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UNIVERSITY OF MYSORE  
(Estd.1916)

**DIPLOMA**  
**in**  
**QUANTITATIVE TECHNIQUES FOR**  
**RESEARCH**



# UNIVERSITY OF MYSORE

DEPARTMENT OF STUDIES IN ECONOMICS AND COOPERATION  
MANASAGANGOTRI, MYSURU - 570 006

DIPLOMA IN QUANTITATIVE TECHNIQUES FOR RESEARCH

SYLLABUS: 2017-2018

  
**CHAIRMAN**  
Department of Studies  
Economics and Co-operation  
University of Mysore  
Manasagangothri  
MYSORE-570 006

## UNIVERSITY OF MYSORE

DEPARTMENT OF STUDIES IN ECONOMICS AND CO-OPERATION  
MANASAGANGOTRI, MYSURU-570 006

## DIPLOMA IN QUANTITATIVE TECHNIQUES FOR RESEARCH

[Syllabus: 2017-2018]

## INSTRUCTIONS:

1. **Duration:** Diploma Course is for a duration of TWO Semesters [i.e., ONE YEAR]
2. **Number of Credits:** Number of Credits for each Course shall be 20.
3. **Teaching Hours:** 6 Hours per week for each course. [About 60 hours for each course]  
[This shall be inclusive of theory, application, practical work, tutorials, and seminars as required/applicable to each course depending on the content and approach by the faculty]
4. **Allocation of Marks: Number of Marks for Each Course: 100**  
Out of 100 Marks:           70 Marks is for Theory Examination [Comprehensive end Semester Exam]  
                                          30 Marks is for Internal Assessment [for all the Courses in 2 Semesters]  
30 Marks for Internal Assessment shall have the break-up as follows:  
                                          10 Marks for One Test  
                                          05 Marks for One Assignment  
                                          05 Marks for Seminar Presentation
5. **Fees Structure:**
  - This is a fully Self-Finance Course and the Fee shall be as prescribed by the University of Mysore in its Prospectus copy every year.

## DIPLOMA IN QUANTITATIVE TECHNIQUES FOR RESEARCH

Course No.	Title of the Certificate Course	Number of Credits	Marks for Theory	Internal Assessment	Total Marks
Diploma: 1.1	Basic Mathematics	6	70	30	100
Diploma: 1.2	Basic Statistics	6	70	30	100
Diploma: 1.3	Theory of Econometrics	6	70	30	100
Diploma: 1.4	Applied Econometrics	6	70	30	100
<b>TOTAL</b>		<b>30</b>	<b>280</b>	<b>120</b>	<b>400</b>

6. **Eligibility Criteria:**

- Students who have completed their Bachelor's Degree with Economics as one of the Cognate Subjects, B.Sc., with Mathematics or Statistics as one of the Cognate Subjects in Bachelor's Programme, B.Com, BBM and Students with Masters' Degree in Social Science, Commerce & Management are eligible to pursue this Course.



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**DIPLOMA IN QUANTITATIVE TECHNIQUES FOR RESEARCH**

[For Research in Social Science, Commerce & Management]

**I-Semester**

**Course Code: Diploma: 1-1**

**BASIC MATHEMETICS**

**Preamble:** Economics is incomplete without knowledge of mathematics, since mathematics gives flesh and blood to the subject of Economics. Mathematics for Economics deals with various applications of mathematical tools and techniques in defining and developing economic relationships. So this course, accordingly, is designed to include various mathematical methods to analyze and understand economic theories.

**Module - 1: Basic Mathematics for Economic Analysis**

Relationship between Mathematics and Economics - Applications of Mathematics in Economic Analysis - Its Uses and Limitations - Logic, Sets and Relations - Functions -Meaning and Types: Linear and Non-Linear, Power, Exponential and Logarithm - Analytical Geometry - Simultaneous Equations - Solutions for Two Variables Application to Market Equilibrium: Derivation of Demand and Supply Functions - Marshal and Walras' Stability Conditions - Effect of Taxes and Subsidies, Indifference Curves, National Income, Interest: Compounding and Discounting, Changes in Aggregate Demand and Supply Functions, Consumption Function.

**Module - 2: Elementary Matrix Algebra**

Basic Concepts - Types of Matrix - Matrix Operations - Transpose - Inverse Matrix -Determinants: Meaning, Properties, Rank of Matrix, Minor, Co-factor.  
Functions of Several Variables - Cramer's Rule and its Applications in Economics.

**Module - 3: Differential and Integral Calculus**

Differential Calculus: Limits - Derivations - Rules of Differentiation - Partial Derivatives, Total Derivatives, - Maxima and Minima for One and Two Variables.

**Applications to Economic Analysis:**

*Consumers Behavior:* Elasticity of Demand, Relationship between Price Elasticity and TR, AR and MR, Consumers' Equilibrium and Utility Maximization

*Firm's Behaviour:* Production Function - Cost Function - Revenue Function - Equilibrium of Firm and its Profit Maximization - Homogenous Function - Cobb-Douglas Production Function - CES Production Function - Euler's Theorem - Monopoly and Joint Production -Duopoly, Monopolistic Competition and Oligopoly.

Integral Calculus: Techniques of Integration - Definite and Indefinite Integration.

*Applications to Economic Analysis:* Consumer's Surplus - Producer's Surplus.

Introduction to Frontier Analysis: Technical Efficiency - Technological Change and Total Productivity - Multi-Market Equilibrium.

**Module - 4: Difference and Differential Equations**

*Difference Equations:* Definitions and Concepts - Solutions to First Order and Second Order Difference Equations.

Applications to Economics: Cob-web Model.

*Differential Equations:* Definitions and Concepts - Solutions to First Order and Second Order Differential Equations.

Applications to Economics: Harrod-Domar Model, Multiplier and Accelerator.

**Module - 5: Linear Programming and Input-Output Analysis**

*Linear Programming:* Basic Concepts - Constrained Optimization - Formulation of Linear Programming Problem - Nature of Feasible and Optimal Solutions - Solution through Graphical Methods - Introduction to Simplex method - Duality Theorem.

*Input-Output Analysis:* Basic Concepts, Static, Open and Closed Input-Output Models

**References:** [Please refer to the Latest Editions]

1. Allen R.G.D., *Mathematical Analysis for Economists*, Macmillan.
2. Bose D., *An Introduction of Mathematical Economics*, Himalaya Publishing House, Mumbai.
3. Chiang A.C., *Fundamental Methods of Mathematical Economics*, McGraw-Hill Higher Education.
4. Veerachami R., *Quantitative Methods for Economists*, New Age International Pub., New Delhi
5. Yamane Taro, *Mathematics for Economists - An Implementer Analysis*, Phi Learning Publishers.



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DIPLOMA IN QUANTITATIVE TECHNIQUES FOR RESEARCH

[For Research in Social Science, Commerce & Management]

I-Semester

Course Code: Diploma: 1-2

BASIC STATISTICS

**Preamble:** Economics has become more and more analytic over the years, requiring sufficient knowledge of quantitative methods. To meet this requirement, a course in Statistics for Economics is absolutely essential. This course will help the student in data collection, presentation, analyses and drawing inferences about various statistical hypotheses. Further, it helps to develop the analytical skills in the student.

**Module - 1: Introduction to Statistics**

Types of Data - Nominal, Ordinal & Ratio-Scale Data, Qualitative and Quantitative Data, Individual, Discrete and Continuous Data - Cross Section, Time Series and Pooled Data - Sources of Data - Population and Samples - Descriptive Statistics and Inferential Statistics.

**Module - 2: Measures of Average and Dispersion**

Measurement of Average - Arithmetic Mean, Weighted Arithmetic Mean, Geometric Mean, Harmonic Mean, Median, Quartile, Percentiles, and Mode.

Measures of Variability - Range, Inter-quartile Range, Quartile Deviation, Percentiles Deviation - Mean Deviation, Standard Deviation, and Coefficient Variation.

**Module - 3: Probability and Distribution**

Probability Theory - Concepts and Approaches to Estimate Probability - Probability Distribution Functions - Theoretical Distribution: Normal, t, Chi-Square & F Distribution.

**Module - 4: Theory of Estimation and Hypothesis Testing**

Concept of Estimator - Sampling Distribution of Estimator - Point and Interval Estimation - Properties of Good Estimator for Small and Large Samples.

Hypothesis Testing: Approaches to Hypothesis Testing - Confidence Interval Approach - Test of Significance Approach and P-Value Approach - Formulation of Hypothesis - Null and Alternative - Level of Significance - One Sided and Two Sided Hypothesis - Type-I and Type-II Error - Test Statistic - Critical Value - Parametric and Non-Parametric Tests.

**Module - 5: Correlation and Regression**

*Correlation:* Meaning and Types of Correlation - Measurement of Correlation - Scatter Diagram - Karl Pearson's Coefficient of Correlation - Spearman's Rank Correlation - Testing of Correlation Coefficients.

*Regression:* Simple Regression Model - Estimation - Least Squares Method - Goodness of Fit - Introduction to Multiple Regression.

**Module - 5: Time Series Analysis**

Nature and Decomposition of Time Series - Analysis of Trend - Polynomial Trend - Moving Average Method, Exponential Smoothing, Least-Square Method, Seasonal Component - Forecasts and their Accuracy - Root Mean Square Error.

**Module - 6: Index Numbers**

Nature and Purpose of Index Numbers - Types of Index Numbers: Price Index - Retail Price Index - Quantity Index, Link and Chain Index - Simple and Aggregate Index Numbers: Laspeyre's Index, Paasche's Index, Marshall and Edgeworth's Index - Fisher's Index - Time Reversal and Factor Reversal Tests - Deflation and Splicing of Index Numbers - Problems of Construction of Index Numbers - Limitation of Index Numbers.

***Practical Component:***

***Graphical Presentation of Data:*** *Tabular and Graphical Methods - Relative Frequency and Percentage - Frequency Distribution - Bar Graphs, Line Graph, Pie Charts, Histogram, Cumulative Distribution and Ogives.*

**References: [Please refer to the Latest Editions]**

1. Anderson, Sweeney & Williams, *Statistics for Business & Economics*, Thomson South-Western, Bangalore.
2. Gupta S P. *Statistical Methods*, S. Chand and Company, New Delhi.
3. Veerachami R. *Quantitative Methods for Economists*, New Age International Publication, New Delhi.
4. Yamane Toro, *Statistics - An Introductory Analysis*, Harper and Row Publishers, New York.



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**DIPLOMA IN QUANTITATIVE TECHNIQUES FOR RESEARCH**

[For Research in Social Science, Commerce & Management]

**II-Semester**

**Course Code: Diploma: 1-3**

**THEORY OF ECONOMETRICS**

**Preamble:** The explosive growth in econometric literature in the last few decades hardly needs any emphasis. Introduction of this Course can be viewed as an attempt to expose the students to the basic concepts of econometrics. Keeping this in mind, the focus of this Course will be on a meaningful interface between theory and application - the emphasis being more on empirical analysis rather than theoretical rigour.

**Module - 1: Introduction to Econometrics**

Meaning - Nature and Scope of Econometrics - Distinction between Economics and Econometrics, Mathematics and Econometrics, Statistics and Econometrics - Methodology of Econometrics - Types of Econometrics.

**Module - 2: Simple and Multiple Regression Model**

*Simple Regression:* Meaning - Basic Ideas - Significance of Disturbance Term. Method of Estimation: Ordinary Least Squares and Maximum Likelihood Estimation - BLUE Property - Coefficient of Determination - Assumptions - Hypothesis Testing - Confidence Interval and Test of Significance Approach - Testing Regression Coefficients - Interpretation of Results.

*Multiple Regression:* Meaning - Three Variable Regression Model - Partial Regression Coefficients - Method of Estimation - R-Square and Adjusted R-Square - Hypothesis Testing - Testing Individual Regression Coefficient - Overall Significance Test - ANOVA.

Introduction to Matrix Approach to Estimation of Parameters of more than Three Variables.

**Module - 3: Practical Problems of Regression**

Multicollinearity: Nature - Causes -Consequences - Detection - Remedial Measures.

Heteroscedasticity: Nature - Causes -Consequences - Detection - Remedial Measures.

Auto-Correlation: Nature - Causes -Consequences - Detection - Remedial Measures.

**Module - 4: Dummy Variable and Dynamic Regression Models**

*Dummy Variable Model:* Meaning - Nature - Dummy Variable Trap - Dummy Variable Model with Single Qualitative Variable - Two Qualitative Variables - Dummy Variable Model with Mixture of Qualitative and Quantitative Variables.

*Autoregressive and Dynamic Models:* Role of Lag in Economics - Estimation Methods: Koyck's: Adaptive Adjustment and Partial Expectation Models - Almon Approach to Distributed Lag Models.

**Module - 5: Simultaneous Equation Models**

Nature - Simultaneous Equation Bias - Identification: Under - Exact - Over Identification - Rules of Identification - Order and Rank Condition of Identification - Estimation of Simultaneous Equations Models: ILS, 2SLS, 3SLS, LIMLE, FIMLE.

**References: [Please refer to the Latest Editions]**

1. Damodar N Gujarati, *Basic Econometrics*, McGraw Hill, International Student Edition.
2. Damodar N Gujarati, *Econometrics by Example*, Palgrave Macmillan, United Kingdom.
3. Ghosh Sukesh K, *Econometrics- Theory and Applications*, Prentice Hall Private Ltd., New Delhi.
4. Koutsoyiannis A., *Theory of Econometrics*, The Macmillan Press Ltd., London.



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[For Research in Social Science, Commerce & Management]

**II-Semester**

**Course Code: Diploma: 1-4**

**APPLIED ECONOMETRICS**

**Preamble:** This course covers the statistical foundations of econometric theory as well as econometric methods and applications. The focus of this course will be therefore on an interface between these three facets that are essential for a proper understanding of econometric applications in economic analysis.

**Module - 1: Qualitative Dependent Variable Models**

Nature of Qualitative Variables - Linear Probability Model - Logit Model - Probit Model - Tobit Model for Grouped and Ungrouped Data - Their Application in Economics.

**Module - 2: Time Series Econometrics**

Introduction - Stationary and Non-Stationary Series - Random Walk Model - Testing of Unit Root - Co-integration - Test for Co-integration - Engel-Granger Test - Johansen Test - Error Correction Model - Introduction to ARCH and GARCH Modeling - Their Application in Economics.

**Module - 3: Panel Data Models**

Why Panel Data? - Estimation - Fixed Effects Method - All Coefficient Constant across Time and Individuals - Slope Coefficients Constant but Intercept Varies across Individuals - Slope Coefficients Constant but Intercept Varies Over Individuals as Well as Time - All Coefficients Vary across Individuals - Random Effects Method - Fixed Effects v/s Random Effects Model - Hausman Test - Their Application in Economics.

**Module - 4: Empirical Demand, Production and Investment Analysis**

Static Single Equations - Demand Analysis - Theoretical Foundations of Demand Analysis - Utility Theory - Tobin's Study - Static Multiple Equations - Production Function - Neoclassical Production Function - Cobb-Douglas Production Function - CES Production Function - Dynamic Single Equation Model - Investment Behaviour Models - Meyer and Kuh Model - Kuh Model

**Module - 5: Econometric Applications in India**

Econometric Applications in Indian Demand Analysis - Indian Agriculture - Indian Industry - International Trade.

**References:** [Please refer to the Latest Editions]

1. Brooks Chris, *Introductory Econometrics for Finance*, Cambridge University Press, Cambridge.
2. Desai Meghnad, *Applied Econometrics*, McGraw Hill Publishing Company Ltd.
3. Gujarathi Damodar, *Basic Econometrics*, McGraw Hill, International Student Edition.
4. Krishna K. L., *Indian Econometrics Models*, Oxford University Press, Oxford.
5. Patterson Kerry, *An Introduction to Applied Econometrics a Time Series Approach*, Macmillan Press.

