industrial disputes –social security measures –unorganised sector and India’s informal economy –agricultural workers in India.

### **UNIT-III**

Importance of foreign trade for a developing economy-composition and direction of India’s foreign trade- role of FDI-BOP crisis- India’s trade policy.

### **UNIT-IV**

Financial sector reforms – organisation of India’s money market –changing roles of RBI-development financial institutions –Indian capital market and SEBI

### **UNIT-V**

Trends in revenue and expenditure of central and state Governments-deficit finance in India-current year budget of government of India-finance commission-federal finance in India.

### **Books Recommended:**

1. Uma Kapila, Indian Economy
2. GavravDattand Ashwani Mahajan, Indian Economy
3. SangivVerma, The Indian Economy
4. Government of India-Economic surveys.

### **Elective Paper III: COMPUTER APPLICATIONS IN ECONOMICS**

#### **Unit I: Working with MS EXCEL**

Starting EXCEL

Workbook, Worksheet/Spreadsheet

Calculation Operators

Arithmetic Operators

Comparison Operators

Logical Operations

Excel Tool Bars

#### **Unit II: Descriptive Analysis**

Measures of Central Tendency – Minimum, Maximum, Sum, Mean, Median, Mode

Measures of Dispersion – Range, Standard deviation, Variance

Measures of deviation from Normality – Skewness, Kurtosis

Frequency Distributions – Univariate, Bivariate

Frequency Polygons – Ogives

#### **Graphical Illustrations:**

Column/Bar Diagram

Histogram

Pie diagram

Line Graphs

Scatter Plot

Stock Diagram

Radar Diagram.

#### **Unit III: Measures of Linear Relationships – Estimation & Hypothesis Testing**

Correlation – Simple, Partial & Multiple

Coefficient of Determination

Regression – Simple & Multiple

Regression & ANOVA

#### **Unit IV: Functional Forms (Non-Linear Relationship)**

Double Log Model – Estimation of Elasticity measure

Semi-log Model – Estimation of Growth Rates

Reciprocal Model – Estimation of Asymptote values

Regression on Dummy variables

#### **Unit V: Hypothesis Testing – Significance of Means**

Student's t Test

ANOVA (one-way & two-way)

#### **Books Recommended:**

Micro Soft Excel 2016 Bible – the comprehensive tutorial resource by John Walkenbach, John Wiley and Sons inc., 2013

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**AC' SEPT 2018**