Transportation Problem: Formulation, Solution by N.W. Corner Rule, Least Cost method, Vogel's Approximation Method (VAM), Modified Distribution Method; Degeneracy, Special cases: Multiple Solutions, Maximization case, Unbalanced case, Prohibited routes.

Assignment Problem: Hungarian Method, Special cases: Multiple Solutions, Maximization case, Unbalanced case, Restrictions on assignment.

Unit 3: Network Analysis   (12 Hours)

Basic Concept, Construction of AOA Network diagram, Critical Path Analysis, float and slack analysis (Total float, free float, independent float, Safety Float), probability consideration in PERT, Time-Cost Trade-off in Project.

Unit 4: Decision Theory   (12 Hours)

Decision making environment, Construction of Pay off Table, Opportunity Loss Table, Decision under uncertainty, Decision under Risk: EMV, EOL, EVPI.

Decision under Conflict: Game Theory, Two-person Zero-Sum games, Maximin Minimax Principle, Games without Saddle point- Mixed strategy, Dominance Rule; Reduction of m x n game and solution of 2x2, 2 x s, and r x 2 cases by Graphical Method.

Practical component (if any) - NIL

Essential/Recommended Readings

1. Vohra, N. D., Quantitative Management, Tata McGraw Hill.
2. Kanti Swarup, Gupta, P. K., & Man Mohan, Operations Research, Sultan Chand & Sons.

Suggested readings

1. Taylor, B. W., Introduction to Management Science, Pearson India.
2. Hillier, M. S., & Hillier, F. S., Introduction to Management Science, Pearson India.

Note: Latest edition of the readings may be used.

COMMON POOL OF GENERIC ELECTIVES (GE) COURSES

GENERIC ELECTIVES (GE-4): FUNDAMENTALS OF ECONOMETRICS

Credit distribution, Eligibility and Pre-requisites of the Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course
		Lecture	Tutorial	Practical/ Practice		
FUNDAMENTALS OF ECONOMETRICS (GE-4)	4	3	0	1	Class XII Pass	Nil

Learning Objectives

The Learning Objectives of this course are as follows:

- This course provides a comprehensive introduction to basic econometric concepts and techniques.
- It covers estimation and diagnostic testing of simple, multiple regression models, panel data models, and dummy variable regression with qualitative response regression models.

Learning Outcomes

The Learning Outcomes of this course are as follows:

- Understanding of basic econometrics and its assumptions and the impact of violations of classical assumptions.
- Interpretation of functional forms of regression model.
- Understanding of models using dummy variables and Qualitative Response Regression Models.

SYLLABUS OF GE-4

Unit 1 					**(12 Hours)**
Introduction to Econometrics and an overview of its applications; Simple Regression with Classical Assumptions; Properties of estimators,Least Square Estimation and BLUE, Multiple Regression Model and Hypothesis Testing Related to Parameters – Simple and Joint. Functional forms of regression models.

Unit 2 					**(9 Hours)**
Understanding the impact of change in scale of variables on output. Indicators of Goodness of fit of a model; Understanding and calculation of R Square and adjusted R Square.Understanding and calculation of information criteria for model selection: AIC, BIC, and HQC. Understanding of outliers and their impact on the model's output.

Unit 3 					**(12 Hours)**
Violations of Classical Assumptions: expected value of error term is zero, normality, multicollinearity, heteroscedasticity, autocorrelation, and model specification errors, their identification, their impact on parameters; tests related to and impact on the reliability and the validity of inferences in case of, violations of Assumptions; methods to take care of violations of assumptions.

Unit 4 					**(12 Hours)**
Dummy variables: Intercept dummy variables, slope dummy variables, Interactive dummy variables, Use of Dummy Variables to model qualitative/Binary/Structural changes, Response Regression Models or Regression Models with Limited Dependent Variables - Use of Logit, and Probit Models.

Practical component (30 Hours) –*Recommendation Computer Package to be used: Use of softwares like E-Views, R, and STATA to solve real-life problems and check assumptions, taking care of*

assumption violations, and test goodness of fit, and for estimation of Logit, and Probit Models is recommended.

Essential/Recommended Readings:

1. Christopher Dougherty. Introductory Econometrics. Oxford University Press.
2. Gujarati, N. Damodar. Basic Econometrics. New Delhi: McGraw Hill.
3. Gujarati, N. Damodar. Econometrics by Examples. New Delhi: McGraw Hill.

Suggested Readings:

1. Pindyck, Robert S. and Daniel L. Rubinfeld Econometric Models and Economic Forecasts. Singapore: McGraw Hill.
2. Ramanathan, Ramu (2002). Introductory Econometrics with Applications (5th ed.). Thomson South-Western.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.

GENERIC ELECTIVES (GE-5): ESSENTIALS OF FINANCIAL INVESTMENTS

Credit distribution, Eligibility and Pre-requisites of the Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course
		Lecture	Tutorial	Practical/ Practice		
Essentials of Financial Investments (GE-5)	4	3	1	0	Class XII Pass	Nil

Learning Objectives

The Learning Objectives of this course are as follows:

- To familiarize students with the essential concepts and fundamentals of financial investments.
- The course will enable them to understand and make informed choice about the various available financial investment alternatives.

Learning Outcomes

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

- Understand the fundamentals of financial investments and the investment decision process.
- Able to compute various measures of risk and return, and understand their role for evaluating investments.
- Understand and carry out security analysis using different approaches.
- Learn basic approaches to valuation of securities and carry out portfolio analysis.

SYLLABUS OF GE-5

Unit 1: Investments – An Overview (9 Hours)

Concept of Investment, Financial Investment Vs. Real Investment, Investment Vs Speculation, Objectives of Investment, Risk Return Trade Off, Investment Environment – Overview of Securities Market and Different Types of Financial Investment. Investment Decision Process, Direct Investing Vs Indirect Investing, Approaches to Investing – Active Vs Passive. Diversification, Hedging and Arbitrage.

Unit 2: Risk – Return Analysis (9 Hours)

Concepts of Return and Risk, Types of Return - their Calculation & Utility: Absolute Return, Average Return, Expected Return, Portfolio Return, Holding Period Return, Effective Annualized Return, Risk-Adjusted Return. Causes (or Sources) and Types of Risk – Systematic and Unsystematic Risk, Calculation of Total, Systematic and Unsystematic Risk. Impact of Taxes (discuss relevant provisions of Income Tax Act, 1961) and Inflation on Investment – Computation of Post Tax and Real Returns.

Unit 3: Security Analysis (15 Hours)

Approaches to Security Analysis – Fundamental Analysis, Technical Analysis, and Efficient Market Hypothesis (EMH). Fundamental Analysis – EIC Framework, Economic Analysis, Industry Analysis, and Company Analysis. Technical Analysis – Basic Tenets of Technical Analysis, Tool of Technical Analysis – Charts, and Technical Indicators, Limitations of Technical Analysis. Difference between Fundamental Analysis and Technical Analysis. Efficient Market Theory (EMH) – Concept, Forms of Market Efficiency, Weak Form Hypothesis, Semi Strong Form, and Strong Form of Market Efficiency. Implications of EMH.

Unit 4: Fundamentals of Valuation and Portfolio Analysis (12 Hours)

Valuation of Equity Shares – Peculiar features of Equity Shares, Dividend Discount Model, Relative Valuation - Earning Multiplier or Price-Earnings (P/E) Model and Price to Book Ratio; Capital Asset Pricing Model (CAPM) – its assumptions and limitations. Valuation of Fixed Income Securities – Bond Fundamentals, Types of Bonds, Determination of Bond Prices and Bond Yield. Portfolio Analysis – Portfolio Management Process, Portfolio Analysis – Portfolio Risk, Portfolio Return, Markowitz Model.

Practical component (if any) - NIL

Essential/Recommended Readings:
1. Tripathi, Vanita: Security Analysis and Portfolio Management. Taxmann Publications.
2. Chandra, Prasanna: Investment Analysis and Portfolio Management. McGraw Hill Education.

Suggested Readings:
1. Rustagi, R.P., Investment Management. Sultan Chand Publications.
2. Reilly, F. K. & Brown, K.C. Analysis of Investments and Management of Portfolios, Cengage India Pvt. Ltd.

Note: **Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.**

GENERIC ELECTIVES (GE-6): PERSONAL FINANCE

Credit distribution, Eligibility and Pre-requisites of the Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course
		Lecture	Tutorial	Practical/ Practice		
PERSONAL FINANCE (GE-6)	4	3	1	0	Class XII Pass	Nil

Learning Objectives

The Learning Objectives of this course are as follows:

- To equip students with the knowledge and practical understanding of important dimensions of managing one's personal finance.
- They would be able to understand and do planning for their tax liabilities, investments, insurance coverage, and retirement.

Learning Outcomes

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

• Understand the fundamentals of Personal Financial Planning.

• Learn the basics of managing personal tax liabilities.

• Able to ascertain and choose appropriate insurance policies for managing personal risks.

• Appreciate the importance of choosing right investments for managing personal finance.

• Learn the basic concepts and underlying principles for Retirement Planning.

SYLLABUS OF GE-6

Unit 1: Basics of Personal Finance and Tax Planning (12 Hours)

Understanding Personal Finance. Rewards of Sound Financial Planning. Personal Financial Planning Process. Personal Financial Planning Life Cycle. Making Plans to Achieve Your Financial Goals. Common Misconceptions about Financial Planning. Financial Planning as a career choice. The Financial Planning Environment. Personal Tax Planning – Tax Avoidance versus Tax Evasion, Fundamental Objectives of Tax Planning, Tax Structure in India for Individuals, Common Tax Planning Strategies – Maximizing Deductions, Income Shifting, Tax-Free and Tax-Deferred Income.

Unit 2: Managing Insurance Needs (12 Hours)

Basics Concepts – Risks, Risk Management and Underwriting. Insuring Life – Benefits of Life Insurance, evaluating need for Life Insurance, Determining the Right Amount of Life Insurance. Choosing the Right Life Insurance Policy – Term Life Insurance, Whole Life Insurance, Universal Life Insurance, Variable Life Insurance, Group Life Insurance, Other Special Purpose Life Policies. Buying Life Insurance – Compare Costs and Features, Select an Insurance Company, and Choose an Agent. Life Insurance Contract Features. Insuring Health – Importance of Health Insurance Coverage.

Making Health Insurance Decision – Evaluate Your Health Care Cost Risk, Determine Available Coverage and Resources, Choose a Health Insurance Plan. Types of Medical Expense Coverage. Policy Provisions of Medical Expense Plans. Property Insurance – Basic Principles, Types of Exposure, Principle of Indemnity, and Coinsurance.

Unit 3: Managing Investments (12 Hours)

Role of Investing in Personal Financial Planning, Identifying the Investment Objectives, Different Investment Choices. The Risks of Investing, The Returns from Investing, The Risk-Return Trade-off. Managing Your Investment Holdings – Building a Portfolio of Securities, Asset Allocation and Portfolio Management, Keeping Track of Investments. Investing in Equity – Common Considerations, Key Measures of Performance, Types of Equity Stocks, Market Globalization and Foreign Stock, Making the Investment Decision. Investing in Bonds – Benefits of Investing in Bonds, Bonds Versus Stocks, Basic Issue Characteristics, The Bond Market, Bond Ratings. Investing in Mutual Funds and Exchange Traded Funds (ETFs) – Concept of Mutual Funds and ETFs, Benefits of Investing in Mutual Funds or ETFs, Some Important Cost Considerations, Services Offered by Mutual Funds, Selecting appropriate Mutual Fund and ETF investments, Evaluating the performance of Mutual Funds and ETF.

Unit 4: Investing in Real Estate and Retirement Planning (9 Hours)

Investing in Real Estate – Some Basic Considerations. Modes of Real Estate Investment – Raw Land, Commercial Properties, Residential Properties, Real Estate Investment Trusts (REITs) and Infrastructure Investment Trust (InvITs).

Planning for Retirement – Role of Retirement Planning in Personal Financial Planning, Pitfalls to Sound Retirement Planning, Estimating Income Needs, Sources of Retirement Income.

Practical component (if any) - NIL

Essential/Recommended Readings:
1. Randall S. Billingsley, Lawrence J. Gitman, and Michael D. Joehnk (2017): Personal Financial Planning. Cengage Learning.
2. Susan M. Tillery, and Thomas N. Tillery: Essentials of Personal Financial Planning. Association of International Certified Professional Accountants.

Suggested Readings:
1. Introduction to Financial Planning (4th Edition 2017) – Indian Institute of Banking & Finance.
2. Sinha, Madhu. Financial Planning: A Ready Reckoner. July 2017. Mc Graw Hill

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.